

## Online Learning vs. Offline Learning in an MIS Course: Learning Outcomes, Readiness, and Suggestions for the Post-COVID-19 World

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### ABSTRACT

This study aims to compare learning outcomes and technology readiness in online versus offline learning and to find suggestions from the viewpoint of learners. Besides, this study also compares differences in students' perceptions among learning styles. The associations between several factors such as experience and gender, and learning preferences are also explored. A questionnaire was developed to gather data from students who enrolled in an MIS course during the middle of the COVID-19 pandemic. Around half of the students were assigned to study the topic 'using MS Excel basics' in offline sessions, whereas the rest were assigned to learn through recorded videos online. Responses from 44 students, together with their comments and suggestions, were used for data analysis. This study found that both online and offline delivery methods can improve students' cognitive processes according to the Revised Bloom's Taxonomy and their topic interest significantly. On-campus classes could significantly enhance students' class attendance intention, but online classes could not. The cognitive process of RBT in terms of evaluating MS Excel content and class attendance intention of online students were significantly lower than offline students. Students also felt that place, equipment, and software on-campus were more ready than online environments. This work provides guidelines for both lecturers and universities in choosing teaching methods for using basic tools after the COVID-19 situation pass, selecting proper course types, designing course activities, and providing sufficient supports for better online learning outcomes. Research gaps suggested by past studies are filled up in this study.

*Keywords:* Student perceptions, learning outcomes, online learning, face-to-face learning, COVID-19, MIS education.

### INTRODUCTION

The COVID-19 pandemic affects how people live and work in almost all sectors (Laili & Nashir, 2021; Nguyen *et al.*, 2020; Valentino *et al.*, 2021). Schools to universities are temporarily closed, according to the government announcements. Some of them have to limit 50% of total students at school sites for social distancing. Many of them have to apply alternative teaching-learning methods and tools such as e-learning and video conferencing to fully deliver courses online (Adnan & Anwar, 2020; Aguilera-Hermida, 2020; Akuratiya & Meddage, 2020; Bączek, Zagańczyk-Bączek, Szpringer, Jaroszyński, & Wożakowska-Kapłon, 2021; Nasution *et al.*, 2021; Valentino *et al.*, 2021). However, moving from an environment of traditional education to online or distance education could not happen easily overnight (Adnan & Anwar, 2020). Although the increase in the use of Information and Communication Technologies (ICT), particularly the Internet, leads to the growth of online learning (Yusuf *et al.*, 2021). The transition from offline learning to online learning in higher education could be considered a relatively new phenomenon for some countries (Julien & Dookwah, 2020). The rapid transformation during the pandemic generates several obstacles and challenges for all parties. Educators must upgrade their technological skills for teaching online in a very short time (Adnan & Anwar, 2020; Aguilera-Hermida, 2020; Laili & Nashir, 2021; Valentino *et al.*, 2021). Many of them consider online learning as a failure since it cannot properly transfer knowledge to students (Valentino *et al.*, 2021). Although many students are digital natives, some students show stress and anxiety related to learning, isolation, and loneliness (Aguilera-Hermida, 2020; Besser *et al.*, 2020). Some students lack confidence in using technology and encounter difficulty in maintaining their concentration on distance learning (Aguilera-Hermida, 2020; Besser *et al.*, 2020). Understanding these challenges and obstacles that students face in the transition to online learning can help ensure equal access to education (Besser *et al.*, 2020; Chisadza *et al.*, 2021). However, the benefits of education on economic development have been proven in the literature (Chisadza *et al.*, 2021). Educational institutions are thus inevitable to find appropriate content, an effective delivery system, and provide digital literacy training to their faculties for better learning outcomes (Adnan & Anwar, 2020).

Offline or face-to-face (F2F) learning relies on the presence of instructors to teach in a physical environment (classroom). It is also referred to as traditional learning or conventional education, in which learning is centered on lecturer paces (Anggrawan & Jihadil, 2018; Nasution *et al.*, 2021). Offline learning highly supports interactions among learners and educators. Students generally feel more comfortable and learn easier in a familiar, traditional classroom environment (Julien & Dookwah, 2020). Lecturers or instructors in a F2F setting can receive immediate feedbacks or responses about lessons, delivery, and learning experience from students (Hilton *et al.*, 2020). Online learning, on the contrary, is the use of the Internet to access learning materials, to interact with content, lecturers, and other students, to get support throughout the learning process, without requiring students to physically attend classes (Nasution *et al.*, 2021; Nieuwoudt, 2020). It could utilize various forms of multimedia, e.g.,

text, audio, graphics, animation, video, discussion boards, e-mail, and other forms for learning purposes (Anggrawan & Jihadil, 2018; Bencheva, 2010). Online learning has been promoted as being more cost-effective and convenient than traditional classroom environments, as well as giving opportunities for learners to continue their education (Bączek *et al.*, 2021; Bali & Liu, 2018). Students are attracted to online education because of its flexibility (Laili & Nashir, 2021; Nieuwoudt, 2020). Learners are also trained to be more responsible, creative, independent, and confident in online learning (Anggrawan & Jihadil, 2018; Laili & Nashir, 2021). Online learning can be synchronous or asynchronous. An online course may deliver materials online and meet synchronously regularly with educators and peers, e.g., in a chatroom, or deliver course synchronously via the Internet at a specific time via a specific medium, e.g., video conferencing. The latter type is sometimes called distance learning, in which students and lecturers can engage simultaneously. For an asynchronous online class, lecturers prepare materials such as recorded lectures, assignments, etc., and deliver them online. Then, students complete them at their own pace at a convenient time within a given timeframe (Aguilera-Hermida, 2020; Brown & Park, 2016; McFarland & Hamilton, 2005; Nieuwoudt, 2020). Online learning in this study is an asynchronous online class according to the last definition.

Although online learning has become a major alternative approach in teaching and learning processes during the COVID-19 pandemic (Aguilera-Hermida, 2020; Anggrawan & Jihadil, 2018), it remains at an early stage of development (Smart & Cappel, 2006). Furthermore, studies taking place in online environments are relatively recent (Young & Duncan, 2014). Online learning is also not easy to deal with as imagined (Laili & Nashir, 2021; Tratnik *et al.*, 2019). In online learning, the interaction between students and lecturers is mediated by technology, which the design of learning environments could affect learning outcomes (Aguilera-Hermida, 2020). Because the success of online learning depends on various factors including accessibility, the usage of appropriate methods, course content, and assessment criteria (Bączek *et al.*, 2021). Several things need to be thought and considered to implement online learning such as learning models, methods, strategies, learning outcomes, and so on (Laili & Nashir, 2021). Online learning also needs supportive online learning environments and facilities, for instance, hardware, software, and Internet access (Anggrawan & Jihadil, 2018; Laili & Nashir, 2021; Tratnik *et al.*, 2019). These support facilities are more complicated for developing countries that lack the digital infrastructure for the majority of the population (Chisadza *et al.*, 2021). Hence, offline or face-to-face learning may sometimes be appropriate. Besides, offline learning is carried out before the COVID-19 epidemic but is suspended after that (Valentino *et al.*, 2021). Although the duration of the pandemic is unknown, the government in many countries plans to reopen offline learning with strict health protocols after the situation is better (Nguyen *et al.*, 2020; Valentino *et al.*, 2021). Understanding students' perceptions, challenges, and preferences which learning types they like or are comfortable with most could help in the educators' decision to go back to conventional learning or continue online learning after lockdown (Aguilera-Hermida, 2020; Akuratiya & Meddage, 2020; Paechter & Maier, 2010).

Offline learning and online learning have similarities and differences (Julien & Dookwah, 2020). For example, online learning tends to focus on the interaction of learning, whereas offline learning is more likely to emphasize the interaction of people (Anggrawan & Jihadil, 2018). Universities continue to integrate various forms of learning (Hilton *et al.*, 2020). But a few recent studies have investigated challenges and opportunities associated with online learning during pandemics (Adnan & Anwar, 2020). Studies comparing online and offline learning before the COVID-19 pandemic have yielded inconsistent results. Some studies indicate higher student satisfaction in offline learning, while some works show no significant differences between the two delivery formats (Tratnik *et al.*, 2019). Hence, the current situation is the right time to explore student perceptions of learning, to evaluate methods used by lecturers, and provide an overview and recommendations on future learning processes and improvements (Hilton *et al.*, 2020; Keller & Karau, 2013; Nasution *et al.*, 2021; Smart & Cappel, 2006). For research gaps, the comparison of online or offline learning regarding which is the right format in the new normal period, the gender effects on student perceptions, the effects of prior experience, current experiences, and opinions of students on learning, the problem related to technological infrastructure or technology readiness, students' topic interest development, student performance, the attrition rates or class attendance of each learning method, best online practices or the quality of online learning, the effects of learning types (online, offline) on the learning process, the impact of learning delivery method on skills-based learning are suggested to be further explored to improve learning success (Adnan & Anwar, 2020; Alsaaty *et al.*, 2016; Bali & Liu, 2018; Callister & Love, 2016; Hilton *et al.*, 2020; Kaushik & Agrawal, 2021; Kinlaw *et al.*, 2012; Nieuwoudt, 2020; Paechter & Maier, 2010; Shakourzadeh & Izadpanah, 2020; Swarat, 2008; Valentino *et al.*, 2021). Past research also guides lecturers to evaluate students' traits and learning styles, determine students' learning needs, examine the role of student characteristics in class attendance, and plan to deliver courses that match their styles or characteristics and preferences (Kinlaw *et al.*, 2012; Smart & Cappel, 2006; Smith *et al.*, 2015; Tratnik *et al.*, 2019). Lu *et al.* (2003) also state that there are a few studies involving learning styles in online business courses. No studies to date have explored these gaps simultaneously.

As the foregoing reveals, the current study tries to examine student perceptions (perceived learning outcomes, perceived technology readiness), the differences in these perceptions among student learning styles and delivery formats, and students' online preferences. Data from an introductory MIS course, which is a core course for undergraduate students in the business program, in the part of using MS Excel that had both online and offline delivery formats is used. The study aims to address research questions as follows: 1) Are students perceived learning outcomes in terms of the cognitive process dimensions of Revised Bloom's taxonomy (RBT), topic interest, and class attendance improved after completing the MS Excel part in any course delivery formats? 2) In what way do students evaluating learning outcomes, performance, and technology readiness for offline learning differ from online learning? 3) Do any differences exist between student learning styles concerning their perceived learning outcomes and performance? 4) Are experience, gender, student learning style, and technology readiness related to students' online preference? 5) For what courses or course types do students prefer online learning? 6) What are the

best online practices suggested by students? The RBT has been used for various purposes in education, such as evaluating alignment between curriculum, teaching, and assessment, planning teaching activities and lessons, designing assessment, and analyzing students' performance in the past (Radmehr & Drake, 2019). However, to date, it has not been applied in comparing online and offline settings in MIS education.

### LITERATURE REVIEW

McFarland and Hamilton (2005) carefully controlled and compared student satisfaction between online and traditional classes, preliminarily introduced possible drivers to enhance the performance and satisfaction of students in online sections. The results also confirmed past research about insignificant differences in student performance between online and traditional classrooms. Paechter and Maier (2010) explore student experience regarding the favorable aspects of e-learning and face-to-face learning. Findings indicated that they appreciated online learning in terms of a clear and coherent structure of learning materials, which supported self-regulated learning. Face-to-face learning was preferred due to communication purposes in which a shared understanding has to be established. Liu (2010) compared instructional differences between F2F and e-learning methods in goal-oriented students who faced the competitive entrance exam of graduate schools in Taiwan. The results revealed that the e-learning method offered higher learning effectiveness and yielded more satisfaction on learning materials and environments than F2F learning. Nevertheless, there was no significant difference in the satisfaction of instructors or teachers between the two modules. Dziuban and Moskal (2011) compared online, blended, and F2F courses. Findings showed that factors across different class formats were identical. Thus, the authors concluded that the course modality did not affect end-of-course evaluations. Schwartz (2012) investigated F2F versus online sections of accounting classes. The results indicated a lower level of achievement in online sections. Murdock *et al.* (2012) explored students' skill acquisition in on-campus and online environments of an introductory counseling skills course. The results presented no significant differences in either course format related to students' basic counseling skill acquisition.

