

A Conjoint Study and Segmentation on the Preferred Online Learning Attributes of Senior High School Learners

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Abstract

The educational systems have been disrupted due to the COVID-19 pandemic that has resulted in the sudden shift in the instructional implementation from face-to-face to fully online distance learning. This quantitative study examined the learners' socio-demographic characteristics and access to technological resources, preferred online learning attributes, and their segmentation. The study employed a descriptive and exploratory research design. Using Cochran's formula and disproportionate stratified random sampling technique, 300 senior high school learners were identified as respondents of the study. Five online learning attributes consisting of delivery type, lecture, learning tasks, learning materials, and assessment methods were analyzed through the orthogonal plan component of SPSS 22.0. Respondents voluntarily answered 16 profiles with 2 holdouts generated by the orthogonal design using an online 5-point Likert scale. The conjoint analysis revealed that learners' most preferred online learning attributes were assessment methods using multiple-choice and multiple types of exams; synchronous online lectures with slides as the delivery type; individual tasks; and learning materials utilizing visual aids. Further analysis revealed that learners, considering their preferences and profiles, could be classified into two segments based on grade level. Grade 12 learners comprised segment one, and Grade 11 dominated segment two. The results provide insights for academic institutions that learners in different grade levels differ in their learning preferences in an online setup and to reconsider the appropriate pedagogical activities to be utilized in an online learning setup to ensure educational advantage. Therefore, it would be ideal to redesign the curricula and innovate pedagogical approaches based on learners' preferences and segmentation (grade level) to leverage learning in online education.

Keywords: distance learning, e-learning Philippines, online teaching and learning, remote teaching and learning

Introduction

The global health crisis has impeded the educational systems of academic institutions worldwide. On short notice, academic institutions were compelled to experiment and adopt novel methods and strategies of instructional delivery as countermeasures to mitigate the predicaments brought by the pandemic. To

ensure that the educational system continues despite the crisis, new instructional policies and procedures tailored to the new educational setup were crafted and implemented. Primarily, academic institutions have shifted from conventional face-to-face to fully online learning as the mode of instructional delivery. This abrupt paradigm shift in the educational landscape makes learning even more challenging, especially in developing countries (Muthuprasad et al., 2021).

Suliman et al. (2021) viewed online learning as an instructional modality in which the teacher serves as the facilitator and actively engages learners using various technology-based instructional materials that can be accessed despite the geographical separation of the teacher and the learner. In this type of learning modality, the internet mediates the learner-teacher and learner-to-learner interactions through either synchronous or asynchronous sessions. Synchronous sessions require both teachers and learners to have a reliable internet connection so that they can interact in real-time using a learning management system or other online-related learning platforms. In contrast, asynchronous sessions do not necessarily require both the teachers and learners to access the online platform simultaneously. Using a technology-based platform, the teacher provides learning tasks that learners can access and work on anytime (Chen et al., 2021; Suliman et al., 2021).

There is a consensus in the literature on the advantages of online learning that include easy access to information, ease in creating and updating teaching and learning materials, accountability in the teaching-learning process, cost-effectiveness, and enhancement of learners' motivation, among others (Cano, 2022; Wart et al., 2020). It has been reported that online learning can strengthen learners' concept attainment (Batucan et al., 2022); hence, it is occasionally utilized in science education in the form of computer simulations to motivate learners to learn complex concepts (Cano et al., 2022). Likewise, various scientific reports also revealed that learners in the online learning setup showed higher motivation levels and academic performance (Aelterman et al., 2019; Pham et al., 2019; Ruzek & Schenke, 2019). A systematic meta-analytic review by Woldeab et al. (2020) suggests that online learning shows equivalency or even superiority to traditional face-to-face.

On the contrary, despite the advantages proffered by online learning in education, it still draws negative feedback from the academic community (Barrot, 2021; Suliman et al., 2021). Its efficiency and cost-effectiveness have been put into question by some stakeholders. More so, the sudden shift in the adoption of online learning caused even more drawbacks among the stakeholders due to the emergence of different technological, instructional, financial, and even psychological challenges (Baticulon et al., 2021). Likewise, the full implementation of online learning on short notice exposes the severe conditions of the digital divide in remote areas of developing countries (Batucan et al., 2022). There are also many reports on the prevalence of slow or unstable internet connection, insufficient teaching and learning resources, and ineffective online interaction in low and even in middle-income countries (Baticulon et al., 2021; Muthuprasad et al., 2021). Batucan et al. (2022) emphasized that internet connectivity issues, lack of sufficient engagement and interaction between

learners and teachers, and ineffective utilization of technology were the usual barriers in the online learning environment. Accordingly, Woldeab et al. (2020) reported that the adaptability of the teachers and the learner in online education remains a significant gap in an online learning setup. Without proper mitigation, these issues may negatively impact learning in online education.

To address the challenges mentioned above and to leverage learning in the online environment, a consensus in the literature suggests that the learners' preferences must be considered (Muthuprasad et al., 2021; Ong et al., 2021). Preference is a critical factor in the learners' academic performance because it allows them to be engaged and better process the concepts discussed in the most preferred way (Chen et al., 2021). Likewise, identifying the learners' preferences can help teachers develop and design effective and efficient innovative pedagogical approaches that meet the expectations and needs of the learners (Kuzmanovic et al., 2019; Muthuprasad et al., 2021). Furthermore, a study among medical science learners revealed that most of them experienced burden and burnout in the online learning setup (Baticulon et al., 2021). The reasons cited by the learners were difficulty in achieving the educational outcomes of clinical courses due to a lack of social and technological support to manage online learning and the utilization of pedagogical approaches that do not meet their needs. In the study of Muthuprasad et al. (2021) among college agriculture learners in India, learners preferred structured online learning with recorded sessions and assessments after class; however, slow internet connection was the most common problem identified. Internet connection was regarded as one of the critical factors in the learners' preferences and coping mechanisms in online education (Baticulon et al., 2021). Accordingly, Cano et al. (2022) posited that learners' preferences are greatly influenced by their positive perception of easy access to technology. More so, literature reported that utilizing instructional materials based on learners' preferences is an effective measure in bridging educational gaps in online learning (Debattista, 2018; Kuzmanovic et al., 2019).

According to Kuzmanovic et al., (2019), conjoint analysis is commonly utilized in examining preferences. Conjoint analysis is a multivariate statistical technique that is widely used as a market research tool for measuring and analyzing the value that consumers place on features of a product, service, or idea (Hair et al., 2010). It is based on the assumption that the decisions on the features of a certain product, service, or idea are based on several factors that must be considered 'jointly'; hence, the term conjoint. On that note, using conjoint analysis, investigators could easily examine the interrelationship of the different factors as they contribute to the general preferences. Nowadays, the technique has been further applied to understand preferences in various services such as transportation (Kowalska-Pyzalska et al., 2022), retail (Payini et al., 2022), telecommunication (Shin et al., 2011), and health care (Al-Omari et al., 2022; Shamma et al., 2022). More so, the conjoint analysis approach has been applied in making decisions in selecting new personnel by the human resource professionals (Ramantswana et al., 2021), as well as in evaluating teaching performance (Bacon et al., 2016).

Despite the wide utilization of conjoint analysis in the different fields, literature revealed that only a handful of studies had utilized conjoint analysis in the context of education. For instance, Longva et al. (2020) examined the impact of entrepreneurship education using business planning courses on the career intentions and preferences of college learners in Norway; Macindo et al. (2019) explored the experiential learning preferences of student nurses in terms of acute and critical care; Azarcon et al. (2014) attempted to determine the decision-making process of the college learners related to retention and attrition; and Kuzmanovic et al. (2019) designed an e-learning environment that is tailored to the preferences of college learners in Serbia. It can be noted that the studies identified have employed the conjoint analysis approach to examine and explore learners' preferences at higher education levels, specifically during the pre-pandemic periods. Although Ong et al. (2022) conducted a scientific study on the preference analysis of the online learning attributes among senior high school learners during the COVID-19 pandemic, the segmentation of the learners was the limitation of the study.

