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Investigating Learning Modalities among Diploma Students

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Abstract

The understanding and recognition of the three different learning styles, visual, kinesthetics, and auditory, is even more important in the context of online learning, which presents unique challenges and difficult for educators to cater to the diverse learning needs of their students. Understanding these different learning styles can be helpful for educators and learners alike, making online learning more engaging with visually appealing for visual learners, interactive and hands-on for kinesthetic learners, and auditory based for auditory learners' materials and accessible for all. Thus, the purpose of this study is to investigate the various learning styles demonstrated by students during online learning and how educators might accommodate them. In this study, a quantitative research approach was employed, and an electronic survey with descriptive statistical analysis was administered to 300 students from various programs and campuses. The results indicate that visual is the preferred learning style, followed by kinesthetic and auditory. Instructors must comprehend different learning types and alter their methods of instruction accordingly to guarantee that students have a successful online learning experience. The study's findings serve as a roadmap for educators and instructors to improve the design of instructional materials and learning environments. Future research should therefore analyze learning styles by age, gender, course of study, campus, or even semester, and investigate the efficacy of online learning systems that accommodate varied learning styles. The association between learning style and other variables can also be investigated.

Keywords: Learning Style, Learning Modalities, Online Class, VAK Model, Visual, Auditory, Kinesthetic

Introduction

Background of Study

Online learning enables the transformation of technological educational methods into modern learning through websites, YouTube, learning portals, and others (Kim, 2020; Di Vaio et al., 2020). This online learning is reflected in the education system due to the outbreak of the Covid 19 pandemic and continues to expand with the advancement of information and

communication technologies (Ustun et al., 2020). As online learning has become a trend, this method in education has an intense influence on the views and ideas on learning and teaching (Idrizi et al., 2019). However, learning is a process, and each student has different characteristics that are influenced by social, physiological structure, environment, and cognitive and affective characteristics (Yilmaz, 2009; Sahin & Celik, 2011; Gulbahar & Alper, 2014).

Knowledge of these characteristics will increase the efficiency of the teaching process by determining the learning style of the student who is alone in the online learning environment (Sahin & Celik, 2011; Gulbahar & Alper, 2014). In line with Kim (2020) and Di Vaio (2020) online learning is therefore an educational process that takes place via the Internet as a form of modern learning methods such as artificial intelligence. Learning style is the way a person prefers to learn, how they perceive something better, how they learn based on their dominant sensory perceptions, and how they can improve their skills or knowledge to the maximum (Grasha, 1996; Hermini et al., 2021).

Since everyone has natural preferences for the way they learn, students find it easier to learn in their preferred learning style. In fact, both teachers and students can benefit from knowing a student's learning style. Students can become aware of their learning style preferences and expand their learning style repertoire. For teachers, in turn, knowing students' learning styles can help them find the best method for the teaching and learning process (Hermini et al., 2021).

In general, there are three types of learning styles, the widely used categorization of learning style is Flemings' VARK model or VAK, an acronym for visual (V), auditory, (A), and kinesthetic (K), (SK & Helena, 2017). This information helps the teacher to prepare for students' learning styles and preferences because there is no right or wrong learning style, but different individuals fit different types (Gibson, 1998; Sk. & Helena, 2017). Learning styles are becoming more and more involved in improving the learning process and many researchers have worked in this area and agree that learning styles play an important role in education (Eishani et al., 2014).

In Malaysia, many studies have been conducted on learning styles and online learning. Yet, there is no concrete result that suggests which learning style is exhibited in an online course. The majority of students cover online learning styles, but they do not identify the type of learning style in the result. For example, there are studies on the relationship between learning style and e-learning environment, the impact of learning style on online learning, learning style and perception of online learning, and learning style in Massive Open Online Courses (Mamat & Yusof, 2013; Chun & Junaid, 2012; Mansor & Ismail, 2012; Hasyim & Mohamad, 2017). Despite the general finding, there is one study that shows that students in online courses are kinesthetic learners (Kamarazaly et al., 2020).

Although numerous studies had mentioned a wide range of effects and relationships between learning style and online learning, the result is inconclusive and the concern about learning success in online classes continues to be the focus of research. Therefore, this study analyzed the learning style demonstrated in the online course, i.e., auditory, visual, or kinesthetic.

Statement of Problem

Modern education faces many challenges. One of them is to create and maintain the best way to impart knowledge to students. Identifying the preferred learning styles among students can be very arduous as there is no single style that can be said to be the best way to

impart knowledge to students (Derkach & Kharitonenko, 2018; Ibrahim & Hussein, 2015; Noor Nasyikin et al., 2019; Fahim et al., 2021; Sam, 2022; Sherly Deborah et al., 2018; Olivier et al, 2021; Mehmood, 2020; Nasir et al, 2021; Quinn et al, 2018).

In terms of learning style tools and theories, there are more than 70 different learning styles identified in previous studies (Quinn et al., 2018), such as Kolb's experiential learning model, Fleming's VARK model, Entwistle's model, Barbe and Milone's VAK model and the Index of Learning Styles (ILS). Previous studies have tested numerous learning styles such as Fleming's VARK model (Nasyikin et al., 2019; Fahim et al., 2021; Deborah et al., 2018; Nasir et al., 2021), Index of Learning Styles (Quinn et al; 2018; Sam, 2022; Olivier et al., 2021), Felder-Soloman Learning Styles (Derkach & Kharitonenko, 2018), VAK Model (Ibrahim & Hussein, 2015) and Kolb Learning Model (Mehmood, 2020). Interestingly, these studies have attempted to identify preferred learning styles using numerous models and learning frameworks.

