International Journal of Sustainable Development and Planning
Vol. 19, No. 1, January, 2024, pp. 209-219
Journal homepage: http://iieta.org/journals/ijsdp

Evaluating Students Acceptance of AI Chatbot to Enhance Virtual Collaborative Learning in Malaysia

Siti Norbaya Yahaya[1*], Mohd Hafiz Bakar[2], Juhaini Jabar[1], Mariam Miri Abdullah[1], Yashveeni Segaran[1]

[1] Faculty of Technology Management & Technopreneurship, Universiti Teknikal Malaysia, Melaka 76100, Malaysia
[2] Faculty of Business and Management, Universiti Teknologi MARA, Shah Alam 78000, Malaysia

Corresponding Author Email: sitinorbaya@utem.edu.my

https://doi.org/10.18280/ijsdp.190119

Received: 28 September 2023
Revised: 19 December 2023
Accepted: 30 December 2023
Available online: 31 January 2024

Keywords:
AI chatbot, collaborative learning, tertiary education, Malaysia

ABSTRACT

The pandemic COVID-19 has created a crisis in tertiary education sectors worldwide with significant impacts in Malaysia. It gives the challenge to students to cope with their new learning setup. However, with the help of technology such as AI chatbot, students can receive instant assistance in seeking and accessing information and limit the disruptions during online classes. Furthermore, the advancements in AI technology have led to improvements in natural language processing, enabling chatbots to engage in more natural interactions and provide better visual and audio representations. Therefore, the purpose of this study is to examine students' acceptance on the effectiveness of AI chatbots to solve virtual class issues. The factors involved in this process were identified and include perceived ease of use, perceived usefulness, and perceived security. A total of 376 responses were taken into this study, and the data were analyzed using SPSS software. The results indicated that higher education authorities should focus on the effectiveness of AI chatbot by its perceived ease of use which has the highest significance value followed by perceived usefulness and perceived security as the less significance value. Findings were proved by testing through Pearson correlation coefficient and multiple linear regression. University authorities should provide students with basic techniques for learning, as well as sufficient understanding and teaching about the system's capabilities, which can help students' confidence in and willingness to adopt the technology.

1. INTRODUCTION

This study concentrates on the effectiveness of AI chatbots to solve virtual class issues amidst the COVID-19 outbreak. In recent decades, with all the exponential growth of technology in Artificial Intelligence (AI) chatbot, the role of the chatbot has expanded from just conducting a normal task into a complex one. Since the beginning of technology eras, artificial intelligence has constantly prejudiced the way people occupy themselves every day into designing and gauging advanced technology that performs various functions like chatbots. Basically, the series of artificial intelligence has outgrown in a way it impacted all parties by working with machine learning capabilities together and its intelligence [1]. Regardless, artificial intelligence is an innovation that is transforming by varying social statuses as it enables people to rethink the way they integrate information and analyze data to improve their knowledge. This is due to the fact that artificial intelligence is a technology wherein computers are imitated as the way humans learn, reason, and communicate, embodied with tons of information including templates and patterns. Educators have the opportunity to harness AI chatbots as engagement tools to enhance efficiency in teaching and learning, productivity, and communication in virtual classrooms. Moreover, the use of AI chatbots can also help reduce interaction-related ambiguity and create a more seamless learning experience.

A chatbot is often related to an advanced and effective automated communication channel between humans and machines. It uses Natural Language Processing (NLP) and sentiment analysis to communicate in human language by text or oral speech with humans or other chatbots [2]. It is used as a tool to conduct an online conversation via chat or speech and interpret questions asked by humans to provide a fixed answer. As supported by Molnar and Szuts [3], chatbots can provide different responses to the requestor question from different users as it is seen as an alternative for users to perform specific tasks. Chatbots have been used for many different purposes such as in marketing, customer service, technical, training, and education field.

The new norm with the Movement Control Order in response to the COVID-19 crisis as imposed by the government has deeply interrupted tertiary educations sectors in Malaysia. After MCO was imposed, many educational institutions especially universities were forced to make a swift change into their way of learning virtually, however it came with several challenges. Research made by Deepika [4] presented that 87.1% of students from the university surveyed

reported they preferred classroom teaching more than online learning due to lack of quality, issues with feedback and clarifying doubts, and also because of the inability to cope with the sudden change in education. The unexpected shift to virtual learning without proper planning was hard for students to adapt as they are not prepared with the tools and their curriculum was not intended for such formats that lead to transforming students into passive learners which will make them lose interest because of the disability to stay focused.