Like conjoint analysis, segmentation is occasionally utilized as a marketing tool. Martin (2011) defined segmentation as a process of classifying consumers based on their related needs and purchasing behavior pattern. He added that segmenting consumers allows businesses to be more targeted in marketing their products or services. If segmentation is done effectively, it could help organizations to achieve the highest return on investment. He emphasized that if any organization markets its products or services, it should focus on segmenting its consumers. On that note, if segmentation is applied in the educational context, the utilization of instructional strategies and computer systems would be more specific and targeted to the needs and preferences of a particular group of learners. Thus, the instructional outcomes could be effectively channeled to the learners in the online learning environment. It has already been emphasized in the literature review that learners' academic performance, motivation, satisfaction, and even their retention in a particular academic institution in the online learning setup are significantly affected by their perceived preferences. Hence, educational institutions must acknowledge the preferences of their learners and take necessary actions to take advantage of them (e.g., redesigning course curricula based on learners' preferences) to leverage learning in online education.

The results of this study can be applied as take-off points for educational institutions that offer K-12 programs to adjust and redesign their curricula and innovate pedagogical approaches based on learners' preferences to maximize learning in the online environment. Furthermore, the conjoint analysis of the preferred online learning attributes and the segmentation of the learners can serve as models and baselines for future studies to further evaluate the effectiveness of the results in different contexts globally.

Since online learning is multi-attributed, this posed a limitation in the study. More so, Kuzmanovic et al. (2019) posited that the number of levels per attribute in a conjoint analysis is usually limited to 2 to 4 levels. To address these limitations, the researcher only included learner-relevant online learning

attributes that any educational institution can manage. Furthermore, the online learning attribute levels considered in this study were ensured to be adequate, credible, and capable of being traded off against each other (Kuzmanovic et al., 2019). Hence, five attributes of interest were defined based on the previous research (Kuzmanovic et al., 2019; Muthuprasad et al., 2021; Ong et al., 2021), online learning models and frameworks (Anderson, 2013; Garrison et al., 2004; Laurillard, 2013), and the researcher's experience in teaching in the online learning setup. Specifically, the online learning attributes considered were the delivery type, lecture, learning tasks, learning materials, and assessment methods. More so, this study is only within the context of the K-12 program (senior high school) and does not measure learners' perceptions of the online learning setup.

The dearth of literature that examines and explores preferences and segmentation of learners in the K-12 program in a fully online learning setup amidst the COVID-19 periods prompted the researcher to conduct this study.

Objectives

This study aimed to examine the preferences of learners in an online learning setup and explored their segmentation – primarily focusing on senior high school learners. Specifically, this study sought to answer the following research questions:

1. What are the learners' profiles in terms of socio-demographic characteristics and access to technological resources?
2. What are the preferred online learning attributes of the learners?
3. How should the learners be segmented?

Review of Related Studies

Online Learning Models and Frameworks

Different learning models and frameworks suggest different conceptualizations of how learners learn in the context of online learning. The conversational framework by Diana Laurillard described the learning process as an 'iterative' dialogue that is discursive, adaptive, interactive, and reflective (Laurillard, 2013). The framework highlights the process of how both the teacher and the learners are able to access each other's understanding of the content; adapt to their respective tasks, with the teacher setting up the environment for the learners and how they are adapting to the established learning setup; do the learning tasks through the plan-do-check-feedback cycle of interaction; and be reflective as they interact with one another for the refinement and confirmation of the acquired topic goals. This process primarily occurs on two levels: discursive and experiential level. At the discursive level, the learning process occurs through a dialogue between the teacher and the learner. It is where the teacher and the learners exchange and negotiate ideas with one another. While at the experiential level, both the teacher and the learners are adaptive to their tasks and reflective as they interact, especially on the things that transpire during the discursive level. This gives the insight that to maximize the learning process,

the teaching and learning environment must have task goals or outcomes, promotes learner initiative and an effective feedbacking system, and gives an avenue for adaptive and reflective learning (Laurillard, 2013; Picciano, 2017).

Meanwhile, the Community of Inquiry (CoI) model describes the learning experience as the establishment of community through the three elements: social presence, teaching presence, and cognitive presence (Nolan-Grant, 2019). Social presence refers to the ability of the learners to project themselves as 'real' individuals that possess social and emotional qualities in the technology-mediated environment. Teaching presence refers to the designing, facilitating, and guiding of the cognitive and social aspects of the learners by the teachers with the goal of achieving personally meaningful and educationally valuable learning outcomes. On the other hand, cognitive presence is the extent to which the learners are able to construct ideas and validate them through reflection dialogue which is regarded as the widely accepted goal of academic institutions (Shepherd et al., 2022; Wertz, 2022).

According to Picciano (2017), the CoI model is anchored on the 'transactional' point of view, where an educational experience of the learners is viewed as having the dual purpose of enabling their personal construction of meaning and being reinforced by collaboration within a community of learners for the refinement and confirmation of the acquired concepts. Since the CoI model was developed based on research on the distinguishing characteristics of computer-mediated communication, i.e., computer conferencing applications, the preferences of learners and their needs, institutional support, and curricular approaches must be taken into consideration (Rivera-Vargas et al., 2021). For instance, Garrison et al. (2004) posited that there is a difference in the learners' preferences for the type of learning delivery (synchronous and asynchronous), and the cost of supporting the acquisition of technology-based paraphernalia is undeniably expensive (Garrison et al., 2004; Rivera-Vargas et al., 2021). Wertz (2022) suggests that since the levels of interactivity are challenging to prescribe and assess in the online setup, academic institutions should devise strategic methods to ensure that the types of interactions are addressed using various types of technologies.

Moreover, these issues enabled Anderson (2013) to develop the model of online learning that integrates flexibility, self-directed learning, and participation in the learning environment. In this model, Anderson (2013) addressed two approaches in online learning: collaborative learning in a community of inquiry and independent learning using structured learning resources. In the collaborative learning approach, the utilization of asynchronous and synchronous delivery types as means of communication primarily promotes the learner-learner, learner-content, and learner-teacher interactions. Meanwhile, in the independent learning approach, the prominent type of interaction is the learner-content. Likewise, the teacher-learner interaction is possible through the intervention of the content, while the learner-learner interaction is possible through the interaction of the learners with their family members, relatives, and peers, including those whom they might meet in the online environment. Anderson (2013) posited that academic institutions that would like to use this model should consider the curriculum, nature, preferences, and needs of the

learners, among others.

Online Learning Attributes

The online learning modality has many attributes that must be considered to leverage learners' learning. It has been emphasized in the different online learning models and frameworks the salient components of online learning that must be considered to maximize its purpose in the teaching-learning process, such as the appropriateness of online instructional designs to the needs and preferences of the learners, effective and efficient technology integration in discourse, and institutional support. Likewise, Kuzmanovic et al. (2019) reiterated that the online learning attributes that must be utilized are those that are learner-relevant and can easily be managed by any educational institution, and the attribute levels must be credible, effective, and capable of being traded off against each other.

Online learning may be delivered in different types: synchronous, asynchronous, or mixed (Ong et al., 2021). In the synchronous delivery, there is a real-time teaching-learning engagement between the teacher and the learners where they go online at a specified time despite the differences in their geography using a learning management system or other online related learning platforms. In this type of online learning delivery, the teacher gives a live lecture, and the learners learn directly from the teacher, interact, and give feedback in real-time. On the other hand, the asynchronous type of delivery is when the teacher and the learners do not necessarily access the online platform simultaneously. The teacher provides learning tasks that learners can access and work on anytime. Moreover, interaction and giving of feedback are not in real-time. The teacher can upload pre-recorded video lectures through online learning platforms so that learners can watch them at the most convenient time and space (Lee et al., 2021).