Young and Duncan (2014) compared student ratings in online and F2F courses in higher education. Findings showed that offline courses were evaluated significantly higher than online courses in several aspects, including communication, faculty-student interaction, grading, instructional methods, and course outcomes. On the contrary, student effort was rated significantly higher for online than F2F courses. Comparing the same courses with the same instructors also revealed similar results. Students were more satisfied with traditional learning compared to online learning. Smith *et al.* (2015) examined differences in the learning levels and perceived efficiency between online and F2F courses for graduate students. The results pointed out that students in both groups gained the same levels of learning. However, they perceived a significant difference in their learning efficacy. Online instructional modality received more favorable in perceived learning efficiency. Biel and Brame (2016) reviewed the literature concerning the effectiveness of online instruction in biology courses. Of eight large-scale studies, the results from two studies found that students in F2F classes outperformed students in online classes, while three studies showed no significant difference. For eight small-scale studies, six of them also showed no significant difference in student performance between the two class formats, but two of them found superior performance in online sections than F2F sections. Callister and Love (2016) compared learning outcomes of online versus F2F skill-based (negotiation) courses. Findings indicated that F2F learners gained higher negotiation outcomes than online learners. Brown and Park (2016) conducted longitudinal research to explore research self-efficacy and retention between online instruction and F2F instruction. The results showed that students' knowledge and research self-efficacy increased between pretest and posttest. This knowledge and research self-efficacy remained significantly increased after a one-year follow-up later. Nevertheless, there was no significant difference between online and F2F students, which means students gained and maintained their research method knowledge regardless of which learning platforms were utilized.

Bali and Liu (2018) examined student perceptions in the context of social presence, social interaction, and satisfaction between online versus F2F learning in Indonesia Open University, Taiwan branch. Findings indicated a higher learning perception in F2F learning than online learning in all aspects, but there was no statistically significant difference in learning preferences among students at different levels. Anggrawan and Jihadil (2018) tried to find an answer to the question, an online learning/ e-learning truly replace F2F learning in the cognitive area? Findings revealed that online learning could substitute traditional learning in the cognitive area. The results were based on the algorithm and programming instructional at STMIK Bumigora tertiary institution. Stark (2019) intended to compare motivations and learning strategies between online and F2F students. The results pointed out that although online students reported lower motivations compared to F2F students, these motivations strongly correlated with their performance rather than learning strategies, especially for online courses. Tratnik *et al.* (2019) compared student satisfaction in an online versus conventional Business English course. Findings revealed a significant difference in the levels of student satisfaction among the two learning formats. Face-to-face students earned more satisfaction with the course in several dimensions than their online counterparts.

Hilton *et al.* (2020) explored student perceptions and course satisfaction of online and F2F courses. The results indicated no significant differences in the analysis by gender and majors, but there were differences between the second-year and the fourth-year graduate students. Besides, more positive perceptions of online learning could be increased if students took more online courses. Thai *et al.* (2020) explored four learning environments that were face-to-face learning, fully e-learning, blended learning, and flipped classroom in terms of student performance in the Animal and Human Physiology course. Changes in perceived flexibility, intrinsic motivation, self-efficacy beliefs of students, and the interaction effects of these variables on learning performance were investigated. There was a significant positive differential effect on students' learning performance in the flipped classroom and blended learning settings, but there were no significant interaction effects regarding changes in perceived

flexibility, intrinsic motivation, and self-efficacy. There were significant differences between learning environments or conditions in students' perceived flexibility. Bourzgui *et al.* (2020) evaluated the effectiveness of blended learning compared to F2F learning and assessed student perceptions about blended learning. Findings pointed out that more than 50% of students attended lectures regularly, believed that course objectives were reached and well-defined, used an e-learning platform (Moodle), faced difficulty in studying materials online, and thought that interactive evaluation was not enough. They also believed that teaching should not be fully conducted online. Julien and Dookwah (2020) conducted action research regarding the experiences of undergraduate students in the transition from F2F to online learning. The results from the informal, structured interview and semi-structured questionnaire showed the possibility of online learning for instructional options and F2F learning for human interaction and mathematics-related courses. Adnan and Anwar (2020) examined the attitudes and perspectives of Pakistani higher education students toward compulsory digital and distance learning during COVID-19. Findings highlighted that online learning could not generate desired outcomes in underdeveloped countries since a vast majority of students were unable to access the Internet properly.

Aguilera-Hermida (2020) explored college students' adoption, use, and acceptance of emergency online learning because of COVID-19. The results showed the significant roles of attitude, motivation, self-efficacy, and technology usage in students' cognitive engagement and academic performance. However, students preferred F2F learning over online learning. Akuratiya and Meddage (2020) studied IT students' perceptions of online learning during the COVID-19 pandemic in Dehiwala, Sri Lanka. Findings revealed that more than 60% of participants had little or no experience with online learning before. More than 50% of them preferred blended learning and raised the challenges in online learning, including the reduction of interactions with teachers and peers, social isolation, and technical problems. Nevertheless, 82% of them agreed to combine online learning into their course in the future. Students also perceived online learning as effective as traditional learning because online learning was enjoyable, let students learn at their own pace and easy to access materials, and created active participation. The authors indicated the favorable perception of online learning among IT students. Besser *et al.* (2020) explored higher education students' adaptability to the COVID-19 pandemic, personality, and learning experiences. The results showed the negative reactions of students to the online condition, which became necessary due to the pandemic. Even so, students with adaptability to the pandemic showed more positive reactions across multiple indicators. Their personality traits were also associated with specific reactions to online learning through their learning adaptability. Schlenz *et al.* (2020) assessed students' and lecturers' perspectives on the transition to online learning due to COVID-19. Findings showed that 36.8% of students preferred F2F learning rather than pure online learning. Both students and lecturers were interested in keeping up with online courses in the future. Nieuwoudt (2020) investigated the relationship between students' online interaction and participation and their academic success as well as class attendance in both virtual classes (synchronous) and/or watching the recorded virtual classes (asynchronous). The results indicated the importance of class attendance, but it did not differ whether students attended classes synchronously or asynchronously. A significant relationship was supported between students' participation and interaction with an online learning system and their academic success.

Laili and Nashir (2021) explored higher education students' perceptions, supporting factors, and constraints regarding online learning of Intensive English class during the COVID-19 using the descriptive method. Findings showed both positive perceptions and negative perceptions of students in online learning. Positive perceptions were related to flexibility, whereas negative perceptions were difficult to practice conversation, fewer motivations, and constraints such as an unstable Internet signal, high cost of the Internet. Nasution *et al.* (2021) explored student perceptions of various learning experiences (F2F learning, blended learning, and online learning) and determined which learning type was preferred most by students. Findings confirmed that F2F learning was the most preferred choice by 78% of students, whereas 20% of students preferred blended learning and 2% of them chose online learning. Bączek *et al.* (2021) studied the perception of medical students regarding full online learning because of the COVID-19. Many respondents indicated the main advantages of online learning, which were the ability to stay at home (69%), continuous access to online materials (69%), learning at your own pace (64%), and comfortable surroundings (54%). The main disadvantages of e-learning were lack of interactions with patients (70%) and technical problems with IT equipment (54%). There was no significant difference between F2F and online learning concerning the ability of learning methods to improve knowledge, but online learning was considered significantly less effective than F2F learning in terms of increasing skills and social competencies. Medical students also evaluated themselves as less active in online learning compared to traditional learning. Nevertheless, many respondents (73%) rated e-learning as enjoyable. Chisadza *et al.* (2021) examined factors predicting students' performance after the transition from F2F to online learning due to the COVID-19 pandemic. Findings showed that students' performance in terms of the average assessment grades was driven by good Wi-Fi access. Lower academic performance was found in students who faced difficulty in transferring to online learning. Lower academic performance was also found in students who preferred self-study by reading class slides and notes more than students who preferred assisted study by joining live lectures or watching recorded lectures.

## BACKGROUND AND HYPOTHESIS DEVELOPMENT

### Learning Outcomes

#### *Revised bloom's taxonomy (RBT) and student performance*

Learning outcomes are competences that students aim to achieve. Competences may have different facets, such as factual and conceptual knowledge, methodical knowledge, social and personal competences, and media competence. In higher education, university students should acquire not only conceptual and methodical knowledge, but also social and personal competences e.g., competences in teamwork and self-regulation (Paechter & Maier, 2010). Online learning is crucial for higher education

institutions and is expected to improve students' learning outcomes (Laili & Nashir, 2021). Bloom's taxonomy (BT) is a widely used and well-known taxonomy for identifying, writing, or interpreting instructional objectives in educational settings (Kocakaya & Kotluk, 2016). Bloom's taxonomy, original version, defines six cognitive categories comprising of knowledge, comprehension, application, analysis, synthesis, and evaluation. It provides a basis for educators to classify learning levels in terms of expected outcomes for a given program. It is extended to the Revised Bloom's Taxonomy (RBT) with a knowledge dimension and minor adjustment in sequential order of six cognitive process dimensions (Lau *et al.*, 2018). The RBT also a classification of learning objectives, which are important as a common frame of reference to develop intended learning outcomes. It facilitates planning until assessing instruction and has been applied from pre-school education to higher education for all academic subjects (Kocakaya & Kotluk, 2016). Compared to the original Bloom's taxonomy, the RBT covers many aspects of assessment, which are not addressed in-depth as the previous version (Clark & Ernst, 2010). In addition, the study of Radmehr and Drake (2019) compares the RBT and some of the major theories and frameworks. Their results identify that the RBT is the most detailed, comprehensive, and flexible framework. Thus, it has the highest potential to explore teaching, learning, and assessment of mathematics than other theories and frameworks due to its broad approach, strengths in terms of two-dimensional structures that the overlaps of knowledge categories are allowed, and the rejection of strict hierarchy as the original BT.

For the RBT, nouns are used to show knowledge, whereas verbs are used to show the cognitive process. Four types of knowledge are factual, conceptual, procedural, and metacognitive knowledge, which could overlap each other. Factual knowledge is the terminology, specific details, and basic elements that students must know. Conceptual knowledge is the knowledge of interrelationships among the basic elements. It is also related to knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures. Procedural knowledge is knowledge of subject-specific skills and algorithms, knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures. Metacognitive knowledge is knowledge of cognition in general, awareness, and knowledge of one's cognition. It also refers to strategic knowledge, knowledge about cognitive tasks, and self-knowledge (Kocakaya & Kotluk, 2016; Radmehr & Drake, 2019). The cognitive process dimension of RBT consists of remembering, understanding, applying, analyzing, evaluating, and creating. These dimensions represent a continuum of increasing cognitive complexity, from lower-order thinking skills (remember) to higher-order thinking skills (create). 'Remember' is the lowest level of the cognitive process dimensions. It is defined as a cognitive process that requires students to identify and retrieve relevant knowledge from long-term memory. Recognizing and recalling are the sub-categories of remembering. 'Understand' allows students to construct meaning from instruction, including oral, written, and visual communications. The sub-categories of understanding are interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining. In 'apply', students carry out or use a procedure that is normally hands-on. Executing and implementing are objectives or sub-categories of this category. 'Analyze' is the ability to break down materials and concepts into parts and specify how each part is related to each other. Analyzing is an extension of understanding. Three sub-categories of analyzing are differentiating, organizing, and deconstruction. 'Evaluate' allows students to make judgments based on a set of criteria or standards. Checking and critiquing are sub-categories of evaluating. 'Create' is the highest cognitive process dimension. It is the ability to put elements together and/ or reorganize elements to form new patterns or structures. Three sub-categories of creating are generating, planning, and producing (Clark & Ernst, 2010; Kocakaya & Kotluk, 2016; Lau *et al.*, 2018; Radmehr & Drake, 2019). The intersection between knowledge and cognitive process in the RBT is designed to support learning strategies and facilitate learning assessment (Lau *et al.*, 2018; Radmehr & Drake, 2019).