The education sector advantages a lot from the development of chatbot as it can improve the productivity of the students or the educator, communication channel, learning outcomes, and efficient assistance in teaching and minimizes the uncertainty of students. According to Sandu and Gide [5], chatbots helps to arrange content to fit into students' needs and helps in reflecting information needed along with learning companion for students). Chatbots have been used as a pedagogical agent in digital educational setting for a long time and is known as Intelligent Tutoring Systems [6]. However, the implication of chatbots is still in its infancy stage especially when it is needed during this pandemic situation where students are rambling to get used to the virtual classes. This is because the public education system is insufficient in providing learning and teaching skills through online and incompetent to support students understanding and uncertainty in a short period of time. Currently, Malaysian educator welcome the AI chatbot application in education which can improve student's learning capabilities.

The aim of this research paper is to determine the acceptance of students from tertiary studies in using AI chatbot to solve virtual class issues. Due to the current situation of COVID-19 outbreak which has been mushrooming across the world affecting every country made changes in many aspects of life from working conditions to the freedom to move around. Education is one of the sectors that has been impacted significantly by the outbreak leading to the closures of educational institutes and universities around the globe implemented digital learning and asynchronous teaching formats in a short period of time. An online learning which are well planned is totally different than fast shifting into online class in response to a crisis as the speed of the shift would tremendously be shocking to the educators and also the students.

A recent study on the Impacts of the COVID-19 Pandemic on Life of higher Education Students from a Global perspective by Aristovnik et al. [7] were surveyed. Based on the journal the researcher pointed out few problems that tertiary students face admits the pandemic. Students faces problem in order to fit into the new norms of learning and the problem can be divided into four sub-problems: lack of individualized support by educators, slow response time, emotional breakdown, the increase of workloads. This problem as been addressed from some of students on the global level that the isolation affected the physical and mental health since they have to adapt to the new norms by the change in assessment method, switch from onsite to online methods and the amount of workloads that measures the performance of students. Students are expecting a way to get support measures from the institutions and government during this crisis as they struggle to be able to learn effectively through online and thrive for their academic performances where they find it is difficult under this circumstance because of unclear instructions and interruptions in learning.

This study is being conducted since less research being done on how university students all over the world have dealt with the current pandemic and how are they going through their semesters virtually especially in Malaysia. Since the Malaysian Prime Minister Tan Sri Muhyiddin Yassin announced the first Movement Control Order (MCO) in Malaysia on the 18th of March 2020, it directly affected many industries, businesses and organization systems which includes the educational system. This subsequently lead the Higher Education Ministry of Malaysia to make a choice to declare that all the teaching and learning activities in all higher education institutions in Malaysia be it private nor public, to be conducted virtually starting from 27th May 2020 until the end of 31st December 2020.

It is not easy to adapt into online learning in a sudden response to lockdown and Open and Distance Learning (ODL) as educators and students encounters many obstacles such as unfamiliarity with the ICT platform used, insufficient experience in preparing online learning content and intolerable participation and engagement of students [8]. As a result, it only led to affect negatively by the sense of physical, social, and emotional state of students. Fundamentally, several universities in Malaysia have adopted the virtual learning process which is described as learning using technology and internet partially. Despite that, it has been reported that IPT students in Malaysia was overlooked by inadequate online learning infrastructures, difficulties in communicating with their lecturers and inappropriate time management that made this process harder for them [9]. However, now students must accept the fact that they have to adapt and learn things fully through online without physical classes even till the end of the coronavirus crisis. Due to point that even after reopening these educational institutions will still not encounter the exact environment they had before the lockdown in a way of reformulating their norms.

Therefore, a new proper option should be taken to enhance the productivity of these students throughout the online learning process such as the chatbot. This study will focus on the determinant factors that will be considered to determine student's acceptance on the AI chatbot during the pandemic crisis by proposing a suitable conceptual framework.