Meanwhile, in the mixed delivery type, the teacher gives a live online lecture to the learners while it is being recorded. The recorded videos can be uploaded to online learning platforms for the learners to access and review (Aghababaeian et al., 2019). Lapitan et al. (2021) posited that one of the advantages of the mixed delivery type is that learners with unstable internet connections can still review the lecture recording after their internet connections become stable.

When it comes to learning experiences, Cano et al. (2022) emphasized that learners tend to be motivated to learn and acquire better concept attainment through experiential online learning activities. The hands-on activities in an online environment strengthen the concept attainment of the learners of the topic goals. However, the preferences of the learners in doing online activities are found to be dependent on whether they would be engaged individually or collaborate with their peers (Chandna et al., 2021; Dobao, 2012). Correspondingly, designing appropriate instructional materials by the teachers in an online learning environment has been acknowledged as an effective measure for bridging educational gaps since it intensifies interactions among the teacher, learner, and the content (Kuzmanovic et al., 2019; Muthuprasad et al., 2021).

Furthermore, the assessment method is one of the critical components of the teaching and learning processes, especially in an online learning setup. Primarily, the different assessment methods employed by the teachers are in the form of multiple-choice exams, essays, and conference papers. A multiple-choice type of exam is an assessment technique that presents a question or statement and provides options with the correct answer (Butler, 2018). Meanwhile, an essay exam requires learners to justify by writing a given scenario or problem to measure learners' learning (Mingo et al., 2018). The conference paper requires learners to write an academic paper with content related to a certain topic. These assessment methods are primarily based on the paper's soundness and the content's constructs.

Learner-Related Online Learning Factors

Traditional face-to-face education often assumes a great deal about the characteristics and learning styles of the learners (Messina et al., 2022). Similarly, in online distance learning, these learner-related factors must be taken into consideration, especially in designing instructional materials, using media for instruction, designing, and evaluating interaction, evaluation, and feedback mechanisms, among others (Anderson, 2013; Laurillard, 2013; Wertz, 2022). However, due to the transactional distance posed by the online learning setup, it is even more challenging for teachers to factoring learner characteristics, learning styles, and approaches (Muthuprasad et al., 2021).

Since online learning dramatically depends on technology-based instructional modes of delivery, thus it is centered on the concern for access (Dhawan, 2020). Despite the initiatives of the different government agencies in broadening the reach of online learning to all the learners across different contexts, the access to technology by the learners simultaneously facilitates and constrains the purpose. Moreover, learner autonomy is one learner-related factor that must be considered in the online distance learning modality. Learner autonomy is regarded as the core of several online learning theories, such as the theory of independent study by Charles Wedemeyer, the theory of transactional distance by Michael Moore, and the theory of guided didactic conversation by Borje Holmberg (Dobao, 2012; Garrison & Arbaugh, 2007; Moore & Diehl, 2018). In the transactional distance theory, Moore and Diehl (2018) posited that separating the teachers and the learners creates a communicative and psychological gap called transactional distance. This gap must be addressed in online distance learning, for it can be a possible avenue for misunderstanding between the teacher and learners in the teaching-learning process. Therefore, in any given context of online learning, it is crucial to design learning activities that would promote self-directed learning (Garrison & Arbaugh, 2007; Moore & Diehl, 2018). These self-directed learning activities allow learners to become independent and learn the topic by themselves as they engage with the appropriate learning materials. More so, they help the learners better attain the concepts shared during the class interactions.

On that note, it is, therefore, imperative to design learning activities that promote interaction in every learning situation. According to Dobao (2012), interaction is a specific and essential component of the educational process

since it enhances learner motivation and academic performance. Moore and Diehl (2018) classified interaction into three major types that are particularly effective in creating online learning instructional materials, which are also seminal components of different online learning models and frameworks: the learner-content, learner-learner, and learner-teacher interaction. In the learner-content interaction, the learning materials play an important role. In this type of interaction, the learning materials are designed according to the principles of guided didactic conversation. Correspondingly, in the learner-teacher interaction, the learners receive feedback from the teachers on how well they are learning. Meanwhile, in the learner-learner interaction, the learners are engaged in social interaction with their peers, which increases motivation and social construction of knowledge.

Segmentation

In the fields of business and management, understanding people's behavior based on different aspects is one of the important considerations to fully understand how the markets work (Martin, 2011). Hence, business organizations occasionally segment people based on their needs and purchasing behavior pattern. According to Sahu and Barman (2021), the primary reason for examining the preferences is to provide a concrete basis for effective segmentation for firms to come up with sound marketing plans, strategies, and decisions (Martin, 2011).

Segmentation is the process of grouping people in the market based on their related needs, preferences, or purchasing behavior pattern (Martin, 2011). Using segmentation, any organization can easily and effectively satisfy their customers and achieve a higher investment return since time and resources are allocated and focused on particular groups of people (Sahu & Barman, 2021). According to Martin (2011), effective segmentation should be based on three primary levels: consumers' personal characteristics, desired benefits, and behavior. The personal characteristics involve the consumers' socio and psycho-demographics. The demographics are occasionally utilized as they can provide a good overview of what kind of consumers are dominant in every segment, and firms can easily target these segments. However, according to Martin (2011), the limitation of this method is that, more often than not, it shows no good correlation between personal characteristics and what the consumers want to purchase. In addition to descriptive demographics, one way to understand and analyze consumers' information is through psychographics which attempts to classify consumers based on the combination of their values and resources (Sahu & Barman, 2021). The second level, desired benefits, is segmenting people based on their wants rather than who they are. Utilizing segmentation based on desired benefits is more challenging since businesses need to understand and analyze each product category thoroughly. However, using this type of segmentation level can make the products, services, or ideas match more closely to a particular group of people's specific wants. The third level is segmentation based on consumer behavior. Since consumers have the tendency to switch from their preferred choice to other deals and promos, this segmentation level aims to entice many consumers as possible to switch to the firm's products, services, or ideas by giving them incentives (Martin, 2011).

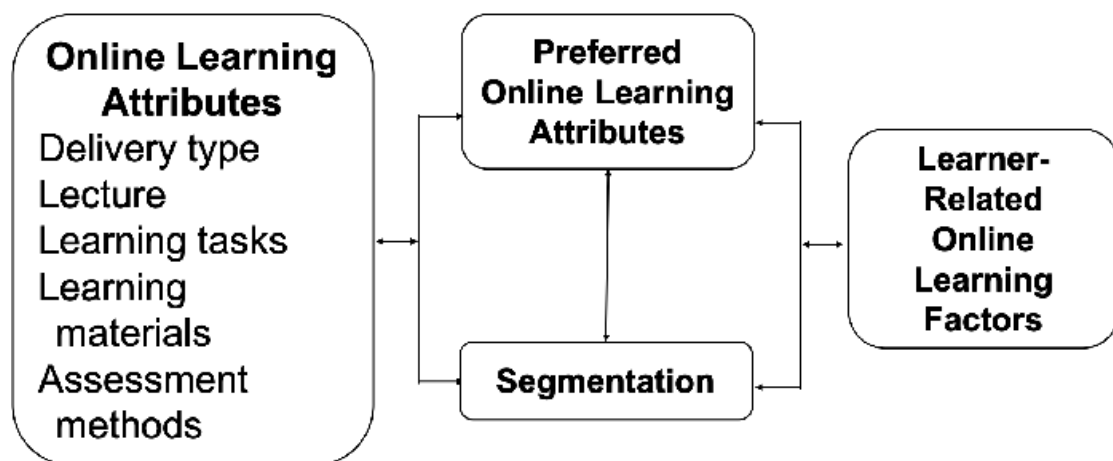
If learners are seen as customers, segmenting them into specific groups would be beneficial for it can promote satisfaction; hence, learning outcomes could easily and effectively be achieved in the online learning environment despite the transactional distance (Eishami et al., 2022; Ong et al., 2022).