In addition to learning outcomes according to the RBT, Lu *et al.* (2003) mention that there has not been much research investigating the learning effectiveness of web course tools. Learning effectiveness could be evaluated through student performance and satisfaction. In their study, a lower number of errors on an achievement test after instruction indicates student performance, whereas drop rate, anxiety, and/ or frustration during the learning process show satisfaction. For online learning, the study of Nieuwoudt (2020) investigates the best predictor of final grades. The results show that the attendances of synchronous virtual class and recorded class significantly predict final grade in the Managing Your Study subject, but both variables are not significant predictors of final grades in the Studying Science subject. This study assesses student performance in both learning methods using the assignment score. Satisfaction in terms of topic interest and class attendance are explored and described further in the next section.

### **Topic interest**

Interest is the psychological state of engaging with classes of objects, events, or ideas over time (Swarat *et al.*, 2012). Interest is also defined as content-specific motivational characteristics, specific preference for particular subject areas, or a motivation to engage a topic or an activity (Swarat *et al.*, 2012). It is seen as a central to explain how people select and persist in processing certain types of information compared to others. Interest promotes motivation for learning and the long-term stage of information. It could result from the interaction of a learner and his/ her environment (Weber *et al.*, 2001). Interest is the driving force behind self-initiated learning behavior (Swarat, 2008). The positive effect of interest on learning, such as learning outcomes, achievements, or cognitive skill development, has been studied and documented in a wide range of learning situations (Swarat, 2008). Compared to learning based upon coercion, interest-based learning is an active state, which has personal meaning to learners. Therefore, researchers have tried to understand the impact of learning interest. Individuals are motivated to take part in activities they are interested in. However, interest is declined when they feel ill-prepared to complete a certain task (Weber *et al.*, 2001). Since interest plays an important role in promoting learning, educators should explore whether students show interest in the materials. Nevertheless, students' interests seem to decline over time. Educators thus have to provide materials that cater

to their interests. To do so, a firm understanding of what students are interested in is need. Knowing what topics are of high interest to learners can help educators in choosing topics to teach or help textbook writers or publishers in creating more attractive materials for students (Swarat, 2008).

Topic interest is a type of interest, which is seen as a relatively long-term preference for a certain topic or content (Weber *et al.*, 2001). It also refers to a learner's interest, which is evoked when a specific topic is presented. It is the extent to which materials are interesting enough for readers or learners to make them focus. Some past studies consider topic interest as a form of situational interest, while other studies view it as a form of individual interest. Because some learners may find the topic interesting because of their individual interests, but others who are not interested in the topic before. They think the topic is interesting due to situational interest factors such as novelty, anomaly, and unexpectedness afterward (Shakourzadeh & Izadpanah, 2020; Weber *et al.*, 2001). Both learners' well-established individual interest and their situational interests contribute to the increase of comprehension and learning. Several studies support the impact of high-interest topics on children's comprehension, inferencing, and retention (Shakourzadeh & Izadpanah, 2020). The study of Shakourzadeh and Izadpanah (2020) also indicates the importance of topic interest. There is a significant difference in students' perception (topic interest) between the textbook-assigned topics and self-selected topics. In the study of Swarat *et al.* (2012), the follow-up interviews of 30 students show that 19 of them believe topics affect students' perception of the interestingness of activity. Five of them also believe that activity affects their perception of the interestingness of the topic. Activities relating to experiment/ lab/ project and technology (computer/ Internet/ video) are main activities considered as interesting. However, activities relating to technology (computer/ Internet/ video) are also viewed as uninteresting as same as reading and writing activities, after the lecture. In sum, technology may not be preferred by all interviewees and its interestingness could be influenced by the content topic that is used.

### ***Class attendance intention***

Class attendance dramatically contributes to improving learning (Cortright *et al.*, 2011). It has been repeatedly shown to be related to student performances such as grades or test scores across a wide range of disciplines, from economics, social studies to biology (Cheung, 2009; Cortright *et al.*, 2011). There is also a common belief or conventional wisdom that academic success is linked to class attendance. Students who attend classes regularly generally achieve higher grades than those who do not attend classes on a regular basis (Cortright *et al.*, 2011; Nieuwoudt, 2020; Van Schalkwyk *et al.*, 2010). Students who attend classes more often obtain better grades (Cortright *et al.*, 2011). The empirical findings of Kwak *et al.* (2019) show that both lecture and tutorial attendance positively impact test scores. The results of Cheung (2009)'s study also revealed that students with high performance before attending the Wind Engineering course are associated with high-class attendance. They do not access online materials as much as the lower attendance students, but they generally gain better performance afterward. Their performance is also improved if they frequently access lecture materials online. Moreover, competing for academic commitment as a class attendance variable significantly correlate with total examination scores. Students who are absent frequently perform more poorly on course examinations compared to others (Grabe *et al.*, 2005). Highly motivated students attend classes more and succeed academically (Cortright *et al.*, 2011). Therefore, the reasons why students attend or do not attend classes have been examined from various perspectives (Van Schalkwyk *et al.*, 2010).

However, the relationship between class attendance and academic success is not necessarily linear. For example, a typical student's performance may not always affect by a few absences. In some cases, the relationship between class attendance and student performance is not significant but positive, and sometimes the correlation is relatively low. Nevertheless, students with high GPAs are more likely to attend class (Van Schalkwyk *et al.*, 2010). In online environments, students who view online materials perform better on course examinations. The frequency of absences is also associated with examination performance (Grabe *et al.*, 2005). Some studies found that webcasts or online materials encourage students to skip classes (Grabe *et al.*, 2005; Traphagan *et al.*, 2010). In the study of Traphagan *et al.* (2010), there is a difference in absence frequency between the webcast and non-webcast sections. Besides, there is a significant correlation between the frequency of accessing webcasts and online resources such as PowerPoint slides and the absence frequency in the webcast section, showing a negative relationship between online learning and class attendance. Accessing webcasts after missing a lecture is also the topmost reason for students to use webcasts. However, the webcast access could nullify the negative impact of absence behavior on student performance. More webcast viewing positively associates with higher performance. The study of Kinlaw *et al.* (2012) also supports that highly online resources used by lecturers lower the absence of students. The study of Nieuwoudt (2020) points out that there is a significant difference in final grades between students who do not attend any classes (synchronous virtual classes or asynchronous recorded virtual classes) and students who attend classes. Students who attend classes less than half of the classes poorly perform than students attending classes more.

### **Online Learning versus Offline Learning**

#### ***Learning outcomes***

Fourth-year pharmacy students have higher post-learning outcomes in a problem-based learning course than online students (Callister & Love, 2016). Young and Duncan (2014) compare ratings from students in F2F and online on matched courses. Course outcomes are significantly higher in F2F than in online settings. The study of Callister and Love (2016) compares the impact of class types on learning outcomes in the business deal negotiation exercise. Findings show a significant effect of class types on performance, in which students were learning on campus yield higher outcomes than those learning online. In the study of Bourzgui *et al.* (2020), 53.8% of students prefer F2F, but 61.1% of them support that online courses are effective in helping them understand course materials. The study of Bączek *et al.* (2021) shows no statistical difference between F2F and online

learning in terms of opinions regarding the ability of methods to improve knowledge. Nevertheless, e-learning is considered less effective than F2F learning in terms of enhancing skills and social competences. Literature reviews regarding online learning and student learning outcomes in the study of Murdock *et al.* (2012) indicate that, in general, research in higher education has found similar outcomes, e.g., performance, persistence, and learning outcomes for online and traditional F2F education situations. A past study also shows no statistically significant difference between students achieving learning objectives based on the course format (on-campus versus online settings) (Murdock *et al.*, 2012). There are no differences in learning outcomes in an introductory marketing class. Online learning formats provide equal learning outcomes across various subjects in the field of management, including qualitative management classes (Callister & Love, 2016).

Past research observes learning outcomes for F2F and online learners. Findings show that the learning outcomes of online learners are as effective as or better than learning outcomes for F2F learners (Chisadza *et al.*, 2021). Literature reviews in the study of Callister and Love (2016) point out that, in the studies examined since 2006, students in online courses perform slightly better than students in on-campus courses. The study of Paechter and Maier (2010) compares the suitability of learning methods in the view of students show that online sessions are significantly better than F2F sessions in the aspects of clarity and explicit structuring of the course and learning contents, the favorable cost-benefit ratio of effort and learning outcomes, fast feedback from tutors, easy and fast exchange of information and knowledge with other course participants, the flexibility of learning about time and place, flexibility about learning strategies and pace of learning, opportunities for exercising and applying one's knowledge, opportunities for monitoring one's learning outcomes, and acquisition of skills in self-regulated learning. On the contrary, F2F sessions are better for counseling and support for learning by the tutor, possibility to establish personal contact with the tutor, support for cooperative learning and group work with other course participants, possibility to establish positive social relations with other course participants, support for maintaining learning motivation, acquisition of skills in scientific work procedures, acquisition of conceptual knowledge in the subject matter, acquisition of skills in the application of one's knowledge and of using one's knowledge in practice, and acquisition of skills in communication and cooperation. In the study of Adnan and Anwar (2020), the majority (65.7%) of students perceive online learning as quite different from conventional learning. Most of them (71.4%) also agree that online learning is more motivating than F2F learning. However, 50.8% of students believe that it is not possible to effectively complete entire courses online only. The majority (78.6%) of students also feel that F2F contact with a lecturer is needed for any type of learning. Past studies show mixed results when comparing online and offline platforms in terms of learning outcomes such as course grades or GPA (Brown & Park, 2016). Callister and Love (2016) also conclude that literature reviews present mixed results. Some have found no differences, while others have found significant differences.

The study of Liu (2010) confirms that e-learning is superior to F2F learning in terms of overall learning effectiveness. In terms of student performance, a meta-analysis and review of online learning studies indicate that, on average, students taking all or a part of their class online perform better than those taking only F2F instruction (Schwartz, 2012). Ladyshevsky (2004) compares final grades of post-graduate students in nine units offered in both F2F and online modes of learning. Post-graduate students generally perform better in online mode. Besides, students completing units in both modes averagely have significantly higher grades than completing only online units. Literature reviews in the study of Callister and Love (2016) indicate that first-year nursing performs better on a theoretical examination in an online course, but there are no significant differences in their performance for a structured clinical exam. In an undergraduate course in Human Resource Management, online students generally outperform F2F students (Callister & Love, 2016). On the contrary, past research mentioned in the study of Akuratiya and Meddage (2020) indicates that e-learning is perceived as less effective than traditional classroom learning. The study of Murdock *et al.* (2012) shows a significant difference between final exam scores between online and F2F students. F2F students have higher final exam scores than online students. In the study of Schwartz (2012), Standard Learning Outcomes Assessment Test (SLOAT) Scores, course grades (GPA), and teaching evaluation of students from the aggregate courses of major subject areas in onsite mode are significantly higher compared to online mode. The study of Lu *et al.* (2003) specifies that there is a difference in student achievement because of delivery methods. Students in the traditional group have higher but not significant performance than students in the online group. A past study indicates that students taking distance education courses outperform students enrolling in traditional courses. Another research finds out that F2F students outperform online students in overall performance in terms of grade, but online students perform better in a knowledge-based examination (Smith *et al.*, 2015). There is research reporting no significant differences in performance levels between undergraduate students who complete online courses and students who complete F2F instruction. Another research also shows no significant difference in performance in terms of homework assignments between students enrolled online and F2F intermediate accounting courses (Smith *et al.*, 2015). The study of Thai *et al.* (2020) explores the learning performance of students after studying in different settings. Their results show no significant difference between e-learning and traditional learning. Past research shows no difference in quiz scores between online and F2F learners (Callister & Love, 2016). Literature reviews of empirical studies in the business school context show mixed results when comparing student performance, perceptions, and satisfaction between online learning and classroom learning (Cater III, Michel, & Varela, 2012). In sum, the results regarding student performance between online versus offline modes are mixed.