Yet, these studies found inconsistent learning styles among students. Derkach and Kharitonenko (2018) found that the visual learning style is the most preferred learning style with a score of 75-81%, which is relatively higher than other learning styles. A study by Ibrahim and Hussein (2015) showed that the visual, auditory, and kinesthetic learning styles of the study participants were 40.0%, 2,9.5%, and 30.5% respectively. In a study by Nasyikin et al (2019), the preferred learning styles of high achievers and low achievers differ. High Achievers prefer the kinesthetic learning style, while Low Achievers tend to prefer the reading/writing or audio learning style. Fahim et al (2021) found that of the students, 39.37% preferred the unimodal learning style while 60.62% preferred the red multimodal style. Kinesthetic (K) and visual (V) were the most preferred unimodal styles. Students with lower academic performance chose unimodal styles compared to high-performing students who chose multimodal styles.

Sam (2022) also found that the predominant learning style of nursing students was visual style, followed by auditory and tactile styles (or the other name for kinesthetic learning). The findings of a study by Deborah et al (2018) showed that students preferred kinesthetic learning the most. The same finding was also found by Olivier et al (2021) that the predominant preferred learning styles are the collaborative and participatory styles. This learning style is consistent with the kinesthetic style as well as with Mehmood's (2020) finding that students show a tendency to actively experiment (AE) in their learning, indicating that they want to be actively involved in their own learning process rather than just listening to lectures delivered in the traditional method. In addition, the findings of Nasir et al (2021) showed that the frequency of the unimodal learning style is higher than the frequency of the multimodal learning style. Among the unimodal learning styles, kinesthetic topped the frequency list. The same is true for a study by Quinn et al (2018), who found that the kinesthetic learning style was more common than other learning styles.

However, when reviewing previous studies, it was also found that most studies conducted among undergraduate students focused only on bachelor students, and very few studies focused on graduate students. This group of students is of key importance as they are the feeder students for most of the undergraduate programs offered at the respective universities. This study will therefore examine how diploma students adapt their learning modalities during online classes. Specifically, this study aims to answer the following three (3) research questions: (i) How do learners in online courses behave during visual learning? (ii) How do learners in online courses relate to auditory learning style? and (iii) How do learners in online courses relate to kinesthetic learning style?

Literature Review

Theories/ Advantages of Online Learning

Online learning has been used extensively at all levels of education due to its accessibility, flexibility, and inclusivity especially during the period of governmental restriction due to the Covid-19 pandemic since November 2019. The restriction has transitioned the mode of learning from traditional to electronic on full blast due to the near-total closures of schools and universities. Conceptually, online learning refers to a learning environment where the instructor and the students are remotely present in which communication, interaction, and access to content are conducted by using communication technology or specifically the internet. It provides students and instructors with the opportunity to access resources remotely or whenever and wherever they are available.

According to Khan (1988), this type of learning provides the acquisition of knowledge and skills through learning applications synchronously and asynchronously using internet technology. In asynchronous or non-real-time learning, students and instructors can be involved in the learning process whenever they want, while interaction and communication are provided in the same time period with synchronous or real-time learning (Ally, 2004). The flexible learning opportunity offered by online learning increases the quality and accessibility of the educational process. Over the years, a number of online applications have been developed to accommodate online learning, meet the objectives of the lessons and enhance the learner's online education experience.

In terms of the theories of online learning, there is a number of theories that have been developed and evolved in accordance with the appropriateness for the online environment and technological advances that rapidly progressed and evolved. Most of these theories are rooted as well as derived from major learning theories such as behaviorism, cognitivism, and social constructivism which also act as the foundation of these learning theories. In short, learning theories basically provide an explanation of how people learn as it involves multiple disciplines. However, this section provides reviews of several online learning theories that are relevant and appropriate to the context of the current paper.

The first model is the community of inquiry or Col model for online learning environments is rooted in the concept of three distinct elements which are cognitive, social, and teaching. These three presences hold an important role in creating an effective learning experience for students. This model is developed by (Garrison et al., 2000). Their model is generally based on the design of online and blended courses as active learning environments or communities. It manifests itself through interactions between students and instructors. This model is one of the popular models for online and blended courses that are designed to be highly interactive among students and faculty using interactive online learning applications.

The second online learning theory is connectivism. This model refers to a learning model that acknowledges major shifts in the way knowledge and information flow, grow, and change because of vast data communications networks. This model is introduced by (Siemens, 2004). Siemens highlighted connectivism as a theory that is driven by the dynamic of information flow in which students are expected to understand, and able to navigate and recognize constantly shifting and evolving information. Precisely, there are 8 principles that define this theory. Connectivism is particularly appropriate for courses with very high enrollments and where the learning goal or objective is to develop and create knowledge rather than to disseminate it.

The next theory is online collaborative learning or OCL which focuses on collaboration and knowledge building via the Internet. This theory is introduced by Linda Harasim describes this theory as an online learning model that focuses on collaborative learning, knowledge building, and internet use for formal, non-formal, and informal education in this new age. She also introduces three phases of knowledge construction through discourse in a group which is the brainstorming phase, organizing phase, and intellectual convergence phase (Harasim, 2012). This theory is also based on social constructivism where the students need to solve problems collaboratively through discourse and are assisted by the instructor as an active facilitator of knowledge building. In comparison to constructivism theory, this theory is suitable for smaller instructional environments or small groups of students.

A lot of online learning researchers tried to come out with an integrated online learning model that is relevant in fulfilling pedagogical objectives and available online applications. Anderson (2011) proposed an online learning model by adding an extra component which is community/collaborative models to Bransford et al (1999)'s lenses which are community-centeredness, knowledge-centeredness, learner-centeredness, and assessment-centeredness as well as the affordances and facilities of the Internet, and interaction. Anderson concluded that his model "will help us to deepen our understanding of this complex educational context". He also commented that it is also advisable to measure more fully the direction and magnitude of each input variable on relevant outcome variables.

