Analyzing Flexible Learning Implementation using Decision Tree Approach

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Abstract. Philippine Commission of Higher Higher Education (CHED) compelled Higher Education Institutions (HEIs) to adopt flexible teaching and learning and urged them to employ available flexible curriculum with incorporates both synchronous and asynchronous learning modes and a mixture of teaching and learning methods. This study aims to analyzed the implementation of flexible learning using decision trees. The research utilized descriptive research, where a descriptive survey was designed to identify the problems encountered, problems/challenges, and suggest solutions by university students in the implementation of flexible learning in the campus. Problems/challenges on no/unreliable internet connection and cost of internet connectivity are the two (2) major problems that were encountered by the students in the implementation of flexible learning in the university. Administrators should coordinate with the local government units to assist students in terms of internet connections. PSU should provide subsidies to assist students with the needed devices for flexible learning.

Keywords: Flexible Learning; Decision Tree; Learning; Internet; Online Learning;

INTRODUCTION

The COVID-19 pandemic has led to the disruption of the traditional educational system in the Philippines. This encouraged the Commission on Higher Education (CHED) to write the Bayanihan to Heal as One Act, and by virtue of Commission en Banc (CEB) Resolution No. 412-2020, series of 2020, the guidelines on the implementation of flexible learning were put to order. This highlights the utilization of flexible learning methodology to address the needs of students all over the Philippines while limiting the risks of infection in the academic community. Commission of Higher Higher Education (CHED,2020) compelled Higher Education Institutions (HEIs) to adopt flexible teaching and learning and urged them to employ available flexible curriculum with incorporates both synchronous and asynchronous learning modes and a mixture of teaching and learning methods. Specifically, flexible learning provides learners with several options as to when, where, and how learning occurs (Naidu, 2017), which is not solely focused on the use of technology. However,
most universities and colleges in the Philippines are using the traditional modes of learning that involve the conduct of classes through face-to-face instruction with very few institutions using blended and other alternative modes of instruction (Pawilen, 2021).

Toquero (2020) revealed that many HEIs in the Philippines, both private and public, are not prepared to implement an flexible system and they need to consider several factors like financial stability, network accessibility, technical equipment, and digital knowledge. Furthermore, according to Gocotano, et al. (2021) students possess just mobile phones and use mobile data as their primary internet access source, ranging from moderate to poor connection. Also, the majority are not fully equipped with enough skills in digital media. For challenges, students experienced the unavailability of a network, economic instability, digital divide, the shortage of digital devices, addictive learning environment, expensive internet data, health-related problems, lack of resources, lack of digital literacy skills, and loss of motivation.

Limited resources for online learning have always been considered as one of the major challenges faced by teachers and students. The study of Dela Cruz and Catura (2020) showed that teachers in the Philippines are doubtful about the accessibility of a reliable internet connection, computer, and computer accessories such as microphones, headphones, and webcams for a virtual classroom. The economic aspect of flexible learning is also considered an issue among the students regardless of their location, whether they are from urban, rural, or suburban areas (Laguador, 2021). Students from suburban areas feel that their family members are less supportive; students from rural areas feel significantly higher challenges in terms of limited communication with teachers; and moderate challenges are expressed by students, regardless of location, in terms of delivery of instruction and achievement of learning outcomes. The study conducted by Fabito et al. (2021) on the computing department in one private school in Luzon showed that issues with internet connectivity and lack of computers and laptops are among the problems encountered by students. They also found in their survey that teachers were not able to meet the needs of the students in an online learning environment, hence training that would allow them to design a more suitable online learning pedagogy is needed.

Pangasinan State University forced its faculty and students to immediately adapt to the flexible learning modalities. Flexible learning however, is newly introduced on the university, thus its effectiveness and the problems encountered related to this are not yet fully studied. Such sudden implementation of flexible learning raised some challenges to students, parents, and educators. Thus, this study specifically aims to analyze the implementation and problems/challenges in the implementation of flexible learning particularly, identify current media in implementing flexible learning; media used in the implementation for flexible learning; identify problems/challenges encountered in the implementation of flexible learning modalities, and to propose interventions related to the challenges encountered in the implementation of flexible learning modalities.

This results of the study aid the university administration and other stakeholders to subsequently sort the required modifications and steps to improve the implementation of flexible learning and to create a more worthwhile teaching-learning occurrence to the teachers and students.