Considering class attendance, researchers have found that most students prefer attending lectures on-site over online for various reasons, for instance, classroom interactivity, in-person viewing of demonstrations, and better concentration (Traphagan *et al.*, 2010). However, some studies compare actual class attendance for classes with and without webcast or podcast access and have found insignificant differences between classes (Traphagan *et al.*, 2010).

### **Technology readiness**

readiness is recognized as one of the most important factors to achieve the successful implementation of e-learning in higher education. To build effective e-learning, the readiness of technology, the readiness of educational institutions, and the readiness of the community have to be prepared since they will later influence the quality of the e-learning program (Irene & Zuva, 2018). Irene and Zuva (2018) propose an e-readiness assessment model consisting of readiness in the aspects of people, technology, content, strategy, and institution. In terms of technology dimension, skills, software, and hardware are the main issues (Smith *et al.*, 2015). Psycharis (2005) specifies technology resources as criteria of e-learning readiness. Aydin and Tasci (2005) present an e-learning readiness model, which includes technology as one aspect. Technology refers to access to computers and the Internet, the ability to use computers and the Internet, and a positive attitude towards using technology. Lopes (2007) presents e-learning readiness that contains several dimensions: business, content, technology, culture, human resources, and financial. Technology is the degree of access to infrastructure. Darab and Montazer (2011) propose a framework for assessing e-learning readiness. Network and equipment are technological aspects relating to e-learning readiness. Akaslan and Law (2011) propose a model for measuring students' readiness for e-learning comprising of people, technology, content, and institution. Stability, software, and hardware are technological factors in readiness. Keramati *et al.* (2011) propose a conceptual model of factors influencing e-learning outcomes. Technical, as one of the readiness factors, and IT, as one of the e-learning factors, affect interaction, which possibly drives e-learning outcomes. Omoda-Onyait and Lubega (2011) introduce a model for e-learning institutional readiness assessment. Technology is one of the dimensions specified in the model. Alshaher (2013) proposes a model for e-learning system readiness assessment (ELSRA) consisting of strategy, structure, systems, style/ culture, staff, skills, and shared values. Systems comprise technology, content, platform support, and documentation. Technology and online instruction facilitate learning by enabling real-life contexts to engage students in solving complex problems and enriching learning experiences more than what can be done in F2F environments (Smart & Cappel, 2006). Technology readiness significantly influences technology adoption (Damerji & Salimi, 2021).

The successful transition to online learning is affected by technology usefulness (Aguilera-Hermida, 2020). The sudden shift from traditional to online classrooms during the COVID-19 resulted in different experiences for students, particularly those in underdeveloped areas, who do not have high-speed or reliable Internet services (Adnan & Anwar, 2020). Similar to the findings in the literature before the COVID-19, technical problems, e.g., Internet access, poor Internet speed, and difficulties in downloading and installing the online class applications, are reported as challenges faced in online lectures by more than 50% of students during the COVID-19 pandemic in the study of Akuratiya and Meddage (2020). The constraint of online learning is the availability of Internet services. Some students use cellular, and some of them use WiFi services at home (Laili & Nashir, 2021). In the study of Bączek *et al.* (2021), most students who have never experienced any form of e-learning before the pandemic mention technical issues as the second major disadvantage of e-learning. E-learning requires a reliable Internet connection and the necessary hardware and software. Both learners and educators have to be familiar with the equipment and should receive technical support and guidance from the IT department before and during online learning. Poor interaction between learners and lecturers can impede self-learning in online settings. Online classes have limitations, including problems with Internet access, poor Internet connection quality, and insufficient digital skills of respondents Chisadza *et al.* (2021) suggest that the improvement of digital infrastructure and reducing the Internet access cost are necessary for mitigating the impact of the COVID-19 on educational outcomes. Their findings reveal that students' performance in online settings positively correlates with better Internet access. The major challenges faced by higher education students in Pakistan are lack of access to Internet facilities and ineffective technology. Lack of resources in academic institutions, such as insufficient access, Internet availability, and the latest technology, influence organizational responsiveness and students' capacity to engage in digital learning (Adnan & Anwar, 2020). Accessibility means access to the Internet, a reliable device, and technical support. The accessibility is highly related to students' online learning during the COVID-19. Moving from educational institutions to their homes changes technological tools and support in their learning. The effective use of technology allows students and lecturers to engage and collaborate. Online or distance education implies that interactions between students and teachers are mediated by technology. Hence, the design of learning environments can have a considerable impact on learning outcomes (Aguilera-Hermida, 2020). Although students perceive online lectures are good enough, they are less satisfied with the implementation because of the support facilities like Internet quota. The implementation of online learning is not optimal or ineffective, particularly in rural areas, which the use of technology is limited. Students in rural areas often get unstable connections. They face problems if online learning cost more expensive than F2F learning. Learning through video conferences consumes a lot of the Internet data quota, compared to online discussions through Whatsapp. Bad internet access and poor signals for students in rural areas also cause miscommunication between students and lecturers. In conclusion, crucial factors in online learning are the availability of supporting tools and the stability of Internet access. Besides, online learning must be easy to access, attractive, and motivated (Laili & Nashir, 2021).

### **Online Experience, Gender, and Student Learning Styles and Online Preferences**

#### **Past experience**

Students' demographic characteristics, e.g., the previous experience, could impact their attitudes and perceptions of online education (Hilton *et al.*, 2020). The prior online experience is one of the variables relating to students' self-efficacy in online learning environments (Shen *et al.*, 2013). Kaushik and Agrawal (2021) state that the readiness for online learning of students having prior experience with digital learning tools may differ from students having no prior experience with digital technologies. Students who have no experience with online learning may think that online delivery mode is not desirable. Hilton *et al.* (2020) believe that the more online courses taken by students, the more positive perceptions of online learning students have. Experience during the COVID-19 is an emergent response to the global crisis and may not depict normal online learning instruction



(Aguilera-Hermida, 2020). Past studies point out that students pay much more attention to their overall educational experience than the individual aspects of a course (Dziuban & Moskal, 2011). If students' and professors' learning experiences are positive, they may increase online learning adoption. Conversely, they may avoid online learning if their experiences are negative (Aguilera-Hermida, 2020). It is evident that the use and experience of technology could increase its acceptance (Kaushik & Agrawal, 2021). If individuals have limited experience with basic computers, they may not adapt to new technologies easily and may suffer if such technologies are integrated into academics (Caison *et al.*, 2008). When individuals use technology constantly or have experiences with technology, they perceive ease of use and usefulness of technology even though they feel discomfort (Yusuf *et al.*, 2021). Individuals with online learning experience have more self-efficacy ratings than those without online learning experience (Zimmerman & Kulikowich, 2016). Shen *et al.* (2013) mention that instructors could find slow participation or failure to submit assignments in students who have less experience online. Past research shows that longer computer experiences of students significantly impact their achievement scores (Ho, 2009).

Many students in the study of Lopes (2007) think that e-learning features positively contribute to the teaching or learning experience. Liu (2010) believes that students are more satisfied with e-learning than F2F instructions in terms of teachers' characteristics, learning materials, and learning environments. On the contrary, in the study of Bali and Liu (2018), students rate F2F learning greater than online learning in all dimensions, showing their satisfaction and good experience in F2F learning. In the study of Nasution *et al.* (2021), almost all students choose offline learning rather than online. Qualitative data from the study of Aguilera-Hermida (2020) indicate that many students have an unpleasant experience in the online learning transition. They also express negative attitudes toward online learning. The study of Besser *et al.* (2020) compares two learning experiences. Participants reported significantly more stress, isolation, and negative mood in synchronous online learning than their experience in previous F2F learning. They also show significantly lower levels of positive mood, relatedness, concentration, motivation, and performance in online learning compared to traditional learning. Students enrolled in an online course in the study of Kuong (2015) enjoy learning experiences. All of them agree that online education is convenient, flexible, and enables more reflection time on learning materials. Even though their learning experiences are satisfied, not all of them will take another online course. Some of them choose F2F courses due to personal interactions and immediate feedback from instructors and fellow students. The majority of students who join an online Intensive English class in the study of Laili and Nashir (2021) agree or strongly agree that online learning simplifies the student-lecturer interaction, making them easier to convey opinions than F2F, making them more discipline in collecting the task. However, miscommunication with friends and lecturers occurs during their online learning, showing both positive and negative experiences in online learning. Young learners are increasingly entering schools with technology-specific experiences, which could affect learning outcomes (Warden *et al.*, 2020). Past research indicates that undergraduate students have more online experience, take more online courses, and tend to take online courses in the future more than graduate students (Shen *et al.*, 2013). Undergraduate students in the study of Keller and Karau (2013) tend to prefer online learning over F2F learning, but graduate students prefer traditional courses because of their experience in undergraduate degrees and less familiarity with online courses. People with little experience also expect digital technologies to echo conventional pedagogies (Warden *et al.*, 2020).

### **Gender**

Males and females are different in their technological expectations and take different roles in online learning environments. Hence, the gender factor is needed to be further investigated (Lu *et al.*, 2003). Student demographics in terms of gender could affect their attitudes and perceptions about online education (Hilton *et al.*, 2020). There is a significant interaction between topic interest and gender (Shakourzadeh & Izadpanah, 2020). Gender may also affect the impact of attendance on students' performance (Cortright *et al.*, 2011). The literature points out that females tend to be more persistent in online education than males (Lu *et al.*, 2003). Past research indicates gender influencing students' self-efficacy in online learning. Female students have higher self-efficacy compared to males (Shen *et al.*, 2013). The conventional wisdom or belief that grades are linked to class attendance appears to be corrected for female students only (Cortright *et al.*, 2011). Past research states that there is a strong body of evidence regarding women being inherently more successful in online learning environments than men. The majority of male students prefer F2F courses, whereas the majority of females prefer online courses. Female students also have stronger intrinsic motivations to take online courses than male students. Some studies also point out that females post more messages in online classroom discussions than males (Hilton *et al.*, 2020). Findings in the study of Caison *et al.* (2008) indicate that male medical students have greater overall technology readiness attitudes than female medical students. Thus, females with lower technological readiness than males may face more difficulty in adapting to the introduction of advanced technologies. There are some cases that girls report the use of technology as uninteresting but lectures as interesting, while some boys view lectures as uninteresting (Swarat *et al.*, 2012). Findings in the study of Alsaaty *et al.* (2016) show distinct differences between males' and females' perceptions. Many male students (48.4%) think online courses are easier to complete than F2F courses, but only a few females (32.9%) agree. However, many females (41.2%) believe online learning is superior to F2F compared to 19.4% of male respondents. Some studies found no differences in the Internet or online communication self-efficacy between genders (Shen *et al.*, 2013). Gender does not significantly affect students' choice of learning model in the study of Liu (2010). Gender does not impact students' evaluation of whether the learning objectives of a course can be better achieved in online or F2F sessions (Paechter & Maier, 2010). Hilton *et al.* (2020) specify that previous studies have shown mixed findings with regards to gender differences and online learning. Analysis by gender in their study also does not reveal any significant differences.