Conceptual Framework of the Study

This study examined learners' preferred online learning attributes and their segmentation in a fully online learning setup amidst the COVID-19 pandemic. To address this goal, the conceptual framework shown in Figure 1 was defined and employed in the study.

Figure 1

Conceptual Framework of the Study



The researcher only considered learner-relevant online learning attributes, which can be easily managed by any educational institution that offers a K-12 program. Likewise, the levels of online learning taken into account in this study were ensured to be adequate, credible, and capable of being traded off against each other (Kuzmanovic et al., 2019). On that note, five attributes of interest were analyzed and defined based on the literature review, online learning models and frameworks, and the researcher's experience in teaching in the online learning setup. Specifically, these attributes were the delivery type, lecture, learning tasks, learning materials, and assessment methods (Figure 1).

The different online learning models and frameworks suggest that online learning is a complex process that demands the interrelated integration of technology, knowledge of content, context, and pedagogy that are based on the needs and preferences of the learners (Anderson, 2013; Laurillard, 2013). The delivery type and lecture are attributes that are predominantly salient components of discourse and pedagogy in the conversational framework (Laurillard, 2013), the community of inquiry model (Garrison et al., 2004), and Anderson's online learning model (Anderson, 2013). Meanwhile, the learning tasks and materials are important aspects of the collaborative and independent learning approaches in Anderson's online learning model, while the assessment methods serve as a

vital component in the teaching-learning process that measure the effectiveness of teaching pedagogies employed by the teachers and the learners' level of knowledge of content acquisition.

The identified online learning attributes were used to determine the learners' preferences and their segmentation. This study is primarily anchored on the idea that the learners' higher concept attainment and academic performance in the online learning setup could be justified by their preferences (Baturay & Yukselturk, 2015; Khanal et al., 2019; Muthuprasad et al., 2021; Pham et al., 2019). More so, the researcher hypothesized that the maximization of online learning could be more effectively and efficiently achieved if the learners are segmented based on their shared, preferred online learning attributes since both the time and resources in the teaching-learning process are allocated to a focused group of learners (Martin, 2011).

However, different learner-related online factors such as access to technology, autonomy, and interaction were reported to have a significant effect on learners' perceived preferences in online education (Dhawan, 2020). For instance, Moore and Diehl (2018) posited that the perception of the learners in an online setup was significantly affected by their limited access to technological resources since it can result in a misunderstanding between the teacher and learners' inputs and outputs due to transactional distance.

Methodology

Research Design

This study employed descriptive and exploratory research designs to obtain the necessary information to generate conclusive insights on learners' preferred online learning attributes and their segmentation. More specifically, it utilized a quantitative approach using multivariate techniques such as conjoint analysis to examine the learners' preferred online learning attributes and cluster analysis to segment them based on their preferred online attributes. Cluster analysis is a technique used to group variables into clusters based on the observed similarities in values for each variable (Sinharay, 2010). In this study, the researcher looked into the socio-demographics and access to the technological resources of the 300 senior high school learners to better understand the reasons for their preferences in the online learning setup. The focus, therefore, is not the individual preferences of the learners but their aggregated preferred online learning attributes. The aggregated preferences of the learners were used to segment them. Since this study utilized multivariate tools (conjoint and cluster analysis), the data gathered were multi-cross-sectionally analyzed — i.e., data from the respondents on their preferred online learning attributes were examined, and patterns were identified and analyzed.

Respondents of the Study

The senior high school learners of the Notre Dame of Marbel University-Senior High School Department (NDMU-IBED SHS) were the respondents of the study. NDMU-IBED SHS is a Catholic academic institution that is managed by

the Marist Brothers and located in Koronadal City, South Cotabato, Philippines. Being the academic institution in Koronadal City with the highest number of K-12 online learners, it was chosen as the locale of the study.

Out of 1078 senior high school learners, 300 learners comprised the sample size of the study. The sample size was defined using Cochran's formula with a margin of error of 95%, level of confidence of 5% (0.05), and maximum data variability of 0.25. According to Kuzmanovic et al. (2019), an ideal 200-300 completed surveys are needed to perform the conjoint analysis; however, it could go down to 100 completed surveys if the sample size is small.

In order to ensure that the respondents can provide the necessary information needed to address the research questions of the study and to avoid any form of biases, the following inclusion criteria were employed (Ong et al., 2022): 1. a senior high school enrolled in the 2nd Semester of the school year 2021-2022, 2. of any age with no gender restrictions, and 3. officially enrolled in the online distance learning modality.

Sampling Technique

The respondents were selected using the disproportionate stratified random sampling technique. It is a type of random sampling procedure wherein the number of samples per stratum is not proportional to the total population; hence, equal allocations of the number of samples per stratum were performed (Hair et al., 2010). Due to the restrictions and health protocols brought by the COVID-19 pandemic, the researcher administered the survey questionnaire online using Google forms. Sethuraman et al. (2005) posited that the online distribution of the survey questionnaire is adequate and does not affect the survey result when using conjoint analysis.

A total of 300 respondents, or 50 respondents per strand in every grade level, were considered in the study. The actual list and number of the population were requested from the Record Section of the school through transmittal letters. The population was divided into six (6) strata with 50 respondents each (disproportionate stratification). The respondents in every stratum were identified randomly using a computer program. This was done to ensure that every learner had the chance to be selected as a respondent.

Research Instrument

A survey questionnaire was utilized as a research instrument in the study. The questionnaire was comprised of two major parts. The first part was about the respondents' socio-demographic profile and access to technological resources. Meanwhile, the second part was about the questionnaire proper with 18 profiles. The profiles refer to the combination of the different online learning attributes considered in this study. The profiles were generated through orthogonal design using SPSS 22.0 to determine the efficient combination of the online attributes. The profiles were comprised of delivery type, lecture, learning task, learning materials, and assessment methods. A 5-point Likert scale was utilized to evaluate the profiles, with the value 1 being the least preferred and 5 being

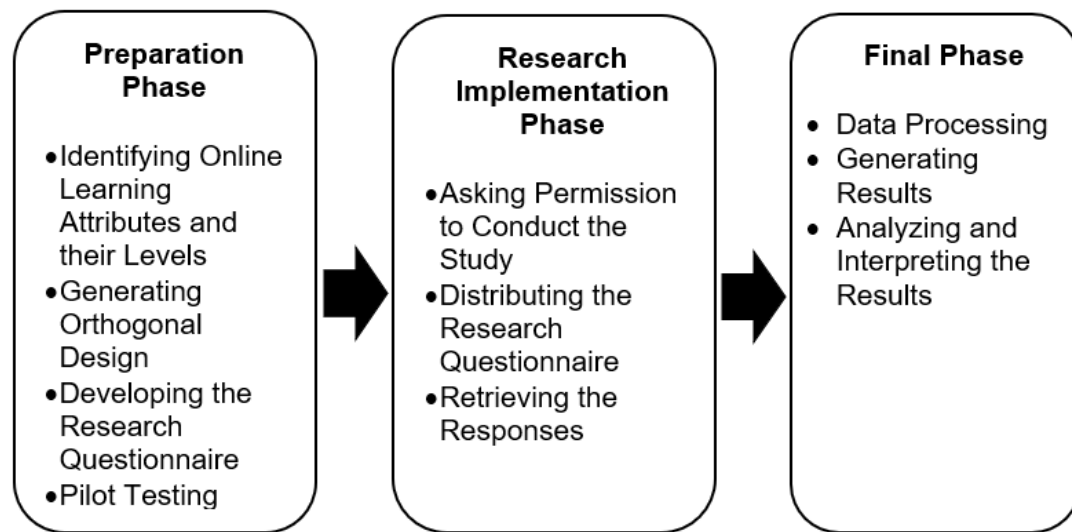
the most preferred.