Challenges of Online Learning

The use of online learning, whether through distance learning, e-learning or mobile learning, has helped education providers improve their services and has become standard practice among many education providers worldwide (Appana, 2008; Anshari et al., 2016; Puzziferro & Shelton, 2014; Park & Lim, 2015; Sun, 2014). Therefore, online learning is becoming increasingly important for the education system, especially in an emergency situation (Ferri et al., 2020). However, online learning has become a new challenge, especially for students, because the shift from conventional to online methods requires students to pay attention to their attitudes and perceptions in order to achieve good assessment, satisfaction, and performance (Clayton, 2005; Sun, 2014). According to Zhong (2020) and Britt (2006), kinesthetic learners are not interested in virtual teaching because they lack socialization in the classroom as they cannot interact with their fellow students in real time. In addition, students show a lack of quality when it comes to following the flow of instruction, interest in studying, and motivation to study, which reduces the effectiveness of online courses (Nambiar, 2020; Yang & Cornelius, 2004).

In addition, it is not only the student who faces the challenges of online learning, but also the teacher or instructor. Online learning means that the teacher revises the approach to teaching, just as it is possible in a physical classroom. Therefore, guidance, feedback, and teaching methods are needed to engage students and stimulate proactive behavior by continuously improving their technological skills (D'Andrea & Ferri, 2009; Ferri et al., 2020). Indeed, online learning has highlighted that despite student and pedagogical issues, technological challenges are the main factor reinforcing inequality through access to the technology needed by students and teachers. These problems particularly affect many low-income and disadvantaged families in rural and urban areas (Salmon, 2002; Liang & Chen, 2012). In addition, almost all countries face insufficient bandwidth as not all geographical areas are reached by wide connectivity. Therefore, the adoption of 5G technologies is

necessary to overcome issues related to connection failures in online learning (Bol, 2020; Doyle, 2020; Outhwaite, 2020; Thomas & Rogers, 2020).

Challenges of Learning Styles

The terms learning style, cognitive style, and learning strategy are used frequently and interchangeably and have been characterized in different ways based on a variety of theoretical models (Cassidy, 2004). Although these terms are used interchangeably, the term learning style appears more regularly in the print of the study to date compared to the terms cognitive and personality learning style (Xu, 2011). Within the broad picture of learning styles, Fleming's VARK model has been extended and divided into three groups: visual, auditory, and kinesthetic, which refer to a representational system (SK & Helena, 2017) where people have a preferred learning style that allows the student to choose the type of learning that works best through seeing (visual), hearing (auditory) or doing (kinesthetic).

A study by Wehrwein et al (2007) found that there are a variety of learning styles in the classroom. This is in line with Shah et al (2013) and furthermore, this study found that students with a pre-multi model tend to learn kinesthetically despite geographical differences. As for the tendency of students to use VAK in multimedia elements, Brennan (2005) found that visual students tend to use text and graphics, auditory ones tend to use audio, and kinesthetic ones tend to use tasks that require action or hands-on work. The VAK learning style can thus create an intriguing learning environment for students and is crucial in allowing students to choose their own preferred learning style during the learning process (Zhang, 2002).

Past Studies on Learning

Many studies have been conducted to investigate learning styles and online learning. This section discusses previous studies on learning styles and online learning. A review of these previous studies provides a comprehensive overview to better understand the field of study.

Past Studies of Learning Styles

Many studies have been done to investigate learning styles (Derkach & Kharitonenko, 2018; Ibrahim & Hussein, 2015; Nasyikin et al., 2019; Fahim et al., 2021; Sam, 2022; Sherly Deborah et al., 2018; Olivier et al., 2021; Mehmood, 2020; Nasir et al., 2021; Quinn et al., 2018). The study in Ukraine by Derkach & Kharitonenko (2018) is done to investigate on preferred learning styles of undergraduate and graduate pharmacy students. Using the Felder Solomon learning model, this study involved 188 students of the specialty "Industrial Pharmacy" of 1-5 years of study. There are 4 constructs under Felder Solomon's learning model namely active learning, sensitive learning, visual learning, and reflective learning. This study found that the preferred learning styles for undergraduate students remain practically unchanged during four years of study and are characterized by the predominance of active (65-79% of all respondents), sensitive (82-92%), visual (75-81%) and sequential (64-73%) styles. In contrast, master's students demonstrate more adherents of the reflective (43%), intuitive (29%), and verbal styles (43%). Master's students of the same specialty differ significantly from undergraduate students, demonstrating more reflective, verbal, and intuitive learning styles. This study signifies that the learning preferences of graduate students differ significantly from those of university undergraduates, thus, requires a deeper understanding what are the underlying factors behind these findings.

Next, the study by Ibrahim and Hussein (2015), also looked at learning styles using the VAK model among 210 undergraduate nursing students in Iraq. This study found that the Visual, Auditory, and Kinesthetics learning style of the study sample was (40.0%), (29.5%), and 30.5% respectively. Male students preferred learning style is Visual, followed by Kinesthetics, and lastly Auditory learning style. Meanwhile, female students preferred learning style is Visual, followed by Auditory, and lastly Kinesthetics learning style. This study implies that in general, learners can be divided into three groups namely, visual learners, auditory learners, and, kinesthetic learners. Therefore, the curriculum should include all tools, materials, texts, and activities that match all the learning styles of students in the classroom. Similarly, a study by Fahim et al (2021) was conducted which aimed at examining the preferred learning styles of medical and dental undergraduate students in Pakistan. Using the VARK model, a total of 1473 students participated in the study. Among the students, this study found that 39.37% preferred the unimodal learning style whereas 60.62% preferred the multimodal style. Kinesthetics (K) and visual (V) were the most preferred unimodal styles. The preferred learning styles of female students are audio (A), visual (V), and kinesthetics (K), whereas male students preferred visual (V) and kinesthetics (K) more. Students with lower academic records chose unimodal styles in comparison to high achievers that chose multimodal styles.