### **Student learning styles**

Researchers have found that the difference among learners who succeed and fail in online learning is based on personal characteristics (Murdock *et al.*, 2012). Personality variables significantly affect the predictions of synchronous online learning experience over the F2F learning experience, while adaptability significantly impacts personality variables (Besser *et al.*, 2020). Becoming an online learner requires a unique characteristic (Cleveland-Innes & Campbell, 2012). Literature indicates student characteristics such as proactive personality and learning goal orientation influence the outcomes of e-learning (Ho, 2009). Student efforts are rated significantly higher in online courses than in F2F courses. These ratings could be impacted by other factors, such as student characteristics. The efforts should be made to examine students' learning needs and to understand learners' characteristics. The analysis of students' traits and learning styles could help to determine their requirements and learning preferences (Tratnik *et al.*, 2019). There are several characteristics of students, such as learning preference, which could be a reason that students choose an online course over a F2F course (Young & Duncan, 2014). Different learners have different cognitive processes and learning style preferences. An individual's learning style influences how information is processed and his/ her learning efficiency and effectiveness. Three learning preferences are dependent learners, collaborative learners, and autonomous learners (Bencheva, 2010). Various teaching modes and technologies may benefit some students who are independent thinkers, have different learning styles, and are self-motivated to work outside classrooms (Smith *et al.*, 2015). Literature on learning styles suggests that field-independent students are more flexible, less gregarious, and do best in an impersonal learning environment of online education, but the absence of personal contacts and clarifying discussions in the environment lead to learning difficulties for field-dependent students who are more socially oriented and extrinsically motivated (Lu *et al.*, 2003). Learning style preferences affect class attendance (Cortright *et al.*, 2011). In online learning, time flexibility could be a limitation for students who have less self-discipline (Bączę *et al.*, 2021). Keller and Karau (2013) believe that individuals with high conscientiousness to be responsible for their learning develop more positive perceptions of online learning. Students who feel transitioning to online is difficult and prefer self-study i.e., reading through class slides and notes more than assisted study i.e., joining live lectures or watching recorded lectures gain lower academic performance (Chisadza *et al.*, 2021). Student performances in terms of average grades between pre-lockdown and post-lockdown are three points lower for those who prefer self-study and are two points lower for those who think the transition to online learning is difficult (Chisadza *et al.*, 2021). Aragon, Johnson, and Shaik (2002) indicate that online students are reflective by watching and doing and learning by thinking more than F2F students. F2F students also greater use learning by doing in comparison to their online counterparts. On the contrary, a past study examines the effects of learning styles on student achievement in technical writing classes of undergraduate students. It found no effect of learning styles on student achievement. Another study exploring how different learning styles function in web-based courses. The results show that learning styles do not impact web-based learning achievement (Lu *et al.*, 2003). There are also no statistically significant differences in the WebCT MIS class achievement scores among online and graduate students when classified by their learning styles in the study of Lu *et al.* (2003). Kwak *et al.* (2019) suggest that there is no one-size-fits-all delivery method to maximize learning outcomes, but universities should enable multiple delivery methods to facilitate various learning needs of students.

## Hypotheses

According to the background literature review, the following hypotheses are proposed:

- H1: There will be a significant increase in the ratings of cognitive process dimension (a) remember, b) understand, c) apply, d) analyze, e) evaluate, and f) create) according to the revised Bloom's taxonomy (before vs. after attending an offline/ face-to-face class)*
- H2: There will be a significant increase in the ratings of cognitive process dimension (a) remember, b) understand, c) apply, d) analyze, e) evaluate, and f) create) according to the revised Bloom's taxonomy (before vs. after attending an online class)*
- H3: There will be a significant increase in the ratings of topic interests (before vs. after attending an offline/ face-to-face class)*
- H4: There will be a significant increase in the ratings of topic interests (before vs. after attending an online class)*
- H5: There will be a significant increase in the ratings of class attendance intention (before vs. after attending an offline/ face-to-face class)*
- H6: There will be a significant increase in the ratings of class attendance intention (before vs. after attending an online class)*
- H7: There is a significant difference in the ratings of cognitive process dimension (a) remember, b) understand, c) apply, d) analyze, e) evaluate, and f) create) according to the revised Bloom's taxonomy between students experiencing offline and online learning after attending the class.*
- H8: There is a significant difference in the ratings of topic interests between students experiencing offline and online learning after attending the class.*
- H9: There is a significant difference in the ratings of class attendance intention between students experiencing offline and online learning after attending the class.*
- H10: There is a significant difference in students' performance in terms of assignment scores between students experiencing offline and online learning after attending the class.*
- H11: There is a significant difference in the ratings of technology readiness (a) place, b) equipment, c) software, d) Internet) between students experiencing offline and online learning after attending the class.*
- H12: In offline learning, there is a significant difference in the ratings of cognitive process dimension (a) remember, b) understand, c) apply, d) analyze, e) evaluate, and f) create) according to the revised Bloom's taxonomy between dependent learners and others (collaborative and independent learners) after attending the class.*
- H13: In offline learning, there is a significant difference in the ratings of topic interests between dependent learners and others (collaborative and independent learners) after attending the class.*

- H14: In offline learning, there is a significant difference in the ratings of class attendance intention between dependent learners and others (collaborative and independent learners) after attending the class.
- H15: In offline learning, there is a significant difference in students' performance in terms of assignment scores between dependent learners and others (collaborative and independent learners) after attending the class.
- H16: In online learning, there is a significant difference in the ratings of cognitive process dimension (a) remember, b) understand, c) apply, d) analyze, e) evaluate, and f) create) according to the revised Bloom's taxonomy between dependent learners and others (collaborative and independent learners) after attending the class.
- H17: In online learning, there is a significant difference in the ratings of topic interests between dependent learners and others (collaborative and independent learners) after attending the class.
- H18: In online learning, there is a significant difference in the ratings of class attendance intention between dependent learners and others (collaborative and independent learners) after attending the class.
- H19: In online learning, there is a significant difference in students' performance in terms of assignment scores between dependent learners and others (collaborative and independent learners) after attending the class.
- H20: There is a difference between students attending online classes and students attending offline classes in their online preference.
- H21: There is a difference between male students and female students in their online preference.
- H22: There is a difference between dependent learners and others (collaborative and independent learners) in their online preference.
- H23: In offline learning, there is a difference between the level of perceived technology readiness (a) place, b) equipment, c) software, d) Internet) in online preference.
- H24: In online learning, there is a difference between the level of perceived technology readiness (a) place, b) equipment, c) software, d) Internet) in online preference.

## METHODS

The purpose of this research is to explore the perceptions regarding learning outcomes, technology readiness, experience, learning styles, and online preferences of undergraduate students enrolling in a business course (the Digital Technology for Business course) and the linkage among these variables in both online and F2F environments. This work also provides an in-depth understanding of students' opinions in online courses. This study was carried out in a business school at a university in Thailand. Because of the COVID-19 epidemic, as same as other areas in the world such as Sri Lanka (Akuratiya & Meddage, 2020) and Poland (Bączek *et al.*, 2021), the school unexpectedly changed from F2F to online learning in the middle of the 2nd semester in 2019 academic year. However, when the situation was better, the faculty changed the learning mode backed to F2F teaching in the 1st semester of the 2020 academic year. This change is an opportunity for this study to compare online and F2F delivery modes and provides a guideline for teaching and learning after the COVID-19.

The sample of this study was 44 of 46 registered students who participated in online or F2F sessions, which were a part of the Digital Technology for Business course. This course was one of the core courses for business students. Systematic sampling was applied to select students into online or offline classes. All students participating in the survey attended online or F2F sessions depending on their running numbers, which were sorted by their student id. Students with odd numbers were assigned to attend synchronous F2F sessions, whereas students having even numbers were assigned to self-study via asynchronous online sessions. According to the strict instruction, students could attend only one delivery method, but not both. Students in F2F sessions were studied on campus in the computer room. They also saw online clip production for online students. Professional video recorded production was conducted with assistance from the technical staff of the school. A high-end video camera and Zoom application were applied to record both Window screens and a lecturer's action. The recorded video classes for online students were posted on the Google classroom immediately, within one day after the offline sessions finished. Files and documents for practices were given to offline students in the computer room, whereas files and documents for online students were posted on Google classroom. Google classroom was applied for all students, but Excel files, documents, and recorded clips are for online students only. In conclusion, all students experienced online or offline delivery modes before answering the survey.

For the Digital Technology for Business course, MS Excel basics were chosen for the comparison because they were simple skill-based topics. The topics about using tools were may well-suited to explore in an online format since they require learners to hands-on practice. For using MS Excel, a lecturer could show how to use the tool and give students time to follow by themselves no matter what delivery mode they were in. Besides, other topics in the course tended to require more interactions from students. There were three sessions for using MS Excel, which required three hours each. Three sessions were taught in three consecutive weeks. The first two sessions were about the use of MS Excel for fundamental analysis. Their topics included setting up a workbook, manipulating workbooks and worksheets, working with data and tables, performing calculations on formulas and cell references, using basic functions such as count, sum, max, min, average, if, creating charts and graphics, formatting worksheet, cells, and defining styles, and printing worksheets and charts. After finishing all content, both online and offline, students were ordered to pair and apply Excel basics to their real-life situations. A student could only pair with another student who learned Excel basics in the same delivery method. Each pair of students was free to choose input data, design which functions or formulas to be used, and select the proper graphs or charts to present their data. The third session was for Q&A and the assignment presentation.

After experiencing MS Excel basics teaching in any mode, students were immediately asked to fill an online questionnaire to reflect their perceptions and opinions in their learning. A retrospective pre-test/post-test design was utilized to collect data regarding learning outcomes, i.e., the cognitive process of RBT, topic interest, and class attendance intention. In the retrospective design, participants completed a retrospective pre-rating of their perceptions after the intervention and at the same time as post-rating. Several studies supported the validity of retrospective ratings on intervention-related criteria (Archibald *et al.*, 2014). The questions for learning outcomes were adapted from past research, theory, and literature studies (Forehand, 2005; Tan & Hew, 2016; Thongmak, 2019). Technology readiness was extracted from previous studies (Akaslan & Law, 2011; Aydin & Tasci, 2005; Darab & Montazer, 2011; Mosa *et al.*, 2016). Student learning styles (dependent, collaborative, and independent) were developed from the study of Charkins *et al.* (1985). The frequency of reviewing materials in general, the top six of twelve aspects in learning that participants were giving importance developed from pros and cons of online/ offline learning (Bencheva, 2010), learning preference, opinions about suitable courses for online learning, and additional comments and suggestions for online learning successful, were also collected. The assignment scores represented students' performance in this study while attending online or F2F classes were used as an experience variable.

Because the sample size was small and the distribution of the outcome was unknown and could not be assumed to be approximately normally distributed (Sullivan, n.d.), this study applied nonparametric tests. Descriptive statistics were applied to explore demographic data. The nonparametric test equivalent to the dependent t-test was employed to evaluate hypotheses: H1 to H6. the nonparametric alternative to the independent t-test was also applied to test hypotheses: H7 to H19. The chi-square test for independence was used to assess hypotheses: H20 to H24. Quantitative content analysis was applied to extract opinions about suitable courses for online learning and suggestions for online learning success using a guideline from the study of Erlingsson and Brysiewicz (2017).