Data Collection Procedure

The data gathering procedure employed in this study was primarily divided into three (3) phases: (1) preparation phase, (2) research implementation phase, and (3) the final phase, as shown in Figure 2.

Figure 2

Operational Framework of the Study



Preparation Phase

The different key online learning attributes and their levels were identified through reading and analyzing literature, online learning models, and frameworks. Learner-relevant online learning attributes to the learners with 2-4 levels that are adequate, credible, and capable of being traded off against each other (Kuzmanovic et al., 2019) were considered in the study. Table 1 shows the different online learning attributes and their levels.

Table 1

Online Learning Attributes and their Levels

Online Attributes	Levels
Delivery Type	Synchronous Asynchronous Mix (Synchronous and Asynchronous)
Lecture	Recorded lecture with slides Live online lecture with slides
Learning Tasks	Individual tasks Group tasks

Learning Materials	Reading materials Video materials Visual aids (pictures, charts, graphs) Hands-on learning materials
Assessment Methods	Multiple choice exam Essay exam Multiple types of exam Conference paper

The identified key online learning attributes and their levels were subjected to SPSS 22.0 using the orthogonal plan component to generate the orthogonal design with 16 profiles. Two (2) holdouts were added and utilized to ensure internal consistency among the respondents' responses (Kuzmanović et al., 2019). A total of 18 profiles comprised the second part of the questionnaire generated from the orthogonal design to represent each combination of the online learning attributes to determine the learners' preferences.

Prior to the conduct of the study, a pilot test of the questionnaire was done among 30 respondents who were selected through purposive sampling. The pilot test result registered a Pearson's R correlation of 0.956, close to the cut-off value of 1.00, implying that the generated orthogonal design has high goodness of fit (Hair et al., 2010).

Research Implementation Stage

Permission was sought from the School Director and Principal prior to the conduct of the study. With the approval, the researcher commenced the gathering of the data. The link to the questionnaire, in Google form, was sent to the identified respondents through the learning management platform of the school. The respondents were asked to fill out the informed consent form before answering the survey. A 5-point Likert scale was utilized to evaluate the 18 profiles. The responses of the respondents were retrieved through the Google form.

Final Stage

The gathered data were processed, analyzed, and interpreted to gain insights into the preferred online learning attributes of the learners. Furthermore, the part-worth utilities and importance scores of the attributes were determined, analyzed, and interpreted. The Kendall's Tau value was utilized to measure the questionnaire's internal consistency. According to Hair et al. (2010), the questionnaire must have a Kendall's Tau value of greater than 0.70 and closer to 1.00 to be considered acceptable with internal consistency. The results of the analyzed part-worth utilities of the attributes were further utilized for segmentation.

Statistical Treatment of Data

The respondents' socio-demographic profile and access to technological resources were analyzed and interpreted using frequency and percentage. Meanwhile, the results on the preferred online learning attributes were analyzed using conjoint analysis. To interpret the results generated by the conjoint analysis, the part-worth utility model was utilized (Kuzmanović et al., 2019). This model presumes that the sum of the partial utilities in a particular profile is equal to the total utility of that profile. Likewise, cluster analysis was utilized to segment learners with similar preferences. The similarity of learners' preferences was measured using the Euclidean distance. Once the similarity measure had been derived, segments (clusters) were formed using the hierarchical clustering method. The clusters were then validated by cross-tabulation using the Ward's method and the number of clusters considered was determined based on the number of respondents per cluster. Clusters with less than 20% of respondents were considered not desirable (Kuzmanović et al., 2019). The clusters generated were profiled and labeled using the extraction method based on their significant difference in terms of their socio-demographics, educational information, and access to technological resources using the chi-square test at 0.05 level of significance. The researcher utilized SPSS 22.0 to perform the conjoint analysis, cluster analysis, and chi-square test.

Ethical Consideration

This study was conducted based on the established protocols. Before conducting the study, the researcher informed the respondents that their participation was voluntary and confidential. Only the respondents who agreed and signed the informed consent form were allowed to participate in the study.

Results

Socio-Demographics and Access to Technological Resources

This study sought to determine the respondents' socio-demographic characteristics and access to technological resources. The frequency and percentage of the variables were computed and analyzed. Table 2 shows the socio-demographic and access to technological resources of the respondents.

Table 2

Respondents' Socio-Demographic Characteristics and Access to Technological Resources (n=300)

Socio-Demographic Variables		Frequency	Percentage
Gender	Male	109	36.3
	Female	180	60.0
	Non-binary	6	2.0
	Prefer not to say	5	1.7

Family's Total Annual Income	Low-income	217	72.3
	Lower-middle income	70	23.3
	Upper-Middle Income	12	4.0
	High Income	1	0.3
			Mean \pm SD
Age	17.21 \pm 0.864		
Access to Technological Resource Variables			
Device Ownership	Smartphone	249	83.0
	Laptop computer	225	75.0
	Desktop computer	64	21.3
	iPad or Tablet	22	7.3
Internet Access	Do not have Internet access and have to go somewhere else	5	1.7
	Prepaid mobile data	53	17.7
	Postpaid subscription service (Connection is slow and/or unreliable)	174	58.0
	Postpaid subscription service (Connection is fast and reliable)	68	22.7

Based on Table 2, females (n=180, 60.0%) outnumbered males (n=109, 36.3%), while there were 6 (2.0%) respondents who identified as non-binary, and 5 (1.7%) who preferred not to disclose their gender identity. The mean age was 17.21 \pm 0.864 years. Most respondents belonged to the low-income (n=217, 72.3%) bracket.

Regarding access to technological resources (Table 2), most respondents (n=249, 83.0%) had a smartphone. Accordingly, 225 (75%) had a laptop computer, 64 (21.3%) had a desktop computer, and 22 (7.3%) had an iPad or tablet. Most respondents subscribed to postpaid internet service (n=242, 80.7%); however, 175 (58%) of the respondents stated that they have slow and/or unreliable internet connection. Furthermore, 53 (17.7%) respondents access the internet through prepaid mobile data. Meanwhile, 5 (1.7%) respondents do not have internet access and have to go somewhere else to connect to the internet.

The limitations on internet infrastructures is a common problem in low-income countries such as lack, slow, and unreliable internet connectivity and devices (Baticulon et al., 2021), and the situation was reported to be even worse in remote areas (Muthuprasad et al., 2021). According to Muthuprasad et al. (2021), the digital divide and the lack of access to reliable internet connectivity posed serious constraints among learners in the online learning setup. These give the insights that if any country and academic institutions want to move forward in online education, they should prioritize the establishment of internet facilities and should utilize online learning applications that can be accessed through smartphones and laptops.

Preferred Online Learning Attributes

This study also sought to determine the learners' preferred online learning

attributes. The different part-worth utilities and importance scores of the online learning attributes are shown in Table 3. The higher the part-worth utility value implies a higher preference toward the attribute level. Likewise, the higher the averaged importance score indicates a stronger attribute preference by the learners. The values generated by the conjoint analysis were used to generate patterns for the most and least valued online learning attributes and levels (Kuzmanović et al., 2019).