METHOD

Research Design

This research utilized descriptive research, where a descriptive survey was designed to identify the problems encountered, problems/challenges, and suggest solutions by university students in the implementation of flexible learning in the campus.

Survey Instrument

The questionnaire utilized in this study was adapted from the one developed by the Statistics Center of Pangasinan State University. The said questionnaire was modified by the proponents to include some additional items to fit the need of the study. The survey questionnaire is composed of two parts. Part 1 focuses on the profile of student respondents which includes the campus where they are enrolled, the program where they belong, the internet connection they utilize, and the device they use for flexible learning. The second part pertains to the problems encountered in the implementation of flexible learning in the university. The enhanced survey questionnaire was validated in terms of its content and reliability by ten (10) people, which include faculty members from PSU and other schools in Pangasinan. The result of the reliability test shows good internal consistency with a Cronbach’s alpha value of 0.887 (Andale,
2017). In addition, comments and suggestions were incorporated into the survey questionnaire instrument before it was administered.

Population

Purposive sampling techniques using total population sampling was utilized to identify the respondents of the study. All students studying in PSU-Urdaneta Campus were considered respondents of this research. To administer the survey questionnaire, a google link for the survey questionnaire was sent via email and Fb messenger to all students enrolled in PSU-Urdaneta City Campus.

Research Procedure

The proponents wrote a letter of request to the Campus Executive Director (CED) to release a campus memo requesting faculty members from university to share the link for the questionnaires with their students. Only seven hundred twenty-nine (729) had the time to participate in the survey.

Classifying and Predictive Tool

Previous research reveals that the most popular learning machine used and supervised classification technique is the decision tree. This involves simple steps and can be applied to any domain. Results from this technique is also very intuitive and is easy to discuss and explain (Lakshmi et al., 2013). The main objective of the decision tree is to produce a tree model that will predict the value of a target variable by applying several input attributes. The output of the decision tree can be utilized as a decision support tool that utilizes a tree-like graph with several predicted possible outcomes. A decision tree is a classifier in the form of a tree structure where each node is either: Leaf node which represents an indicator for the value of the target attribute (class) of examples; or a decision node, which specifies all possible tests on a single attribute-value, with one branch and sub-tree for each possible outcome of the test (Chahal, 2013).

Text Analysis

Voyant Correlations tools was utilized to explore the extent to which term frequencies vary in terms whose frequencies rise and fall together or inversely.

The following terms in columns by default were: (a) Term 1: the first term of the pair (the order or the terms doesn't matter); (b) Trends: two sparklines (mini graphs) that show the distribution of relative frequencies (the left one is for Term 1 and the right one is for Term 2); (3) Term 2: the second term of the pair (the order or the terms doesn't matter); (4) Correlation: the Pearsons correlation coefficient for this pair of words; (5) Significance: the significance of the correlation value (lower is better)

Voyant Collocates Graph

Collocates Graph represents keywords and terms that occur in close proximity as a force directed network graph. This represents a network graph where keywords to collocates hover over a term to see its frequency (for keywords it's the corpus frequency, for collocates it's the frequency in the context of the linked keywords).

RESULTS AND DISCUSSION

Results

Medium used by students in the implementation of Flexible Learning

Figure 2 shows the medium used by the students in their flexible learning. Out of 729 students 123 or 17 % students are with no devices available for this purpose. Majority of students 310 or 43 % utilized smart phone followed by laptop is the second used devices with 246 or 34 % and desktop computer constitute 44 or 6 %. Tablet obtained the lowest device used by students in the flexible learning. The result reveals that smart phone is the most used devices for flexible learning. It is oblivious that majority of the students utilized this in their flexible learning was due to the availability of this devices, used in social connectivity and collaborative tool, and personalized learning activities. The results of this study is similar with Gocotano, et al. (2021) that most students possess just mobile phones and use mobile data as their primary tool in the flexible learning. In addition, abrupt implementation of flexible learning raised some challenge were some students don’t have any devices for flexible learning. According to the recent survey “about four in 10 Filipino students do not have any devices needed for distance learning, according to a recent survey by the Social Weather Stations (SWS)” (Flores, 2021).
Figure 2. The devices used for flexible learning by the students