## RESULTS AND DISCUSSION

Of 44 participants, there were 37 female and 7 male students, conforming to the proportion of females over males in Thailand. Eleven of them were sophomore students, while the rest were freshmen. The age of students was ranged from 18 to 21, with an average age of 19. Due to the problems of pairing to do the assignment, there were 24 students who studied offline and 20 students who attended online classes. For the average frequency of reviewing materials in general, 15 participants reviewed lessons averagely 4 times per week; 13 participants reviewed materials approximately 2-3 times per month; 11 students reviewed content 4 times per month; 3 students studied materials less than 1 time per month. The average assignment score of all students was 4.7 from 5. There were 32 students who preferred offline learning, whereas 12 students chose online methods over offline. Most of the students choosing offline courses were consistent with the more students satisfied with traditional courses than online courses in the study of Young and Duncan (2014), the study of Bali and Liu (2018), and the study of Tratnik *et al.* (2019). Students also preferred F2F over online learning in the study of Aguilera-Hermida (2020), the study of Schlenz *et al.* (2020), the study of Valentino *et al.* (2021), and the study of Nasution *et al.* (2021). For the aspects in learning that all participants gave importance, the top six things that all students placed importance on were 'learning that can be repeated as many times as they want', 'a communication channel to contact teachers easily and immediately', 'ease of searching for information while studying as soon as they have questions', 'two-way communication with teachers to ask and answer questions', and 'flexible learning to learn from anywhere, at any time'.

Considering only students who chose offline learning, they paid attention to the same aspects. However, they gave precedence to the aspect 'flexible learning to learn from anywhere, at any time' as important as another two aspects, which were 'studying in a framed environment to increase concentration, such as a scheduled classroom' and 'learning that interacts and relationships are developed face-to-face.' For students who preferred online learning, most of them also chose the same factors as all students. Nevertheless, they expressed concern to the aspect 'flexible learning to learn from anywhere, at any time' as important as the aspect 'having a system or program to help manage classes and arrange content, to share resources in learning conveniently'. For student learning styles, dependent learners are defined as learners who generally prefer teacher-directed and courses with explicit reading assignments, explicit class assignments, a predetermined number of tests. Collaborative learners are learners who prefer group projects selective assignments, such as case studies. Independent learners are those who like to influence the content and structure of the course. They also like to have some roles in the determination of materials, the number of tests given, and so forth (Charkins *et al.*, 1985). Of all students, there were 31 students classified themselves as dependent learners, 9 students believed that they were collaborative learners, and 4 students chose their learning styles as independent learners. Therefore, this study classified student learning styles as dependent and non-dependent learners in further analyses.

### Overall Learning Outcomes

For pre- and post-learning outcomes in F2F sessions, Wilcoxon Signed-ranks tests indicated a significant increase in students' remembering Excel basics after attending an offline class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 3.0$ ),  $Z = -4.295$ ,  $p = .000$ , a significant increase in students' understanding Excel basics after attending an offline class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 2.5$ ),  $Z = -4.340$ ,  $p = .000$ , a significant increase in students' applying Excel basics after attending an offline class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 2.0$ ),  $Z = -4.336$ ,  $p = .000$ , a significant increase in students' analyzing Excel basics after attending an offline class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 2.0$ ),  $Z = -4.331$ ,  $p = .000$ , a significant increase in students' evaluating Excel basics after attending an offline class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 2.0$ ),  $Z = -4.320$ ,  $p = .000$ , and a significant increase in students' creating by Excel basics after attending an offline class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 3.0$ ),  $Z = -4.134$ ,  $p = .000$ .

= .000. A Wilcoxon Signed-ranks tests also revealed that students' topic interests were greater after students attending an offline class ( $Mdn = 5.0$ ) than before they attended the class ( $Mdn = 3.0$ ),  $Z = -3.848$ ,  $p = .000$  and their class attendance intention were greater after students attending an offline class ( $Mdn = 5.0$ ) than before they attended the class ( $Mdn = 4.0$ ),  $Z = -3.810$ ,  $p = .000$ .

For pre- and post-learning outcomes in online sessions, Wilcoxon Signed-ranks tests indicated a significant increase in students' remembering Excel basics after attending an online class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 3.0$ ),  $Z = -3.867$ ,  $p = .000$ , a significant increase in understanding Excel basics after attending an online class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 3.0$ ),  $Z = -4.011$ ,  $p = .000$ , a significant increase in applying Excel basics after attending an online class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 2.0$ ),  $Z = -3.960$ ,  $p = .000$ , a significant increase in analyzing Excel basics after attending an online class ( $Mdn = 4.0$ ) compared to before attending the class ( $Mdn = 2.0$ ),  $Z = -3.994$ ,  $p = .000$ , a significant increase in evaluating Excel basics after attending an online class ( $Mdn = 4.0$ ) compared to before attending the class ( $Mdn = 2.0$ ),  $Z = -3.968$ ,  $p = .000$ , and a significant increase in creating by Excel basics after attending an online class ( $Mdn = 5.0$ ) compared to before attending the class ( $Mdn = 2.0$ ),  $Z = -3.952$ ,  $p = .000$ .

A Wilcoxon Signed-ranks tests also revealed that topic interests were greater after students attending an online class ( $Mdn = 5.0$ ) than before they attended the class ( $Mdn = 3.0$ ),  $Z = -3.861$ ,  $p = .000$ . However, attending an online class did not change class attendance intention significantly ( $Z = -1.650$ ,  $p = .099$ ). Therefore, there is enough evidence to support hypotheses:  $H1a - H1f$ ,  $H2a - H2f$ ,  $H3$ ,  $H4$ , and  $H5$ , but not  $H6$ .

The significant improvements in learning outcomes after online or offline learning accorded with the significant increase of students' knowledge and research self-efficacy between pretest and posttest in the study of Brown and Park (2016) and the positive effects of webcasts on students' learning experiences and performance in the study of Traphagan *et al.* (2010). The increase of topic interest after attending online sessions was supported by the study of Swarat *et al.* (2012) mentioned that the use of technology could effectively enhance students' interest and motivation.

### **Online Learning versus Offline Learning (Learning Outcomes and Technology Readiness)**

#### **Learning outcomes**

For pre-learning outcomes between online and offline sessions, from the data, it can be concluded that remembering ( $U = 219.0$ ,  $p = .609$ ), understanding ( $U = 238.0$ ,  $p = .961$ ), applying ( $U = 221.5$ ,  $p = .653$ ), analyzing ( $U = 225.0$ ,  $p = .713$ ), evaluating ( $U = 219.0$ ,  $p = .608$ ), creating ( $U = 211.0$ ,  $p = .483$ ) Excel basics after attending an online class were not significantly different between students experiencing offline and online learning before attending the class. In addition, topic interest ( $U = 231.5$ ,  $p = .837$ ) and class attendance intention ( $U = 194.0$ ,  $p = .262$ ) were not significantly different between students experiencing offline and online learning before attending the class.

For post-learning outcomes between online and offline sessions, a Mann-Whitney test indicated that evaluating Excel basics was significantly higher for offline learning ( $Mdn = 5.0$ ) than for online learning ( $Mdn = 4.0$ ),  $U = 147.5$ ,  $p = .022$ , class attendance intention was significantly higher for offline learning ( $Mdn = 5.0$ ) than for online learning ( $Mdn = 4.0$ ),  $U = 110.0$ ,  $p = .001$ . However, there were no significant differences in remembering ( $U = 195.5$ ,  $p = .251$ ), understanding ( $U = 180.5$ ,  $p = .138$ ), applying ( $U = 239.5$ ,  $p = .990$ ), analyzing ( $U = 170.5$ ,  $p = .080$ ), and creating ( $U = 196.5$ ,  $p = .275$ ) Excel basics, topic interests ( $U = 198.0$ ,  $p = .286$ ), and assignment scores ( $U = 200.0$ ,  $p = .268$ ) between students experiencing offline and online learning after attending the class. Hence, there is enough evidence to support hypotheses:  $H7e$  and  $H9$ .

The significant differences in the cognitive process of RBT (evaluating) and class attendance intention were supported by a significant difference between online and offline groups in terms of perceived learning efficiency in the study of Smith *et al.* (2015), higher learning outcomes for skill-based courses in F2F sessions than online sessions in the study of Callister and Love (2016), the larger positive changes in students' self-efficacy of students in F2F than in other environments in the study of Thai *et al.* (2020). The insignificant differences in other perceived learning outcomes could be explained by the study of Dziuban and Moskal (2011), stating that the course modality did not impact the students' evaluation of course experiences, the study of Anggrawan and Jihadil (2018) concluding that no differences learning impacts between online and F2F learning, the study of Cleveland-Innes and Campbell (2012) showing no difference effective learning outcomes among two modes, and the study of Brown and Park (2016) presenting no differences in self-reported knowledge and self-efficacy of online and F2F students. The insignificant difference in students' performance between students experiencing offline and online learning after attending the class yielded the contrary results from the study of Liu (2010), indicating the higher learning effectiveness in online learning than F2F learning, and the study of Bączek *et al.* (2021) and the study of Valentino *et al.* (2021) pointing out that online classes were less effective than traditional classes. However, the findings tallied with the study of Lu *et al.* (2003) and the study of McFarland and Hamilton (2005) showing the insignificant difference in students' course grades between online and offline groups, the study of Murdock *et al.* (2012) revealing insignificant differences between the mean of GRE scores of online versus offline students, the study of Schwartz (2012) pointing out that online accounting classes did not become less effective than a traditional classroom, the study of Biel and Brame (2016) reviewed small scale studies and found that six of eight studies showed no significant difference between F2F and online sections, the study of Smith *et al.* (2015) showing no significant differences in students' performance in online and offline instructions, and the study of Akuratiya and Meddage (2020) showing that students perceived online learning as effective as F2F learning. The insignificant increase of class attendance intention after participating in online learning harmonized with the study of Stark (2019) indicating lower levels of motivation in online students compared

to F2F students and the study of Laili and Nashir (2021) indicating that online learning was boring, but differed from the study of Schlenz *et al.* (2020) specifying that online platforms motivated students to learn.

### **Technology readiness**

For technology readiness between online and offline sessions, Perceived technology readiness in terms of place in the offline group ( $Mdn = 6.0$ ) was statistically significantly greater than the perception of students in the online group ( $Mdn = 5.0$ ),  $U = 88.0$ ,  $p = .000$ . Perceived technology readiness in terms of equipment in the offline group ( $Mdn = 6.0$ ) was statistically significantly higher than the perception of students in the online group ( $Mdn = 5.0$ ),  $U = 105.0$ ,  $p = .000$ . Perceived technology readiness in terms of software in the offline group ( $Mdn = 6.0$ ) was statistically significantly more than the perception of students in the online group ( $Mdn = 5.0$ ),  $U = 102.0$ ,  $p = .000$ . Nevertheless, there were no statistically significant differences in technology readiness in terms of the Internet between the two groups ( $U = 231.0$ ,  $p = .819$ ). Thus, there is enough evidence to support hypotheses: H11a – H11c, but not H11d.

The significant differences in technology readiness (place, equipment, and software) of online and offline students were supported by the study of Laili and Nashir (2021), indicating the importance of the availability of supporting tools. Technical problems with IT equipment were also one of the disadvantages raised by students in the study of Bączek *et al.* (2021).