In another study on learning styles in India using the VARK model by Sherly Deborah et al (2018), they found that students have different learning styles which can affect the way they learn. About 820 undergraduate students from various education disciplines were involved in this study. Their findings reveal that the majority of students are multimodal learners. A large group of students preferred kinesthetic learning styles irrespective of the courses they studied. A second preference was visual learning, followed by the least preferred read/ write and audio learning styles which were represented rather equally. This study implies that most individual students have a preferred way of gathering, interpreting, and organizing information. Some learn best by active manipulation, others by reading, some by talking about it and some by listening. No single style of learning has been shown to be better than any other and no single style leads to better learning. Nonetheless, it is important to recognize that a variety of learning styles exist and there is a need to develop a range of teaching strategies. Using the same learning style model, a study by Nasyikin et al (2019) among 433 undergraduate students in a private university in Malaysia discovered that all their respondents were unimodal learners and most preferred kinesthetics over other learning styles. They also discovered that preferred learning styles also vary according to (i) high versus low achievers, (ii) stream of study such as social science versus pure science, (iii) gender of students, and (iv) nature of subjects. This study indicates that there is no one size that fits in teaching and learning activities. Mixed teaching and learning activities are expected to enrich the learners' experience.

Meanwhile, Sam (2022) conducted a study among 98 nursing students in UAE using the LSI model and discovered that visual was the top preferred learning style among their respondents followed secondly by audio, and the least preferred learning style was tactile or kinesthetic. This finding implies that there is no specific learning style as it largely depends on the individual students on how they grasp and understand their study and themself better. Furthermore, Olivier et al (2021) study in South Africa involving 313 undergraduate students discovered that the majority (75.0%) of students scored in the high preference range for the collaborative learning style, followed by the participant learning style with 36.8% of the students scoring in the high preference range. The competitive learning style was the least preferred with 21.7%. The majority of students, 58.4%, scored in the high preference range

for two or more learning styles, while 9.7% showed no learning style scoring high enough to indicate a preference for any of the six learning styles. This study implies that the learning styles of the students in this study were varied (Figure 1, p43). The learning activities these students prefer are also likely to be diverse. This study also argues that while it is important to understand learning styles for both the students and the facilitator, the application in the teaching space should be carefully considered for the selection of teaching approaches and activities.

Educators and researchers recognize that each individual prefers their own learning style. As such, a study by Quinn et al (2018) in the USA was conducted with the aim to investigate the unique nature of anatomy courses in terms of student learning styles, as described by the ILS. This study involved 506 students using 4 learning style dimensions namely active, sensing, visual, and sequential. This study found that sensing was the top preferred learning style (85.1%), followed by visual (81.2%) in second, sequential learning (74.4%) in third, and lastly active learning (54.9%). This study signifies that matching teaching styles to students' learning styles can significantly improve academic performance, student attitudes, and student behavior.

Next, a similar study in Pakistan to determine the preferred learning styles of undergraduate dental students was carried out by (Nasir et al., 2021). Using the VARK model, involving 126 students, this study discovered that the frequency of a single learning style (unimodal) in the study population was 63.5% while the frequency of a combination of different learning styles (multimodal) was 36.5%. The frequencies of bimodal, trimodal, and quad-modal learning styles were 26.1%, 6.9%, and 3.5% respectively. Among the unimodal learning style kinesthetic topped the list with a frequency of 27.9% while among the bimodal learning styles, audio-kinesthetic was more frequent accounting for 10.9%. This study implies that learning style studies can serve as a guide in helping educationists to tailor their teaching strategies according to the learning needs of the students. These findings can also be helpful for students who would have better insight into their learning preferences and thus get benefitted by choosing the learning habits best for them.

Past Studies of Online Learning

A number of studies have been conducted to investigate the effectiveness of online learning among students in different levels, disciplines, and areas. In relation to this matter, this section reviews several significant past studies that are related to online learning in general, narrowing down to the application of learning style during online sessions or classes.

The study conducted by Marsevani (2021) investigated students' e-learning readiness in e-learning. 126 participants were randomly selected for this study. The findings revealed that the students were highly ready to participate in e-learning by assessing them based on four categories which are students' technology skills, technology access, motivation, and time management. Next, Dag and Gecer (2009) investigated the relationship between online learning and learning style by looking into some research works that are available and accessible on the internet. The researchers found that most of the research works used cognitive learning style models. Overall, the researchers concluded that learning styles are not unique factor that affects the improvement of academic achievements in online learning environments. Also, some additional factors such as motivation, demographic factors, teaching strategies, and teaching methods should be included in the research.

A study on the effect of learning style and general self-efficacy on the satisfaction of e-learning among dental students has been conducted by (Baherimoghadam et al., 2021). This

study aimed to evaluate the effect of learning style and general self-efficacy by using Solomon and Felder's learning styles index, the GSE questionnaire, and lastly, the satisfaction questionnaire. The results of the present study showed that active learning style in the processing dimension and global learning style in the understanding dimension affect students' satisfaction with the online course. The researchers also highlighted that appropriate learning activities should be designed based on information and communication technology and presented by using this system. This was to ensure that students were able to find the appropriate content based on their needs and learning style. It would help to bring satisfaction with learning and leads to academic success.

In addition, a study by Faderogaya and Chantagul (2019) has been conducted to investigate the relationship between learning style in terms of instructional preference, social interaction, information processing, and personality in e-learning in terms of visual, auditory, and, tactile; and attitude towards e-learning among undergraduate students in
International program in Bangkok Thailand. A total of 300 respondents participated in a demographic questionnaire survey using the Learning Style Scale, Learning Style Inventory-Likert, and E-learning Acceptance Scale for data collection. The findings of the study revealed that the students preferred 'social interaction' rather than 'instructional preference' and 'information processing' in e-learning. The results were in line with the study conducted by Williams et al (2006) in which they stated that the reason why students do not engage in an e-learning program is due to the lack of social interaction. In a nutshell, the study concluded that there was a positive relationship between personality in learning style in terms of visual and tactile and students' attitudes towards e-learning.