Device = No: None {None=123, LP=0, SM=0, TB=0, DE=0, TA=0}
Device = Yes
- Course = ABEL: SM {None=0, LP=10, SM=11, TB=0, DE=3}
- Course = ARCH: LP {None=0, LP=14, SM=10, TB=0, DE=2}
- Course = CE: LP {None=0, LP=59, SM=54, TB=1, DE=11}
- Course = ECE: SM {None=0, LP=15, SM=28, TB=0, DE=1}
- Course = EE: SM {None=0, LP=73, SM=107, TB=3, DE=16}
- Course = IT: SM {None=0, LP=39, SM=47, TB=1, DE=6}
- Course = ME: SM {None=0, LP=24, SM=31, TB=1, DE=3}
- Course = Math: SM {None=0, LP=1, SM=7, TB=0, DE=2}
- Course = SE: SM {None=0, LP=11, SM=15, TB=0, DE=0}

Legends:
- SM - Smart Phones
- LP - Laptop
- TB - Tablet
- DE - Desktop/PC
- None

Problems/challenges Encountered by students in the implementation of Flexible learning

For the problems encountered by the students, some of the items identified are adaptability struggle coded as AS, cost of internet coded as CI, data limits coded as DL, lack of self-motivation as LM, no internet connection as NI, non-responsive faculty as NF, problem in grades as PG, the problem with time management as TM, and unclear learning outcomes as UA. Using the decision tree technique, Figure 1 shows that no internet connection (NI) was the most encountered problem by the students in the implementation of flexible learning. Further, the result shows that 166 BSEE students, 105 BSCE students, 77 BSIT students, 44 BSME students, 42 BECEd students, 22 BSEd students, 19 ABEL Students, and 8 BSMath students or 66 percent of the respondents claimed that they have a device for flexible learning but they have problems regarding internet connection. In addition, 30 BSEE, 27 BSCE, 13 BSIT, 8 BSEd, 6 BSME, 5 BECEd, 4 ABEL, and 1 BSMath, or 0.13 percent of the students assert that they have no devices for flexible learning, and at the same time, they have problem with internet connectivity as well. The reason for this problem is the country’s internet infrastructure lags compared with other developing countries in Asia (Salac and Kim, 2016).
Figure 3. Graphical representation of the connection problems/Challenges encountered words derived from dataset

Description

Problem00 = AS (Adaptability Struggle)
Internet Connection = No: IT {IT=3, EE=3, CE=2, ABEL=2}
Internet Connection = Yes: CE {SE=1, ME=3, EE=3, CE=6}

Problem00 = CI (Cost of Internet)
Internet Connection = No: EE {ME=2, IT=6, EE=8, CE=8, ARCH=1, ECE=1, ABEL=2}
Internet Connection = Yes: EE {SE=2, ME=4, Math=2, IT=3, EE=10, CE=4, ARCH=1}

Problem00 = DL (Data Limits)
Device = No: EE {ME=1, EE=2, CE=2, ECE=1}
Device = Yes: EE {SE=2, ME=5, IT=4, EE=10, CE=3, ARCH=2, ECE=1, ABEL=1}

Problem00 = LM (Lack of Self Motivation)
Internet Connection = No: IT {IT=1, ABEL=1}
Internet Connection = Yes: CE {CE=1}

Problem00 = NI (No Internet Connection)
Device = No: EE {SE=8, ME=6, Math=1, IT=30, EE=30, CE=27, ARCH=4, ECE=5, ABEL=4}
Device = Yes: EE {SE=22, ME=44, Math=8, IT=77, EE=166, CE=105, ARCH=22, ECE=42, ABEL=19}

Problem00 = NF (Non-Response Faculty)
Device = ME {ME=2, EE=1, CE=0}

Problem00 = PG (Problem in Grade)
Device = EE {EE=2}

Problem00 = TM (Problem with Time Management)
Device = IT {IT=4, CE,2}

Problem00 = UA (Unclear Learning)
Device = EE {EE=1}

The cost of the internet (CI) is the next pressing problem encountered by the students in the implementation of flexible learning. The results shown in Figure 1 reveal that 28 students...
have issues with the cost of the internet, and 26 students with problems with the internet connection have issues with the cost of the internet as well. According to an article by Moneymax (2021) the internet in the Philippines is already slow and what makes it worse is the fact that it is expensive. Internet connection in the Philippines is one of the most expensive in the world landing number 5 as the most expensive in terms of internet speed and cost. The results of this study confirmed the study of Dela Cruz and Catura (2020) that accessibility of a reliable internet connection is considered a major problem in the successful implementation of flexible learning in the Philippines. Intervention proposed by students to solve problems in flexible learning

With regarding the proposed intervention as proposed by the students, table 2 and figure 3 reveals most frequent word patterns that gives hints on suggestions to what students needs during flexible learning.