### **Dependent Learners versus Others (Learning Outcomes)**

For offline students' post-learning outcomes between dependent and non-dependent learners, A Mann-Whitney test showed no statistically differences in remembering ( $U = 58.5$ ,  $p = .599$ ), understanding ( $U = 44.0$ ,  $p = .174$ ), applying ( $U = 45.0$ ,  $p = .194$ ), analyzing ( $U = 61.0$ ,  $p = .726$ ), evaluating ( $U = 45.5$ ,  $p = .194$ ), and creating ( $U = 41.5$ ,  $p = .123$ ) Excel basics, topic interests ( $U = 53.0$ ,  $p = .411$ ), class attendance intention ( $U = 61.0$ ,  $p = .726$ ), and assignment scores ( $U = 43.5$ ,  $p = .155$ ) between dependent learners and others (collaborative and independent learners) after attending the offline class. Therefore, there is not enough evidence to support hypotheses: H12 – H15.

For online students' post-learning outcomes between dependent and non-dependent learners, A Mann-Whitney test revealed no statistically differences in remembering ( $U = 27.5$ ,  $p = .682$ ), understanding ( $U = 13.5$ ,  $p = .080$ ), applying ( $U = 27.5$ ,  $p = .682$ ), analyzing ( $U = 12.0$ ,  $p = .064$ ), evaluating ( $U = 20.5$ ,  $p = .290$ ), and creating ( $U = 26.0$ ,  $p = .617$ ) Excel basics, topic interests ( $U = 12.5$ ,  $p = .064$ ), class attendance intention ( $U = 29.5$ ,  $p = .820$ ), and assignment scores ( $U = 32.0$ ,  $p = 1.000$ ) between dependent learners and other learner types after attending the online class. Hence, there is not enough evidence to support hypotheses: H16 – H19.

The insignificant relationships between student learning styles and learning outcomes showed the contrast results with the study of Besser *et al.* (2020), highlighting that personality traits were associated with reactions to online learning, but presented similar findings with the study of Lu *et al.* (2003), which showed no significant interaction between learning styles and instruction methods based upon course grades.

### **Online Experience, Gender, Student Learning Styles, Technology Readiness and Online Preference**

For online experience and learning preference, a chi-square test of independence was performed to examine the association between the online experience and online preference. The association between these variables was not significant,  $\chi^2(1) = 2.994$ ,  $p = .084$ . So, there is not enough evidence to support hypothesis H20.

For gender and online preference, a chi-square test of independence was conducted to test The association between gender and online preference. The association between these variables was not significant,  $\chi^2(1) = 1.019$ ,  $p = .313$ . Thus, hypothesis H21 is not supported.

For student learning styles and learning preference, a chi-square test of independence was employed to investigate the association between student learning styles (dependent learners and others) and online preference. The association between these variables was not significant,  $\chi^2(1) = 3.567$ ,  $p = .059$ . Thus, there is not enough evidence to support hypothesis H22.

For perceived technology readiness of offline students and learning preference, chi-square tests of independence were applied to investigate the associations between technical readiness of students in the offline class and online preference. The association between technical readiness (place) and online preference was insignificant,  $\chi^2(1) = .600$ ,  $p = .439$ . The association between technical readiness (equipment) and online preference was not significant,  $\chi^2(1) = .000$ ,  $p = 1.000$ . The association between technical readiness (software) and online preference was insignificant,  $\chi^2(2) = .240$ ,  $p = .887$ . The association between technical readiness (Internet) and online preference was insignificant,  $\chi^2(3) = 1.629$ ,  $p = .653$ . Hypotheses H23a – H23d are thus not supported.

For perceived technology readiness of online students and learning preference, chi-square tests of independence were utilized to explore the associations between the technical readiness of students in the online class and online preference. The relationship between technical readiness (place) and online preference was not significant,  $\chi^2(3) = .972$ ,  $p = .808$ . The relationship between technical readiness (equipment) and online preference was insignificant,  $\chi^2(4) = 9.444$ ,  $p = .051$ . The relationship between technical readiness (software) and online preference was insignificant,  $\chi^2(3) = 4.524$ ,  $p = .210$ . The relationship between

technical readiness (Internet) and online preference was not significant,  $\chi^2(3) = 2.011, p = .570$ . Therefore, hypotheses H24a – H24d are not supported.

The insignificant associations between variables and learning preferences could be explained by the benefits of both online and offline learning according to the study of Paechter and Maier (2010), the insignificant differences in learning preferences among the level of students in the study of Bali and Liu (2018). An insignificant effect of gender on online preferences tallied with the insignificant differences among gender in student perceptions of learning and course satisfaction of online courses in the study of Hilton *et al.* (2020). The insignificant association between past experience and learning preferences yielded contrasting results to the findings of Hilton *et al.* (2020), pointing out that the more online courses student had taken, the more positive perceptions of online learning they had, but presented similar results to past research mentioned in the study of (Bali & Liu, 2018) that there was no statistically difference in learning preferences between two learning modes. Besides, the study of (Aragon *et al.*, 2002) specified that neither F2F students nor online students varied significantly according to their experience. The relationship between student learning styles and learning preferences was insignificant as same as the study of Lu *et al.* (2003).

## Students' Opinions

### *Suitable courses for online learning*

Of 20 opinions from students in online sessions and 24 opinions from students in offline sessions, there were 70 condensed meaning units extracted from 44 comments. Figure 1 shows suggested subjects or courses that students believed to be suitable for online learning. Many comments mentioned lecture-based, theory-based, memorized-based classes, which were mostly no practices, no interactions, and no group assignments attached and easy to read, research, and self-study. These aspects were generally embedded in General education (Gen-ed) courses in the university, which were aimed at laying the public or general knowledge for all undergraduate students. For technology-related courses, the results were mixed. Some students thought that technology-related courses, the courses using software, or information systems (IS) courses were suitable, whereas some other students denied applying the online method to the courses that required more resources or equipment. Besides, few students commented that online learning was suited for non-technology courses. Some students also supported using online methods with the subjects requiring more time from students to review lessons or having a lot of content. Some opinions supported online learning for all courses. However, another opinion said that no courses were 100% suitable for online methods.

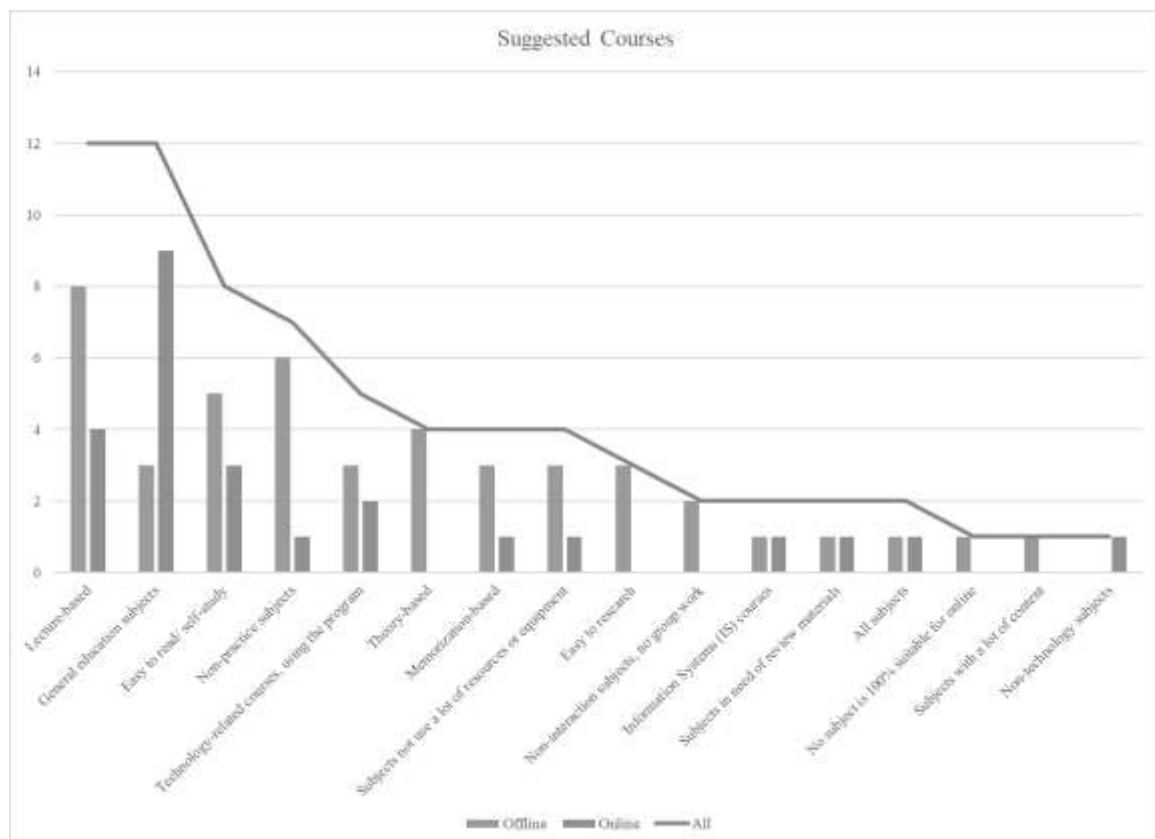


Figure 1: Suggested suitable course types from students.

### *Additional comments and suggestions for online learning successful*

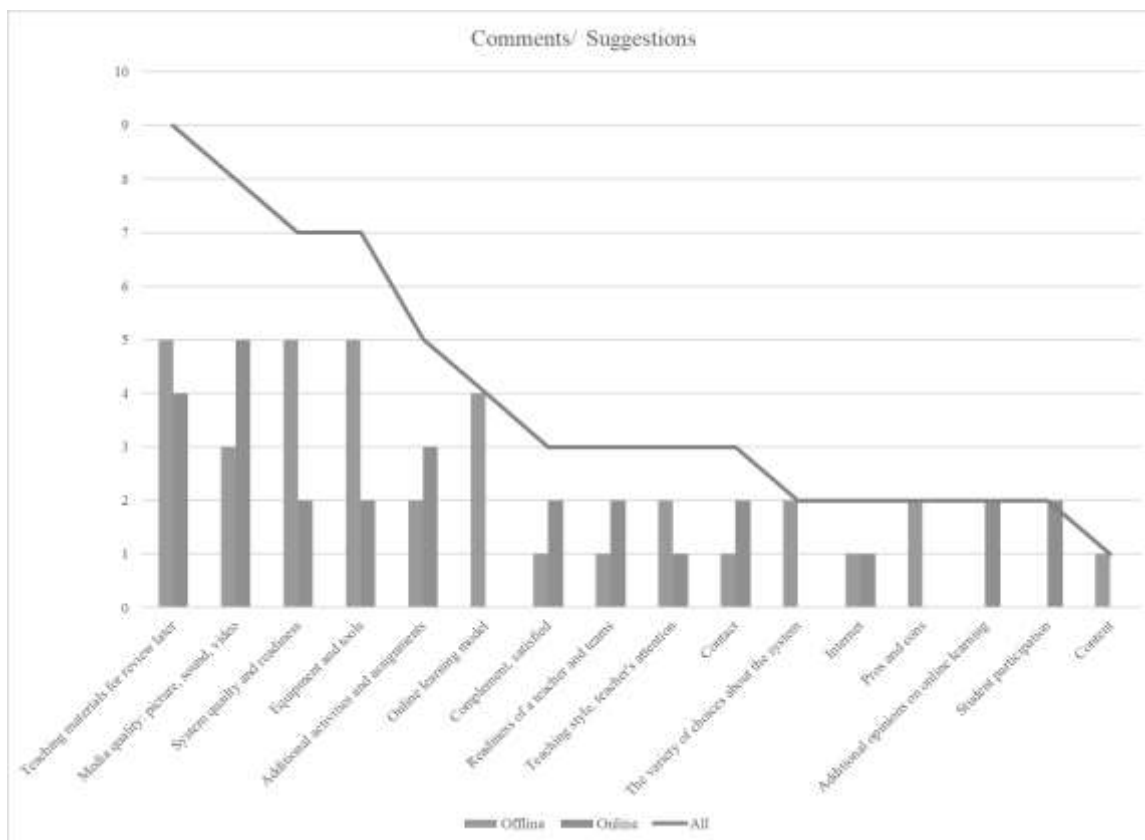


Figure 2: Students' comments and suggestions for the success of online learning.