Furthermore, the study by Layco et al (2022) focused on learning style preferences, academic satisfaction, and performance in online distance learning in tertiary education. 1150 college students in the Philippines were involved in this study. The study was anchored in Khale's Social Adaptation Theory. The findings of the study revealed that most of the students were visual and read-and-write learners who learned best when the information was presented with pictures, graphs, tables, or in a textual form where they can note important key concepts while learning in the online distance learning approach. Besides that, the researchers also discovered that students` learning style preference was significantly correlated or associated with their academic satisfaction and performance in online distance learning. Therefore, the researchers concluded that students` learning style preferences, academic satisfaction, and performance in online distance learning under education in the new normal were correlated with each other.

In 2021, a study on students' perspectives on e-learning has been conducted by (Stamm et al., 2021). The study specifically used occupational therapy students to understand the perspective of kinesthetic learners in an online learning environment. The study also has been conducted quantitatively and qualitatively. As for quantitative results, the findings showed subjects felt most confident in content comprehension but less confident in clinical application. Qualitative data collection led to the emergence of the following four themes which were advantages, disadvantages, accommodations to e-learning, and external factors. The study suggested kinesthetic learners' decreased confidence in comprehension and acknowledged making accommodations for effective learning. Besides that, students reported instructional improvements to facilitate e-learning. They suggested instructors can show more concern for the well-being and provide academic support for clinical skills competence.

Figure 1 presents the theoretical framework of the study. The base of the framework uses the learning modalities by Barbe and Milone (1981). The three learning styles are visual, auditory, and kinesthetic. The explanation for each learning modality is offered in the next sub-section below.

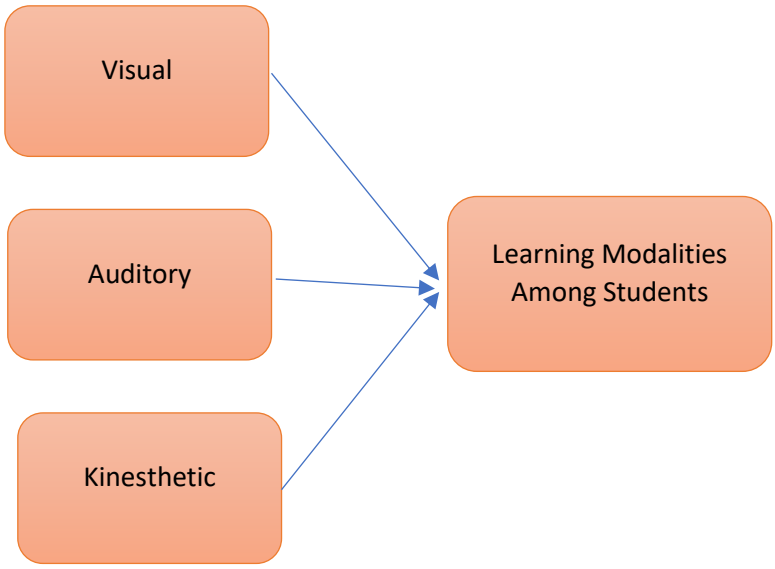

Figure 1- Conceptual Framework of the Study- Learning Modalities Among Diploma Students

Visual

Visual learning is both a style of teaching and a style of learning in which ideas, concepts, data, and other information are associated with images and techniques (Fleming & Mills, 1992). Accordingly, visual learners prefer to use symbolic tools such as diagrams, flowcharts, hierarchies, models, and arrows that represent printed information (Fleming, 1995; Murphy et al., 2004). With the ability to visualize the advantages and disadvantages of this learning style. Visual learners prefer to see information, tools, pictures, and images and to view a concept as a whole. However, visual learners can forget that they have only heard the information, and they can be distracted by others and tend to daydream while reading (SK & Helena, 2017).

Auditory

The auditory learning style learns best by listening and speaking to sort out the information received through rhymes, dialogues, music, group discussions, lectures (Fleming, 2015; Juskeviciene & Kurilovas, 2014), live presenters, listening to podcasts and prominent voice (Syofyan & Siwi, 2018). This type of learner prefers independent work (Lowry, 2011), humming, reading aloud, talking to themselves (Syofyan & Siwi, 2018), and audio recordings that have the function of re-listening (Fleming, 2015) as a method of memorizing. Some of the steps auditory learners took were dividing attention and tending to construct dialogue internally and externally by moving their lips as they read or speaking in a rhythmic pattern (Syofyan & Siwi, 2018). Although auditory learners prefer to complete the task independently and be flexible, they still prefer the style of teamwork and collaboration.

Kinesthetic

Kinesthetic learning refers to an active participation in the learning experience. Fleming and Mills (1992) describe kinesthetic learning as a reference related to experience and practice that produces sensory information through physical activities. In terms of their participation in activities, there are two key characteristics identified which are, firstly, students are actively physically engaged in the exposition and assimilation of classroom material and secondly, this engagement directly supports a specific learning objective. Active participation in academic classes is expected but it seems like most colleges still stick with the traditional way of conducting teaching and learning sessions by relying on the traditional lecture-based format.

Despite using visual slides as the materials used during the academic session, this format is considered a passive form of education. According to Bonwell (1996), this format attracts little attention from students which subsequently affects engagement during the academic session. In relation to this matter, Kinesthetic learning activity (KLA) provides an opportunity for both learners and instructors to avoid these shortcomings. KLAs can be used during the session to engage with the students actively by creating a new perspective from which to consider the topic. Conducting KLAs on a regular basis can bring a fundamental impact on the classroom culture of interaction. There are several advantages that learners can be benefited from these activities, for instance, the students are able to learn to get to know each other comfortably and work together with team members in group discussions. As a result, it helps to increase the level of engagement and participation between learners-instructor and learners-learners. In comparison with a traditional lecture that focuses primarily on a single learning style, this approach to learning can help to broaden the scope of students who achieve positive learning outcomes. Moreover, focusing on multiple modalities in KLAs is effective to increase learners' engagement during academic sessions (Lujan & Dicarlo, 2006).