Table 3*Part-worth Utilities and Importance Scores of Online Learning Attributes*

Attributes	Levels	Part-worth Utilities	Std. Error	Averaged Importance Scores
Delivery Type	Synchronous (S)	0.066	0.026	20.056
	Asynchronous (A)	-0.075	0.030	
	Mix (Synchronous and Asynchronous) (M)	0.009	0.030	
Lecture	Recorded lecture with slides (RLS)	-0.032	0.019	11.263
	Live online lecture with slides (LLS)	0.032	0.019	
Learning Tasks	Individual tasks (IT)	0.062	0.019	11.432
	Group tasks (GT)	-0.062	0.019	
Learning Materials	Reading Materials (RM)	0.016	0.034	24.790
	Video Materials (VM)	-0.044	0.034	
	Visual aids (pictures, charts, graphs) (VA)	0.034	0.034	
	Hands-on learning materials (HLM)	-0.007	0.034	
Assessment Methods	Multiple Choice Exam (MC)	0.122	0.034	30.536
	Essay Exam (E)	-0.119	0.034	
	Multiple types of Exam (MT)	0.122	0.034	
	Conference Paper (CP)	-0.125	0.034	
Constant		3.612	0.020	

Table 4*Correlations*

	Value	Significance
Pearson's R	0.963	<0.001
Kendall's Tau	0.867	<0.001
Kendall's Tau for Holdouts	1.000	

Table 3 shows that the assessment methods were found to have the greatest significant influence on the preferred online learning attributes of the learners with an average importance score of 39.536. In contrast, the lecture was regarded as the least-valued online attribute (11.263). In general, the online attributes have an importance value pattern of: Most-valued → Assessment Methods - Learning Materials - Delivery Type - Learning Tasks – Lecture ← Least-valued.

Meanwhile, the learners preferred the attribute level of having a synchronous session (0.066) in online learning. Although learners were positive towards mix delivery (0.009), it can be interpreted as an attribute level with lower preference. On the other hand, the asynchronous delivery type (-0.075) negatively impacted learners' preferences in online learning.

Furthermore, it can be observed in Table 3 that an online learning which utilizes synchronous session (S) (0.066), live online lecture with slides (LLS) (0.032), individual tasks (IT) (0.062), learning materials that utilize visual aids (VA) (0.034), and either of multiple choice or multiple-type exams (MC or MT) (0.122) generated the highest total utility. This can be summarized as: $0.066 S + 0.032 LLS + 0.062 IT + 0.034 VA + 0.122 MC/MT + 3.612 = 3.928$.

The Kendall's Tau and Pearson's R registered values of 0.867 and 0.963, respectively (Table 4). The values (≥ 0.700) indicated a high internal consistency and confirmed the validity of the estimated model parameters. Likewise, Kendall's Tau for holdouts has registered a value of 1.000 for the two holdout profiles, implying a high quality of responses from the respondents. These generally revealed that the results generated were valid.

Segmentation of Learners

Segmenting learners based on their preferred online learning attributes was also the objective of this study. The result of hierarchical cluster analysis (Figure 2) and the close inspection and cross-matching revealed that learners can be significantly segmented into two (2) clusters: Cluster 1 (n=163, 54.2%) and Cluster 2 (n=137, 45.5%) (Table 5).

Figure 3

Result of the Hierarchical Cluster Analysis

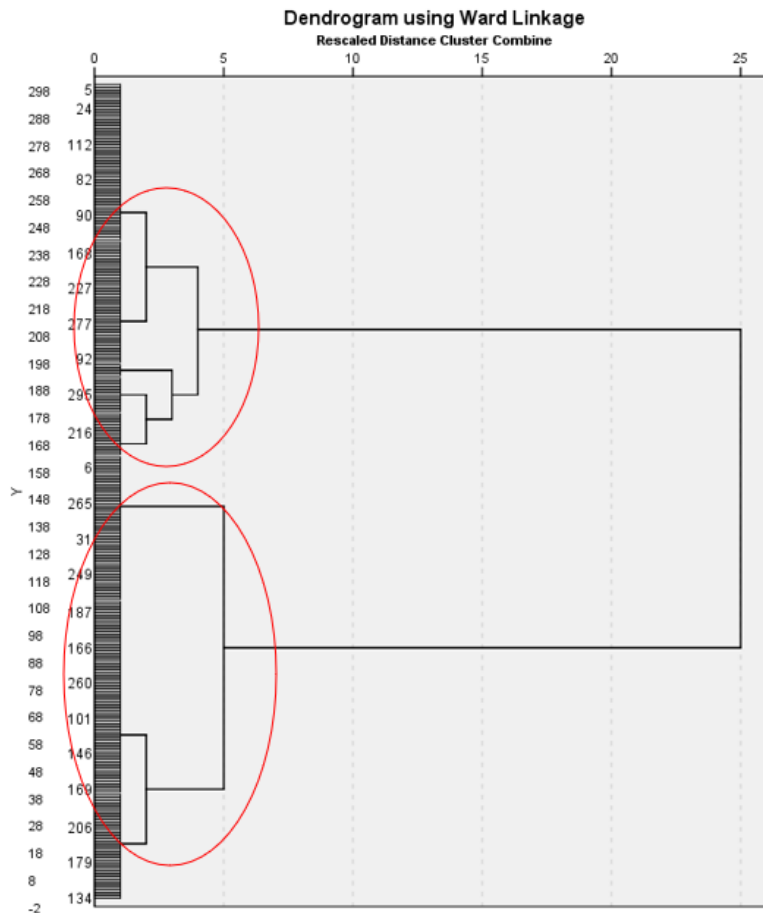


Table 5

Part-worth Utilities of the Segments (n=300)

Online Learning Attributes	Levels	Segment 1 (n=163)		Segment 2 (n=137)	
		Part-worth Utilities	Averaged Importance Score	Part-worth Utilities	Averaged
Delivery Type	Synchronous (S)	0.054	20.179	0.080	19.924
	Asynchronous (A)	-0.064		-0.087	
	Mix (Synchronous and Asynchronous) (M)	0.010		0.007	

Lecture	Recorded lecture with slides (RLS)	0.004	10.592	-0.071	11.986
	Live online lecture with slides (LLS)	-0.004		0.071	
Learning Tasks	Individual tasks (IT)	0.036	11.625	0.090	11.224
	Group tasks (GT)	-0.036		-0.090	
Online Learning Attributes	Levels	Segment 1 (n=163)		Segment 2 (n=137)	
		Part-worth Utilities	Averaged Importance Score	Part-worth Utilities	Averaged Importance Score
Learning Materials	Reading Materials (RM)	-0.033	24.792	0.069	24.787
	Video Materials (VM)	-0.018		-0.071	
	Visual aids (pictures, charts, graphs) (VA)	0.019		0.051	
	Hands-on learning materials (HLM)	0.032		-0.049	
Assessment Methods	Multiple Choice Exam (MC)	0.128	30.590	0.115	30.478
	Essay Exam (E)	-0.131		-0.105	
	Multiple types of Exam (MT)	0.112		0.133	
	Conference Paper (CP)	-0.109		-0.143	
Constant		4.092		3.093	

Based on Table 5, the combination of online learning attribute levels that generated the highest total utility for the learners that belonged to segment one can be summarized as: $0.054 S + 0.004 RLS + 0.036 IT + 0.032 HLM + 0.128 MC + 4.092 = 4.346$. Accordingly, the learners in segment one greatly valued assessment methods, whereas they regarded lecture as the least-valued online attribute. The preferred online attributes for segment one has an importance value pattern of: Most-valued→Assessment Methods - Learning Materials - Delivery Type - Learning Tasks ←Least-valued (Table 5).

On the other hand, the combination of online learning attribute levels that generated the highest total utility for segment two can be summarized as: $0.080 S + 0.071 LLS + 0.090 IT + 0.069 RM + 0.133 MT + 3.093 = 3.536$. Learners that are classified under segment two greatly valued assessment methods, while the learning tasks were regarded as the least-valued online attribute. The preferred online learning attributes for segment two have an importance value pattern of: Most-valued→Assessment Methods - Learning Materials - Delivery Type - Lecture - Learning Tasks ←Least-valued (Table 6).