Of 44 records of comments, 63 condense meaning units were extracted. Figure 2 shows the categories of suggestions for better online learning outcomes. First, both online and offline students mentioned teaching materials that should be provided online for students to review lessons. Students needed up-to-date recorded clips from both offline and online classes that were easy to access and repeatedly watch to review content or to view later in case they could not attend classes. Second, they needed good quality materials, no matter in sound, picture, or video formats. They worried about the quality of sound and pictures in video clips. Sounds as well as pictures in recorded clips should be clear and do not disappear. Third, students mentioned system quality and readiness. They needed fast, good, and stable systems or platforms such as Microsoft Stream and YouTube. Some students wanted more supports to facilitate their online learning. Some students suggested teachers post clips in the same place. Fourth, equipment and tools were mentioned. They needed equipment that was convenient and required more supports regarding equipment such as computers for using MS Excel. Fifth, they talked about additional activities and assignments. Students wanted more activities during online classes. Some students wanted more time, but few amount assignments. Some students did not want to spend too much time in front of screens due to concerns about health (eyes) problems. Sixth, students believed that online learning in synchronous mode was needed. They wanted interaction with instructors through an application such as Zoom rather than recorded videos. They wanted to ask questions immediately if they did not understand. They stated that they could not catch up on lessons like studying in classroom environments sometimes, for other comments and suggestions. Students gave compliments or felt satisfied with online learning. They believed that the readiness of lecturers, teams, and equipment was crucial. Some students needed teachers' attention to check whether they could catch up on lessons or not. Students wanted an online channel, which was easy to contact instructors and received quick responses. Some students needed a variety of learning choices. They wanted to choose delivery modes by themselves. Students wanted the faculty to facilitate their Internet connection. Some students believed that online learning had both advantages and disadvantages. Additional suggestions mentioned that online learning was suitable for not too complex or too difficult content as well as interesting content that convinced to focus easily. Some students wanted to participate or engage in the design of teaching and learning methods. Last, a student wanted recorded clips, which their content was completed.

Suggestions for better online learning conformed to the study of Bourzgui *et al.* (2020), describing that more than 50% of students had difficulty understanding materials online, thought interactive evaluation was not enough, believed that teaching could not be totally conducted online. Students' comments about easy access to online materials were also in line with the study of Akuratiya and Meddage (2020). The need for real-time interactions from instructors was in line with the need for real-time feedback from students in the study of Liu (2010), the significant higher communication in on-campus courses compared to online courses (Young & Duncan, 2014), the necessary of F2F learning for human interaction in the study of Julien and Dookwah (2020), the need of F2F interaction with instructors, fast responses by lecturers, facilitation by teachers, and classroom socialization in the study of Adnan and Anwar (2020), the study of Julien and Dookwah (2020), and the study of Nieuwoudt (2020). Efficient feedbacks and active interactions between teachers and students in e-learning were suggested to be enhanced in the study of Liu (2010). The study of Bali and Liu (2018) also revealed higher learning perception in terms of social presence and social



interaction in F2F over online learning. Providing various options and the availability of recorded classes to students for their learning was supported by the study of Nieuwoudt (2020) in terms of the flexibility of online learning for students to participate and interact online and to attend classes synchronously or asynchronously and the study of Akuratiya and Meddage (2020) supporting online learning as an option for future learning. Both pros and cons of online learning in students' viewpoints were supported by the study of Laili and Nashir (2021), confirming that students had positive and negative perceptions of online learning. The main advantages and disadvantages of online learning were also in line with the advantages and disadvantages mentioned in the study of Bączek *et al.* (2021). The needs for Internet support harmonized with the study of Chisadza *et al.* (2021) guiding that improving digital infrastructure and reducing the Internet access costs were necessary to mitigate the impact of the COVID-19 pandemic on educational outcomes and the study of Alsaaty *et al.* (2016) emphasizing that they encountered unreliable Internet connection during online learning. Students did not feel comfortable with online learning alone, conforming to the study of Schlenz *et al.* (2020). Additional activities or assignments suggested by students were consistent with the study of Nguyen *et al.* (2020), specifying the limitations of hands-on activities as a disadvantage of digital formats. The suggested courses and additional suggestions by students also accorded with the suggestions of Bourzgui *et al.* (2020) to improve course learning in terms of simplifying the course, doing some exercises, increasing hourly volume, and so on. The need for synchronous online learning from students differed from the study of Young and Duncan (2014), indicating that online students were more satisfied and benefited from asynchronous instructions.

### IMPLICATIONS

For theoretical implications, this study explores learning outcomes using different facets to investigate learning outcomes, i.e., the cognitive process dimensions of RBT, topic interest, class attendance intention together with student performance. These facets could be applied and expanded in future research to investigate learning outcomes in different delivery modes more than just online and offline learning, such as asynchronous online learning vs. synchronous online learning or flipped classroom vs. traditional F2F learning. Technology readiness is also explored in several dimensions. The comparisons between different delivery modes and student learning styles are conducted. Findings support the importance of learning environments but not learners' factors in terms of past experience, gender, and learning styles. This could guide researchers to explore deeply into learning methods and tools rather than learners themselves. Besides, learners' characteristics in classes are generally mixed, in which educators hard to control these factors.

For practical implications in the post-COVID world, instructors of the courses related to using basic tools can choose either online or offline methods to deliver the course content because both of them could enhance students' cognitive process dimensions in terms of remembering, understanding, applying, analyzing, evaluating, and creating and motivate their topic interest significantly. Both offline and online can increase all cognitive process dimensions for students. The research shows the difference in Evaluate category. Since the Evaluation facet needs students to check and critique. To maximize this performance, students need to perform with their classmates. Off-line class is where students can practice 'evaluating' much better than in an online class. There are advantages to both methodologies. For the synchronous F2F, students are allowed to interact with their instructors immediately once they encounter challenges to their cognitive process. In this fashion, students' cognitive processes will be enhanced in the classroom promptly. In addition, for learning through the recorded lesson, students are encouraged to repeat their views as frequently as they are willing to, particularly for difficult lessons or complicated Excel applications. Repetition of exposure to the recorded lesson will definitely enhance their cognitive process. Furthermore, asynchronous instruction provides flexibility for the students. Students are allowed to access digital materials in their demand manner. For this specific attribute, students may prepare their environments essential to their learning experience at the right time since they are aware of time and space appropriate to their learning process.

Although students' learning outcomes in terms of RBT cognitive process (evaluating content/ tool usage) and class attendance in offline classes are significantly higher than online students, other cognitive process dimensions, topic interest, and students' performance (assignment scores) do not significantly vary between groups. Therefore, educators could still effectively provide their courses online in addition to offline means. As a result, repetition of exposure to online lessons by in-class students may further improve their RBT cognitive process since they may engage this means after the off-line classes for their self-study for reviewing digital materials to enhance their understanding at any time. However, online sessions do not significantly improve students' class attendance intention as offline sessions do. Class attendance intentions of online students are also significantly lower than their offline counterparts. Most students also prefer offline classes rather than online. Since most of the students declare themselves as dependent learners, they tend to socially interact with others and seek assistance from their classmates. Besides, they also rate technology readiness, i.e., place, equipment, and software in on-campus classes significantly greater than in online classes. Therefore, if lecturers expect more class attendance in the fundamental tool courses, they should choose offline channels over online when the pandemic situation becomes better. Nevertheless, if universities or institutions aim at changing delivery methods to online, they should provide these technologies for students in need, for instance, letting students borrow computers and equipment and providing legitimate software in educational/ student versions. Skipping some online classes is possibly caused by indiscipline. Instructors may design a mechanism to manage students to induct disciplinary action for the online classes. Rewards like extra scores for attending all online classes or penalties like canceling the right to take a final exam if they skip a certain number of classes may be adopted.

For the demographic or background factors of students, e.g., their experience, gender, and learning styles. Since student demographics or backgrounds in classrooms are generally quite mixed and these factors do not associate with both students'

learning outcomes and preferences. Thus, educators could keep their focus on the design of content for each topic, in-class or online activities, and the improvement of students' technology readiness instead. Moreover, according to students' suggestions and comments, universities could apply the online learning format to lecture-based or general education classes that are quite easy for students to study by themselves. To make online courses better, universities should provide high-quality online materials and media for students to review, ensure the readiness of system, equipment, and tools, design more activities or assignments to support their engagement and interactions with instructors, and let them choose which delivery methods that they want if possible. For example, after online class, instructors may regularly set up the online round table where students may bring questions and fruitful discussion with their classmates and instructors. Doing so ensures the enhancement of both knowledge and cognitive process dimensions.

### CONCLUSION AND FUTURE RESEARCH

The purposes of this paper are to investigate learning outcomes of offline and online learning, to compare the differences of learning outcomes and technology readiness among channels and students' learning styles, and to explore the associations between demographic factors and students' online preferences. The cognitive process dimensions in Revised Bloom's taxonomy, topic interest, class attendance intention, and students' performance are applied as learning outcomes. Data, collected from undergraduate students enrolling in MIS 101 class in business school and participating in MS Excel basics online or offline sessions, are utilized to fulfill the research's purposes. Non-parametric statistics equal to dependent and independent t-tests and the test for relationships between categorical variables are applied. The findings reveal the improvement in learning outcomes in both online and offline sessions, except for the class attendance intention of online students. Online channels are inferior to offline channels in evaluating MS Excel and class attendance intention of students as well as the readiness of studying places, equipment, and software. No differences in students' learning styles and no significant relations between student backgrounds and their preferences are found in this study. This study guides institutions and educators after the COVID-19 pandemic in choosing suitable courses and proper delivery methods and adjusting learning facilities, supports, and activities for better online learning outcomes.

For limitations, the sample size in this study is quite small. This work is also limited to a Microsoft Excel basics topic in a single university. Future research thus should replicate this study in other basic tool courses with more undergraduate students from business schools in various universities to extend the research results to other academic subjects. Besides, this study is based on the class of one instructor, so future research may expand to other sections in the same courses to compare the influence of lecturers. In addition, there are few samples in some groups, such as male students, non-dependent learning styles, and online preferences. Future works should collect more data from each group to validate the research results. Students do not voluntarily attend or have a chance to select sessions that match their preferences to form their past experiences. Future research should provide them options regarding delivery methods and explore whether this flexibility yields satisfying outcomes in terms of students' online preferences. This study uses a self-reported instrument based on respondents' perceptions. Only students' assignment scores are an objective measure. Future studies should investigate students' learning outcomes using more objective measures such as exam results, total participation/ engagement duration, actual class attendance counts, and so on. Comparing various delivery methods in detail, for instance, flipped classroom, offline learning, asynchronous online learning through recorded videos, synchronous online learning via live sessions, and mixing between offline and online learning in the same course, should also be deeply investigated. Adopting cross-sectional and longitudinal approaches in the future could also strengthen and generalize the comparisons between online and offline teaching. Although this research aims to suggest educators and institutions after the COVID-19 pandemic, researching in the middle of the pandemic could lead to different results from normal situations. Thus, future research should investigate students' perceptions and needs in the post-COVID time as well.

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