Methodology

This study uses a quantitative research design closely associated with numerical values and statistics to measure and analyze the target concept. This quantitative study was conducted to investigate learning modalities among graduate students. The participants were purposively selected from a public university in Malaysia. The instrument used (see Table 1) is a survey based on (O'Brien, 1989). Besides the demographic profile in Section A, there are 3 other sections. Section B contains 10 items on visual modalities, Section C contains 10 items on auditory modalities and Section D contains 10 items on kinesthesia. This survey method was chosen as the main and most common method to collect data on attitudes or behaviors and opinions from many participants because they can express themselves (Mackey & Gass, 2013). The data collected from 2022 students included 300 graduate and undergraduate students from the randomly selected programmed and campus via a Google form and were analyzed using SPSS version 28.

Table 1
Distribution of Items in Survey

Section	Description	Number of Items	Types of Data
A	Demographic Profile	5	Nominal & Ordinal
B	Visual	10	Interval 5-point Likert scale
C	Auditory	10	Interval 5-point Likert scale
D	Kinesthetic	10	Interval 5-point Likert scale
Total Items		**35**	

Table 2
Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.821	.827	30

Data were collected via a Google form and analyzed using SPSS version 28. Referring to Table 2 above, the SPSS analysis produced a Cronbach's analysis to assess the reliability or internal consistency of a set of scales or test items. Data obtained from a questionnaire are analyzed using a descriptive statistical method. Frequencies and percentages were obtained for all items in the questionnaire. This study has shown that 82% of the Cronbach Alpha results indicate a high reliability of the instrument. The data is considered acceptable if the Cronbach Alpha value is above .70. An alpha of >.70 is usually expected for new scales and higher for established scales (Nunnally, 1978). The demographic profile is presented in percentages and the mean was used to answer the research question in the study.

Findings

This section shows the results of the socio-demographic characteristics of the public university respondents, which are summarized in Table 3 below. The following sections deal with the analysis of the responses in the Visual, Auditory, and Kinesthetic domains.

Findings for Demographic Profile

Table 3 below shows the demographic profile of the participants with key information on gender, age, group, campus, program, and semester. They were 22.7% male and 77.3% female and aged between 18 and 25 years, with the majority of participants aged between 18 and 20 years (77%). All participants are mainly studying in Raub, Pahang (33.3%) and studying in the field of public administration (69.67%). Even though the participants in this study came from different locations and study programs, they represent one of the public universities in Malaysia and the learning style is visual, auditory and kinesthetic.

Table 3
Summary of socio-demographic characteristics

CATEGORY	TYPES/GROUP	PERCENTAGE (%)
GENDER	Male	22.7
	Female	77.3
AGE GROUP	1 (Below 18 years old)	0
	2 (18-20 years old)	77
	3 (21-25 years old)	23
	4 (Above 25 years old)	0
CAMPUS	Pasir Gudang Campus	10
	Kota Kinabalu Campus	24
	Samarahan 2 Campus	7
	Raub, Pahang Campus	33.33
	Seremban 3, Campus	25.67
PROGRAM	BA117 Diploma in business management (transportation)	9.67
	AM110 Diploma in Public Administration	69.67
	AM120 Diploma in Corporate Administration	5.33
	CS110 Diploma in Computer Science	3
	BA111 Diploma in Business Study	1.33
	AM228 Bachelor of Administration Science	0.33
	BA119 Diploma in banking studies	0.66
	CS111 Diploma in Statistics	3.33
	AC220 Bachelor of Accountancy	1.33
	BA118 Diploma in Office Management	2.67
	AS120 Diploma in Science	2.67
SEMESTER	Semester 1	11
	Semester 2	50.33
	Semester 3	4.67
	Semester 4	14.67
	Semester 5	19
	Semester 6	0.33

The descriptive analysis is used to find the mean value for each question under each variable tested in this study. The data is interpreted according to a 5-level mean score scale adopted from Bringula et al (2012); Amin & Ahmad (2012), as shown in Table 4 below.

Table 4
The 5-point scale, its mean range, and the level of interpretation

Mean	Level of Interpretation
1.00 – 1.50	Very Low
1.51 – 2.50	Low
2.51 – 3.50	Moderate
3.51 – 4.50	High
4.51 – 5.00	Very High

Findings for RQ1-Visual (V)

This section provides information in response to research question one: How do students in online classes demonstrate visual learning styles? The information in Table 5 below lists each trait for the visual learner along with the mean that was determined from the response. Figure 2 displayed the participant's mean scores from lowest to highest on the visual feature. Visual question 1's mean score, 2.81, was the lowest (VQ1). VQ3 had the highest mean score, 4.23. The mean score for visual appeal was 3.588 on average. Participants who looked at VQ2 through VQ10 scored greater than 3 for each question. This suggests that the participant has a visual learning style because once they can actually see something, they remember it well and perform well. This can be accomplished, for instance, by utilizing flashcards, reading the textbook, and noting all key points. Overall, this collection of visual objects demonstrates that a participant in an online course does imply being a visual learner.