The aim of this research is to find the acceptance of AI chatbots adoption in education system in higher education sector during the pandemic situation. It shows that the existence of chatbots could help educators discover new ways of teaching and learning to help students thrive in this distance learning environment. This research answer on what factors lead to the acceptance of AI chatbot for virtual collaborative learning in Malaysia. Furthermore, past literature is integrated and synthesized in this proposal to prove the potential of chatbots in helping in the learning outcomes of students. This research will be conducted in Malaysian and the respondents are chosen among students of Technical University of Malaysia Melaka (UTeM). By doing this, the research can determine the level of students' acceptance and effectiveness to use AI chatbot in virtual learning especially during the pandemic where all education institutions were forced to close. Furthermore, the scope of this study also only focusses on university students as they were the most effected ones on being the longest to experience online learning during the lockdown till date. The research wants to find out whether students are willing to accept to see the effectiveness these chatbots could make to improvement to their current condition of learning by using chatbot besides having virtual classes.

2. LITERATURE REVIEW

The increase in technology advancement affected all areas in life so does Artificial Intelligence (AI) that has been used widely around the world in every perspective for its powerful predictive capabilities and autonomous smart system. This is proven from a study that artificial intelligence is the most prominent among most of the current technologies [10]. This paper approaches how AI chatbots could propose a new learning system in education throughout the current pandemic situation.

The most acknowledged concept is of an intelligent agent, where the symbolic and connectionist approaches can act in a collaborative manner aiming at tackling issues through a computational framework. Artificial intelligence is best known to have capabilities of allowing machines to be smarter and simulate human-like tasks that make them more intuitive, convenient, and more advanced than before. Artificial intelligence is thought to have abilities in audio, visual, textual, and tactile perception (e.g., face recognition), decision-making (e.g., clinical diagnosis system), prediction (e.g., weather forecast), automatic knowledge and pattern recognition from data, intuitive communication, and logical reasoning [11].

Chatbots which are short for chatterbots are Artificial Intelligence (AI) featured system that simulates interaction through voice commands and textual conversations. Towards stimulating a conversation, there are two types of approaches in a chatbot which are a rule-based bots and machine learning bots and which in this research is all about machine learning approach [12]. Chatbots works with programming languages that are aligned to manipulate natural human language which is commonly using Natural Language Processing (NLP). Moreover, Khanna et al. [2] justified that this system uses the information given to interpret human language and perform other productive functions like calculation, setting up reminders, alarms and etc. Chatbots have been emerging in many fields like health, business, customer service, entertainment, and many more as an interactive agent system. Chatbots were created since the early 1960s called ELIZA used for psychotherapy and then later came other chatbots with different purposes. Examples of chatbots include AVA from AirAsia that provide seamless customer service and ChatFuel Bots are messenger bots that are used to help with businesses.

However, the transition from AI's general capabilities to the specific application of chatbots in education brings about unique advantages and challenges. One of the main advantages is that AI chatbots can provide personalized and immediate information to students, catering to their individual needs and learning styles. They can also assist educators in managing large class sizes and addressing student inquiries efficiently. Additionally, AI chatbots have the potential to boost students' motivation, self-confidence, and interest in learning. In contrast, there are also challenges when using AI chatbots in education. One of the challenges is the interpretation and diagnosis of minor pronunciation errors, grammar, and spelling mistakes in language learning.AI chatbots are not always able to accurately interpret and provide feedback on such errors, especially in the field of English as a Foreign Language education. Therefore, the need for AI chatbots in education arises from their potential to enhance student engagement, provide personalized and immediate support, and address challenges in language learning. In addition, AI chatbots can assist in automating various operations and handling a variety of domain requests in educational institutions. This can help streamline processes and improve efficiency in administrative tasks, allowing educators to focus more on teaching and student support.

Due to the current pandemic situation, all groups of people thoroughly got impacted globally affecting their mental and emotional state. One of them is students that experienced a dramatic impact of COVID-19 where their lives change after all educational institutes were closed. As supported by Aristovnik et al. [7] pandemic affected students' academic works like online lectures, changes in communication channels for lecturers' and administrative support and new assessment methods and their social life as well as their financial situation. Based on my research, chatbots for education are mainly needed for students who are struggling in online classes amid the pandemic situation.

2.1 Traditional face to face learning versus technology mediated learning

Aftermath of corona virus (COVID-19) affecting every human being all around the world, in-person physical learning in all post-secondary education institutions has stopped to avoid the spread of the virus. Face to face classes are live teaching methods taught by an educator to a group of students in a class vary widely among the cultures. A traditional face to face classes is class where students and instructors are physically in a place together. It is a way of getting students a greater level of interaction and understanding the lesson. The statement by Smith et al. [13] on his research mentioned that the extent and value of interaction between the instructor and students is as crucial as it is for the amount of interaction among the students.