The two (2) segments of learners were further analyzed for profiling using the

extraction method to give insights into their characteristics. The segments were profiled based on their socio-demographics, educational information, and access to technological resources as shown in Table 6. The segments were described below:

Segment 1: This segment comprises 54.3% (n=163) of the respondents who are mostly Grade 12 learners (n=105, 64.4%) from the different strands. They greatly value the assessment method that utilizes multiple-choice, hands-on learning materials, and synchronous session type of instructional delivery. They prefer to record the lecture with slides and do the learning tasks individually (Table 5). The majority had smartphones (n=132, 81.0%) and laptop computers (n=118, 72.4%), while 38 (23.3) and 12 (7.4) had a desktop computer and iPad or tablet, respectively. Regarding internet access, most respondents subscribed to postpaid internet service (n=122, 74.8%); however, 51% (n=84) of the respondents reported that their internet connection is unstable and/or unreliable. Using prepaid mobile data to access the internet was still common in this group of learners (n=37, 22.7%). In contrast, 4 (2.5%) respondents did not have internet access and had to go somewhere else to connect to the internet during online classes. Regarding the family's annual income, low-income dominated the group (n=126, 77.3%).

Table 6

Profile of Segmented Learners (n=300)

		Segment 1 (n=163)		Segment 2 (n=137)		Chi-square
Socio-Demographic		f	%	f	%	
Gender	Male	56	34.4	53	38.7	0.028*
	Female	105	64.4	75	54.7	
	Non-binary	0	0.0	6	4.4	
	Prefer not to say	2	1.2	3	2.2	
Family's Total	Low-income	126	77.3	91	66.4	0.035*
	Lower-middle income	28	17.2	42	30.7	
Annual Income	Upper-Middle Income	8	4.9	4	2.9	
	High Income	1	0.6	0	0.0	
Educational Information						
Grade Level	11	58	35.6	92	67.2	<0.001*
	12	105	64.4	45	32.8	

Strand	ABM	53	32.5	47	43.3	0.948
	HUMSS	55	33.7	45	32.8	
	STEM	55	33.7	45	32.8	
Access to Technological Resources						
Device Ownership	Smartphone	132	81.0	117	85.4	0.936
	Laptop computer	118	72.4	102	74.5	
	Desktop computer	38	23.3	31	22.6	
	iPad or Tablet	12	7.4	10	7.3	
Internet Access	Do not have Internet access and have to go somewhere else	4	2.5	1	0.7	0.028*
	Prepaid mobile data	37	22.7	16	11.7	
	Postpaid subscription service (Connection is slow and/or unreliable)	84	51.5	90	65.7	
	Postpaid subscription service (Connection is fast and reliable)	38	23.3	30	21.9	

Note. *significant at $p < 0.05$.

Segment 2: This group comprises 45.7% ($n=137$) of the respondents, mostly Grade 11 learners ($n=92$, 67.2%). They preferred multiple-choice exams as assessment methods, reading learning materials, and synchronous sessions as instructional delivery. They also value live lectures with slides and individually do the different learning tasks (Table 5). The majority of the respondents had smartphones ($n=117$, 85.4%) and laptop computers ($n=102$, 74.5%), while 31 (22.6) had desktop computer and 10 (7.3) had an iPad or tablet. Most of the respondents in this group subscribed to postpaid internet service ($n=120$, 87.6%); however, 65.7% ($n=84$) described their internet connection as unstable and/or unreliable. Also, 16 (11.7%) respondents could access the internet using prepaid mobile data. Consequently, 1 (0.7%) respondent did not have internet access and had to go somewhere else to connect to the internet. The respondents that came from low-income dominated the group ($n=91$, 66.4%).

Furthermore, a significant difference between the segments in terms of their socio-demographics, educational information, and access to technological resources was confirmed using the chi-square test (Table 6). The two segments differ significantly ($p < 0.05$) in their profiles in terms of gender, family's total annual income, grade level, and internet access, while no significant difference was observed in terms of their strand and device ownership. This gives insights into what variables must be considered to maximize online learning, especially in designing online instructional materials and pedagogical approaches (Kuzmanovic et al., 2019; Muthuprasad et al., 2021).

Discussion

Table 7 shows the summary results of the aggregated preferred online learning

attributes by the learners. The online learning attributes were ranked based on the learners' perceived preferences. The attribute with the first rank was regarded as the most valued, while the fifth rank was perceived as the least valued among the online learning attributes.

Table 7

Summary of the Aggregated Preferred Online Learning Attributes

Rank	Online Learning Attributes
1st	Assessment Methods (Multiple choice and Multiple types of exams)
2nd	Learning Materials (Visual Aids)
3rd	Delivery Type (Synchronous)
4th	Learning Tasks (Individual Tasks)
5th	Lecture (Live online lecture with slides)

As shown in Table 7, assessment methods utilizing multiple-choice and multiple types of exams were found to have the greatest significant influence on senior high school learners' preferred online learning attributes. This finding agrees with the study of Ong et al. (2021) and Butler (2018). Assessment becomes vital in developing skills and competence and measuring learners' concept attainment in the online learning setup. The assessment scores serve as the primary determinant of the learners' progress toward a particular subject; hence, learners tend to be more cautious with their assessment performance. Furthermore, Butler (2018) posited that learners mostly preferred the multiple-choice exam because it allows them to narrow down their choices, giving them a higher chance of getting the correct answer, unlike essays and conference papers. Accordingly, assessment significantly influences their grade component; hence, learners prefer to be assured of getting better or higher scores, thereby passing the subject (Ong et al., 2021).

The second online learning attribute valued by the learners was the learning materials that utilize visual aids. As learning materials in an online setup, visual aids can be considered a media-centered strategy. It is a known strategy that supports learning among learners after the content has been introduced to them (Cano et al., 2022). Utilizing learning materials supported by visual aids is the most effective way of enhancing learning (Aghababaeian et al., 2019). Meanwhile, Cano et al. (2022) posited that learners tend to be motivated to learn and acquire better concept attainment using visual aids since learners can directly observe and imagine the concepts that could result in a more deepened concept acquisition of the topic discussed. Furthermore, learners could easily be guided to organize their ideas logically using illustrations, charts, or graphs.

The third highest valued online attribute was the delivery type, wherein learners preferred to have synchronous sessions. In this particular delivery type, the teaching-learning process happens in real-time. The teacher and the learners accessed the internet simultaneously despite the geographical differences. Literatures of Ong et al. (2021) and Kuzmanović et al., (2019) revealed that

learners prefer online classes with synchronous sessions because it reduces transactional distance. The teacher gives a live online lecture, and the learners learn directly from the teacher, interact with their peers, and exchange feedback in real-time. This instructional delivery strengthens interaction, a vital component of the educational process that enhances learner motivation and academic performance (Garrison & Arbaugh, 2007; Moore & Diehl, 2018). Literature suggests that most theories of formal education place emphasis on learner-teacher interaction, wherein learners receive feedback on how well they learn. Accordingly, learner-to-learner interaction allows learners to engage in social interaction, boosting motivation and social knowledge construction (Garrison & Arbaugh, 2007). Transactional distance posed by online distance learning is reduced through dialogue from learner-teacher and learner-learner interactions that can eventually help improve learners' academic performance.

The fourth online learning attribute preferred by the learners was the individual learning tasks. This particular preference relates to the behavior and attitude of the learners towards autonomy. According to Ruzek and Schenke (2019), the learners' interaction in the online distance learning setup greatly influenced their mastery goal. With the shift of instructional implementation into online learning, the learners are left with no choice but to interact virtually. Thus, it affects their preferences for doing their academic tasks (Ong et al., 2021). This gives insights into how the changes in the educational landscape have greatly influenced the learners' sense of autonomy.