Table 5
List of Visual items

Question	Items	Mean	Value
VQ1	I enjoy doodling and even my notes have lots of pictures and arrows in them.	2.8133	Moderate
VQ2	I remember something better if I write it down.	3.6667	High
VQ3	I get lost or am late if someone tells me how to get to a new place, and I don't write down the directions.	4.2333	High
VQ4	When trying to remember someone's telephone number or something new like that, it helps me to get a picture of it in my mind.	3.4633	Moderate
VQ5	If I am taking a test, I can "see" the textbook page and where the answer is located.	3.7233	High
VQ6	It helps me to look at the person while listening; it keeps me focused.	3.3433	Moderate
VQ7	Using flashcards helps me to retain material for tests.	4.0467	High
VQ8	It's hard for me to understand what a person is saying when there are people talking or music playing.	3.7667	High
VQ9	It's hard for me to understand a joke when someone tells me.	3.8300	High
VQ10	It is better for me to get work done in a quiet place.	3.0000	Moderate
	Overall Mean Score for Visual	**3.588**	**High**

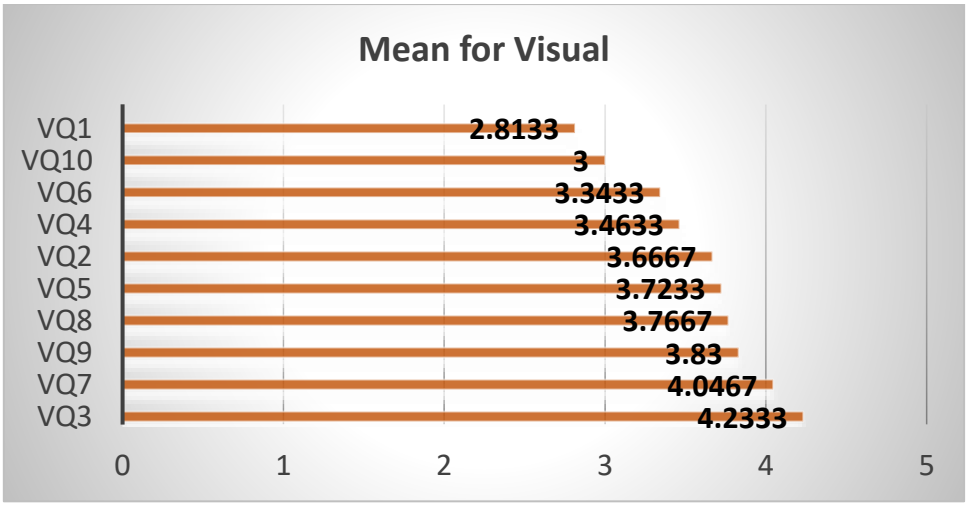

Figure 2- Mean for Visual

Findings for RQ 2-Auditory (A)

This section presents data to answer RQ2-RQ2-How do learners display auditory learning style in online classes? There are 10 items that measure the students learning modality with respect to auditory style in online classes. Table 6 below depicts the mean analysis for auditory style. Table 6 above depicted the mean findings for the auditory modality component measured by 10 items. Four (4) items scored high namely AQ1, AQ3 – AQ5 respectively. The remaining 6 items score moderately which are AQ2, AQ6 - AQ10 respectively. Overall, the mean score for this component pointed out that the respondents moderately agreed that the auditory style is helpful for them during online classes.

While figure 3, showed the minimum to maximum mean score by the participant on the auditory style. The lowest mean score was 2.71, demonstrated by visual question 9 (AQ9). The highest mean score was 4.28, reflected by AQ1. The average mean score for auditory style was 3.4689. Meanwhile, for AQ2 to AQ8, participants scored more than 3.00 for each question. This indicates the participant possesses audio characteristics learning as they remember and doing great jobs once they can hear things physically. Overall, this set of visual items, shows that the participant does indicate learner learned best via listening during an online class.

Table 6
List of Auditory items

Question	Items	Mean	Value
AQ1	My written work doesn't look neat to me. My papers have crossed-out words and erasures.	4.2800	High
AQ2	It helps to use my finger as a pointer when reading to keep my place.	3.4533	Moderate
AQ3	Papers with very small print, blotchy dittos or poor copies are tough on me.	3.6233	High
AQ4	I understand how to do something if someone tells me, rather than having to read the same thing to myself.	3.7533	High
AQ5	I remember things that I hear, rather than things that I see or read.	3.8233	High
AQ6	Writing is tiring. I press down too hard with my pen or pencil.	3.3600	Moderate
AQ7	My eyes get tired fast, even though the eye doctor says that my eyes are ok.	3.3600	Moderate
AQ8	When I read, I mix up words that look alike, such as "them" and "then," "bad" and "dad."	3.3500	Moderate
AQ9	It's hard for me to read other people's handwriting.	2.7167	Moderate
AQ10	If I had the choice to learn new information through a lecture or textbook, I would choose to hear it rather than read it.	2.9700	Moderate
	Overall Mean Score for Auditory	**3.4689**	**Moderate**

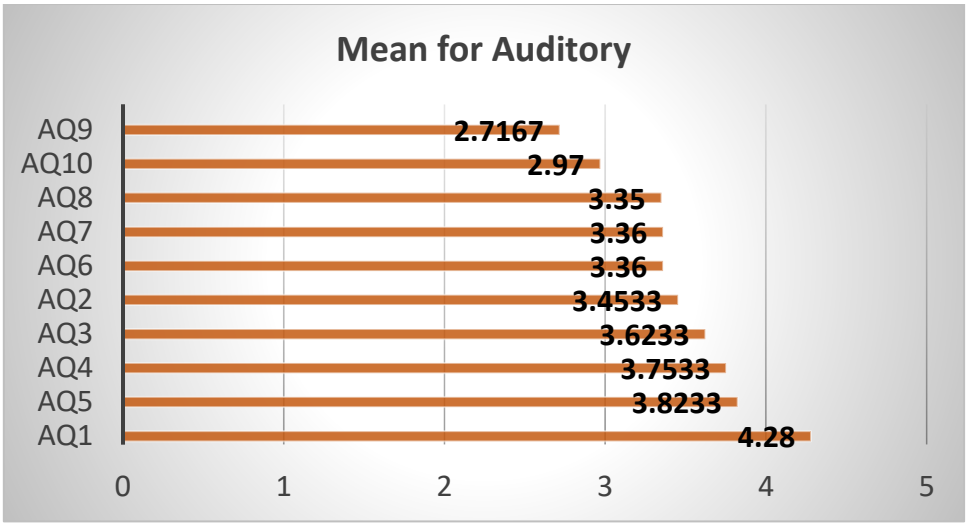

Figure 3- Mean for Auditory

Findings for RQ3-Kinesthetic (K)

This section presents data to answer RQ3-RQ3-How do learners display kinesthetic learning style in online classes? In this study, there are 10 kinesthetic items used to measure the student's learning modality in online classes. Table 7 shows the overall mean score for Kinesthetic. The mean for K10 is the highest among all items measured. In specific, six (6) items scored high in value which are KQ1, KQ3, KQ6, KQ7, KQ8, and lastly, KQ10. Overall, the

mean score for this component shows that the respondents moderately agree that the kinesthetic style is helpful for them during online classes.