**Table 2.** Combination words derived suggested intervention words to help students which was from the dataset

<table>
<thead>
<tr>
<th>Term 1</th>
<th>← →</th>
<th>Term 2</th>
<th>Correlation (r)</th>
<th>Significance (p)</th>
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<tbody>
<tr>
<td>learning</td>
<td></td>
<td>online</td>
<td>0.9229087</td>
<td>0.000140684</td>
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<tr>
<td>connection</td>
<td></td>
<td>internet</td>
<td>0.863608</td>
<td>0.001280033</td>
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<tr>
<td>discussions</td>
<td></td>
<td>learning</td>
<td>0.8081538</td>
<td>0.00468118</td>
</tr>
<tr>
<td>expect</td>
<td></td>
<td>internet</td>
<td>0.7818344</td>
<td>0.00754921</td>
</tr>
<tr>
<td>aid</td>
<td></td>
<td>internet</td>
<td>0.7745479</td>
<td>0.0085231</td>
</tr>
<tr>
<td>considerations</td>
<td></td>
<td>students</td>
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<td>0.009258636</td>
</tr>
<tr>
<td>deadlines</td>
<td></td>
<td>learning</td>
<td>0.76082647</td>
<td>0.010602878</td>
</tr>
<tr>
<td>class</td>
<td></td>
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<td>0.011391826</td>
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<tr>
<td>expecting</td>
<td></td>
<td>learning</td>
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<td>0.016652243</td>
</tr>
<tr>
<td>moral</td>
<td></td>
<td>online</td>
<td>0.72508997</td>
<td>0.017652176</td>
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<tr>
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<td>deadlines</td>
<td></td>
<td>online</td>
<td>0.68246853</td>
<td>0.02969393</td>
</tr>
</tbody>
</table>

**Figure 3** and table 2 shows that students proposed to have an the school should provide then “Internet” + “connection” + “Online” and “access” + “Internet” + “Connection” and “Connection” + “Internet” + “Learning” + “online” + “class” or in other word “provide then with an internet connection for their during their online class”. Other Suggestions were “Load” + “Stable” + “Connection” + “Internet” + “Online” and “Connection” + “Internet” + “Online” + “Classes” or students suggest that the school should provide (aid) Load for internet
connection during their online class. Further, they requested for stable internet connection during their online class. The major request coming from the students are free (“aid”+“load”) and stable internet connection during their online class based on the word patterns and relationship of words. Students suggested this intervention because one of the major problem during online class in the province is poor internet connection (Camara et al., 2021) which posed as the greatest barriers to both faculty members and students of Higher institution in province Pangasinan.

CONCLUSION AND SUGGESTION

This study attempted to identify the medium, problems/challenges encountered by university students in the implementation of flexible learning modalities. Majority of the Students utilized mobile phones and use this device as their primary device in the implementation of flexible learning. However, some of them do not have any available device that can be used for flexible learning. Based on the results, problems/challenges no/unreliable internet connection and cost of internet connectivity are the two (2) major problems that were encountered by the students in the implementation of flexible learning in university. The result of this study brings painful realities faced by Filipino students. Some are willing to pay for the internet connection, even with its high cost however, they still receive a slow internet connection. Students suggest that the school should provide (aid) Load for internet connection during their online class. Further, they requested for stable internet connection during their online class. The major request coming from the students are free (“aid”+“load”) and stable internet connection during their online class based on the word patterns and relationship of words.

It is therefore recommended that university administrators should adopt measures to enhance support to students in all aspects. The administrator should coordinate with the local government units to assist students in terms of internet connections. PSU should provide subsidies to assist students with the needed devices for flexible learning. On the other hand, teachers should reconsider their mode of instruction with regards to the contents and activities given to students, as they find issues in these elements as well.

REFERENCES


Naidu, S. (2017) “Openness and flexibility are the norms, but what are the challenges?” Distance Education 38 (1).