The fifth online learning attribute valued by the learners was the lecture, wherein learners preferred to have a live lecture with slides. The second and the third highest attributes from this study justify that learners want to have real-time interaction and prefer to have a direct observation of the concepts that they are learning. The live lecture with slides allows the learners to organize their ideas better through the guidance of their teacher (Cano et al., 2022). More so, the real-time interaction between the teacher and the learners immediately corrects possible misconceptions due to communicative and psychological gaps posed by the online learning setup (Moore & Diehl, 2018).

Meanwhile, the results of the segmentation using cluster analysis revealed that the learners could be classified into two profiles based on their preferences. The significant difference ($p < 0.05$) between the segments in terms of their gender, family's total annual income, grade level, and internet access (Table 6) gives insights that these are the primary variables that should be taken into consideration in grouping the learners. However, it is noticeable from the table the great extent of the difference in the number of learners in the two segments based on their grade level. From the educators' perspectives, the grade level can be considered as the most important and practical variable to label the segments in general (Kuzmanovic et al., 2019). Hence, the grade level was the variable used to label the segments.

Table 8 compares the preferred online learning attributes of the two segments labeled based on grade level.

Table 8*Comparison of the Preferred Online Learning Attributes of the Segments*

Rank	Online Learning Attributes	
	Segment 1 (Grade 12 Learners)	Segment 2 (Grade 11 Learners)
1st	Assessment Methods (Multiple choice exam)	Assessment Methods (Multiple choice exam)
2nd	Learning Materials (Hands-on learning Materials)	Learning Materials (Reading Materials)
3rd	Delivery Type (Recorded Lecture with Slides)	Delivery Type (Live online lecture with slides)
4th	Learning Tasks (Individual Learning Tasks)	Lecture (Synchronous)
5th	Lecture (Synchronous)	Learning Tasks (Individual Tasks)

It can be deduced in Table 8 that learners in higher class rank (Grade 12 learners) greatly value recorded lectures with slides and hands-on learning materials. According to Palvia et al. (2018), learners with more experience and who were able to adapt to the online learning environment such as the Grade 12 learners are said to be more focused on the procedures of how the contents of a certain topic are being delivered. The recorded lecture enables them to review the lessons afterward, giving them the venue to acquire skills and knowledge better and reflect on their learning (Lee et al., 2021). The utilization of technology applications that promote learner-content interactions must be considered in this group of learners. More so, online learning that is highly valued with experiential, hands-on opportunities such as computer simulations must also be taken into account in designing pedagogical approaches. In the study of Cano et al. (2022) on the concept acquisition of Grade 12 learners on the topic of the central dogma of molecular biology, learners are found to be motivated to learn and acquire better concept attainment through experiential online learning activities.

Meanwhile, the younger learners (Grade 11) prefer live lectures with slides and reading learning materials. In this particular group of learners, the online learning system should be designed to promote learner-teacher and learner-learner interactions. Real-time feedbacking and acquisition of concepts through reading are vital in this group of learners (Butler, 2018). The utilization of different technology in online learning should promote interactions between the teacher and the learners that are more similar to the conventional face-to-face learning modality. Different applications such as messenger, Zoom Meetings, and MS Teams, among others, were frequently utilized in online education as effective communication tools (Kuzmanovic et al., 2019). Furthermore, various social media platforms such as Facebook, Twitter, LinkedIn, and vlogs can be utilized to enhance learners' interactive work (Muthuprasad et al., 2021).

Although the results showed that learners, considering their preferences, can be segmented based on their grade level, the researcher believes that

regardless of learners' grade level, the most commonly valued online learning attribute between the segments: the assessment methods (multiple-choice type of exam) must be given of great importance. It has been discussed earlier that learners perceived assessment scores as the primary determinant of their progress in a particular subject. Therefore, the general recommendation is that real-time feedback on the acquisition of concepts is essential to achieve better assessment performance among learners (Butler, 2018). On that note, the quality of assessment should be designed with an appropriate formative assessment. Technology must be properly utilized in the teaching-learning process as learner-centered to enhance learners' academic performance through instant feedbacking on their test results and conducting immediate academic consultations.

The literature examination highlighted three critical factors that can significantly affect learners' preferences toward online learning: access to technology, interaction, and learner autonomy (Garrison & Arbaugh, 2007; Kuzmanovic et al., 2019; Moore & Diehl, 2018). The concern for access to technology is vital to online distance learning; however, the study's results revealed that the number of learners with limited access to technology was not negligible. Limited access to technology is common in low-income countries (Baticulon et al., 2021). If learners have limited access to technology, the interaction in the teaching-learning process and the learner's autonomy might be affected (Cano et al., 2022). Interactions such as learner-teacher, learner-learner, and learner-content are the essence of the teaching-learning process. Ong et al. (2021) concluded that learners who interact during class discussions with their teacher and peers complete and pass the subject successfully. Therefore, it is imperative to consider the logistical requirements of particular online instructional designs, such as the compatibility of the device, bandwidth for accessing the learning management system, participating in synchronous sessions, accessing learning materials, and using specific content formats like videos (Ali et al., 2022). This gives the general insights that pre-requisite requirements for establishing and strengthening internet facilities should be taken into account to move forward in online education.

Meanwhile, Moore and Diehl (2018) pointed out that the more organized an instructional design is, the fewer opportunities for discourse between the teacher and the learner. In this context, learners exercise greater autonomy; however, it must be balanced with the other elements that influence transactional distance, such as good access to technology. A learner with competing life demands without good access to technology may be forced to drop out if there is too much organization in the assessment pace, sequencing, and timing. At the same time, too little structure may lead to confusion and alienation (Garrison & Arbaugh, 2007; Moore & Diehl, 2018). Designing appropriate instructional materials by the teachers has been acknowledged as an effective measure for bridging educational gaps since it intensifies interactions among the teacher, learner, and the content (Kuzmanović et al., 2019; Muthuprasad et al., 2021). Therefore, it is imperative that the pedagogy to be utilized in the online learning setup should take into account the nature, needs, and preferences of the learners.

Conclusions

In this paper, the researcher examined learners' preferred online learning attributes in the K-12 program and explored their segmentations. Addressing these concerns and examining the most valued online attributes by the learners allow us to reflect on the online pedagogies that could leverage learning. The findings of this study present the first empirical insights into the senior high school learners' preferences and their segmentation in an online learning environment. Five online learning attributes were considered in this study: delivery type, lecture, learning tasks, learning materials, and assessment methods. Assessment methods using multiple-choice and multiple-type exams, synchronous delivery type with slides, individual tasks, and learning materials with visual aids were considered the most preferred online attributes by the learners.

Further analysis revealed that learners could be classified into two segments, considering their preferences and profiles, based on their grade levels. This adds to the body of knowledge that, indeed, learners in different grade levels differ in their learning approaches in the online setup. Therefore, it would be ideal to adjust and redesign the online learning system based on the grade levels of the learners. On the contrary, the limitation of this study is in analyzing the data of the learners' perceptions of the online learning setup. Learners with less experience in online learning perceived the online learning system as a better venue for learning (Kuzmanović et al., 2019). The results give the insights to re-think what pedagogical activities and practices in the online learning system secure educational advantage despite the global health crisis. The teaching-learning process in this context becomes challenging, as it needs to be recalibrated with the contemporary educational landscape. If we look at our learners as our customers, these online learning attributes must be considered to retain them. Academic institutions offering senior high school programs should revisit and redesign their instructional design tailored to the needs and demands of their learners to leverage learning in the online environment.

Recommendations

The COVID-19 pandemic necessitated the researcher to conduct this investigation; however, the quest has just begun. More focused studies need to be conducted, considering other online attributes that were not included in the study. Furthermore, studies need to be conducted using different approaches to draw definitive conclusions about the preferred online learning of the learners and their segmentation. Despite these limitations, the findings of this study are beneficial for future researchers to conduct further studies related to the key factors that are imperative to the implementation of online learning modalities and provide insights for the educational institutions in re-evaluating and redesigning their online learning systems.

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