Figure 4 shows the minimum to maximum mean score by the participant for kinesthetic. The figure clearly shows the lowest mean score for kinesthetic which is 2.4367 by KQ4 and the highest mean score which is demonstrated by KQ10 (4.1367). The average mean score for kinesthetic style is 3.5040. All participants scored more than 3 for all items except KQ4 with only 2.4367 for the mean score. These findings show that the participants prefer to engage actively as well as participate physically in online class activities. Overall, this set of kinesthetic items shows that the participants are kinesthetic learners while participating in the online class.

Table 7
List of Kinesthetic items

Question	Items	Mean	Value
KQ1	I don't like to read directions; I'd rather just start doing it.	3.5800	High
KQ2	I learn best when I am shown how to do something, and I have the opportunity to do it.	3.0733	Moderate
KQ3	Studying at a desk is not for me.	4.1100	High
KQ4	I tend to solve problems through a more trial-and-error approach, rather than from a step-by-step method.	2.4367	Low
KQ5	Before I follow directions, it helps me to see someone else do it first.	3.1500	Moderate
KQ6	I find myself needing frequent breaks while studying.	3.9300	High
KQ7	I am not skilled in giving verbal explanations or directions.	3.9500	High
KQ8	I do not become easily lost, even in strange surroundings.	3.5667	High
KQ9	I think better when I have the freedom to move around.	3.1067	Moderate
KQ10	When I can't think of a specific word, I'll use my hands a lot and call something a "what-cha-ma-call-it" or a "thing-a-ma-jig."	4.1367	High
	Overall Mean Score for Kinesthetic	**3.5040**	**Moderate**

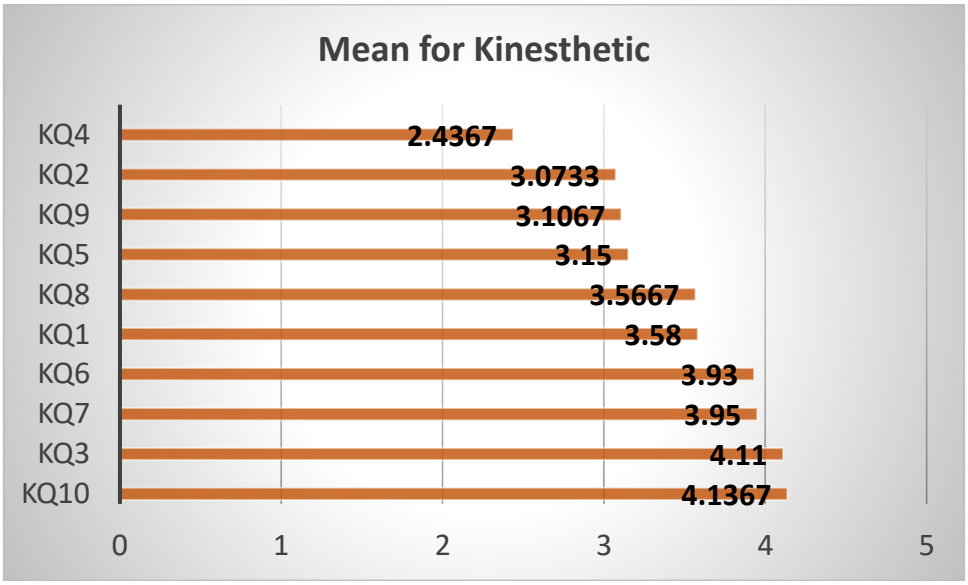

Figure 4- Mean for Kinesthetics

Conclusion

Summary of Findings and Discussion

In this study, the majority of diploma students in the sample of public university respondents report satisfaction with each learning style. In other words, all students successfully demonstrate their learning characteristics through their responses in online classrooms. Despite the fact that all learning styles received a high score, the visual (3.585) learning style appears to be the most favored by students, followed by kinesthetic (3.5%) and auditory (3.46%) independent of programmed, semester, campus, gender, age, unimodal, or multi-modal. Compared to prior research on participants of a comparable age, where the conclusion is supported but also contested, this study's finding was rather intriguing.

The finding was validated by Frankel (2009); Leung and Weng (2007) only with regard to the preferred and most favored learning style, which is visual. On the contrary, this finding contradicts the conclusions of both authors for the second and third preferred learning methods, which they determined to be auditory and kinesthetic, respectively. The second and third most favored learning styles in this study were kinesthetic and auditory, respectively. According to the data presented, the majority of students favored a visual learning approach, followed by kinesthetic and aural styles.

Pedagogical Implications and Suggestions for Future Research

Understanding learning styles is currently a vital and valuable ability for educators since it assists them in identifying and resolving students' learning issues (Cooper, 2007; Fleming & Mills, 1992). In other words, educators should consider learning preferences in order to maximize the learning benefits of a course or program. Instructors may prepare academic material to employ active learning methodologies, reduce passive lecture hours, and develop a more problem-based curriculum so that students may analyze and solve real-world processes and problems. This study investigates the students shown learning methods at a public university. Hence, future research can investigate learning styles between gender, program, campus, age level, and semester in greater depth. Aside from that, this study can develop and examine the important difference outlined in the preceding category in order to effectively identify student learning styles.

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