Technology mediated learning as how researchers described it as an environment in which students' interaction with learning materials such as readings, assignments, exercise and more, peers and instructors are mediated through advanced information technology [14]. The ubiquity of online learning has been increasing rapidly in higher studies institutions especially during this pandemic situation. In a study, it is clarified by Aristovnik et al. [7] to combat the spread of the coronavirus, colleges across the world switched their course teaching methods from onsite to online, making it a mandatory teaching and learning process for them. There are different elements and ways of technology-mediated communication such as online or computer based. The interactive components of computer applications and software, as well as the ability to deliver any form of media to users for instructional purposes, are used in computer-based learning (CBL). The role of computer technology in learning, where the software and hardware including the peripherals and devices inputted are the main components used for instructional purposes in the educational environment.

Second way is conducting it in asynchronous or synchronous mode, E-learning is a way of learning and teaching online through network of technologies are arguable the demand for education these days, in which the initiative can be categorized into two techniques or methods which are synchronous and asynchronous learning [10]. Due to the current serious epidemic, all universities are adapting to online courses using a mix of asynchronous and synchronous learning, merging real time conferencing with self-paced coursework or pre-recorded course lectures. According to Perveen [15], the most common kind of online classrooms is

an asynchronous way of learning and teaching in which students are provided with instantly available modules in the form of audio or video lectures, notes, articles, or journals, as well as exercises and presentation slides. All this are provided through the e-learning system by the educational institution also known as Learning Management System (LMS) which are accessible anywhere and anytime delivering a framework for communication between students and educators similarly on what they do in a classroom.

On the other side, synchronous learning is an environment where students and educators meet on a specific online platform such as video conferencing for the teaching and communicate about the learning activities. It gathers the students and the teachers in a same setting on a real-time engagement despite the geographical distance [16]. The differences in this both is that synchronous requires instantaneous students and instructors' preferences while asynchronous does not have a time bound and is students are more self-paced [15]. Synchronous and Asynchronous learning modes play an important role in humanizing online courses by replicating the classroom experience of information exchange and social construct, not just between learners and instructors but among the learners as well especially when students are obliged to stay home during this pandemic [17].

However, instructor led teaching and learning offers greater interaction and information remotely, in real time, between students and instructors making it as natural as in a classroom environment. Instructor and students communicate using emails, audio or video and any other way to have a real-time conversation to study and deliver instruction in an instructor-led learning. This is supported by Oludare Jethro et al. [18] wherein all students receive information simultaneously and communicate directly with their educators supplemented through and online tutorial while maintaining a quality learning outcome in comparable with face-to-face physical class learning.

Based on research this approach of learning has its potential and drawbacks to the performance of the students. Online learning can be favourable in a way where students will be able to attend their classes in a different time and place as convenient as they can be, proper time management and self-learn. Students who favour self-regulated learning found it conducive for them to learn through virtual classes. Additionally, students that could concentrate self-learning skills normally utilized time management, reviewed course materials, ask for help from lecturers, meet deadlines, and had skill of metacognition so that they can reflect their own learning. This statement can be supported by Smith et al. [13] in his research on Teaching On-line versus Face-to-Face stating that students who were silent in a face-to-face class appear to vocalize more in a web course because of the absence of physical body and absence of normal signs to individuality and initial feeling of privacy.

Winkler & Soellner [14], supports the same point, stating that lectures with more than 100 students per lecturer make it impossible to receive individualized support from lecturers and prevents them from engaging in the process of learning. This might not only burden the instructor but also the student where they become insecure and drop from the class for not being able to understand.

2.1.1 Performance of students in online learning

Higher studies institutions were unprepared and struggled to provide same quality of teaching after the switch of face-to-face learning to online learning during lockdown. Through a research question, majority of students reported that online learning is beneficial for them as it allows for students to work at a flexible time and place that is appropriate for them.

In a qualitative study found that students face high level of dissatisfaction, isolation, unclear and uncertain in their course and also loosely engage with the learning process [19]. The author of Global Impact of E- Learning during COVID-19 stated in his article, one of the biggest challenges faced by students in online learning is the lack of online teaching skills, preparation for lesson plans online is time consuming and lack of suitable materials for learning. Despite the performance of online students was satisfactory, their aggregate final year grade was significantly lower than in face- to-face class session [20]. Chatbot-mediated learning could help to develop a support education process in virtual environment [12].

2.1.2 Chatbot

This artificial intelligence software can be considered as one of the tools used for a technology mediated learning (TML). It portrayed as an advanced technology used to simulate conversation through text or speech with the user. This system includes all types of talkbots, chatterbot, conversational agents and also virtual assistant like Alexa, Google's Home and Siri [14]. It has been utilised for a variety of purposes, including customer service, data collection, and more. For example, in 2017, the Marriott International hotel chain launched their first chatbot for hotel reservations, and since then, 44 percent of all enrolled guests on Facebook have benefited from the assistance linked to their stay or reservation.

Chatbots in education can be an essential tool for educators and students to help them in their learning outcomes throughout the virtual class. It offers a novel learning opportunity in which students utilize chatbots to improve the quality of their learning process and the outcome since it is more internet-based, synchronic, self-learning, and focuses on to a particular individual [14]). This can be an essential tool for students to adapt with this quick transition of new norms of learning. As students' study through online from home, they must still could ask questions and expect an immediate answer [7].

A chatbot has special features that could also be helpful for students where it is ready to service for them anytime of the day. The Intelligent Educational System (INES) consist of a part of chatbot that consist of 3 essential capabilities (Learning Management System, Learning Content Management System, Intelligent tutoring system) which communicates with students in natural language and is the main of the system. These features make it convenient and attractive for students as it can interact with user at their own convenience and is available 24/7 [12]. This demonstrates that utilizing chatbots as learning companions improves students' capacity to capture and store critical information, and encourages them to first analyses a problem before obtaining information rapidly. It helps to increase student motivation in learning and self-efficacy which guides them to strengthen their confidence by giving control to their learning process [14].

In order to provide individual support, the process should be synchronous in providing students the way to use the chatbot, to control the learning process and educator guiding them. The findings from the research also stated with the individual control it shows the outcomes that are improved from the structural factors which refers to the learning method and procedural factor on how the students perceive throughout the

learning process and understand the technological impacts on the outcome using the factors [21].

2.2 Theoretical framework

This framework is designed through technology acceptance model (TAM) which proposed by David et al. [22] to specify the relationships with two main factors which are the perceived ease of use (PEOU) and perceived usefulness (PU). This model is based on the Theory of Reasoned Action (TRA) that sums up those beliefs of a person influence the intentions and the intentions influences a person's action. The factors involve in TAM which are PU and PEOU states that it influences a person's attitude towards the usage on the system, which influences their behavioural on the intention to use the system which sequentially determines the actual system usage. The external factors can be from the social factors, cultural factors, and political factors. According to Liu, Liao, and Pratt [23] this model is designed for the information systems context and the most acclaimed model to be used in a research to identify users' acceptance behaviour. Alongside the main concept of perceived usefulness and ease of use in TAM model is to identify the users' intention to use that determines their acceptance of the technology [24]. The Figure 1 above shows the TAM model by Davis that will be used as a reference to build a new conceptual framework as related to the research topic.

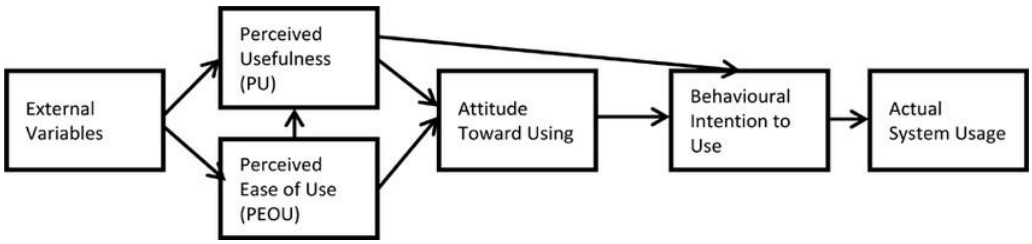

Figure 1. TAM model by Davis [22]

2.3 Conceptual framework

The proposed conceptual framework as illustrated from Figure 1 shows the variables involved and the interrelation between each of them in order to develop hypothesis for this study. Figure 2 shows that the independent variable that involve is perceived ease of use, perceived usefulness and perceived security and privacy. The AI chatbot is use as the mediating variable and student's acceptance is the dependent variable.

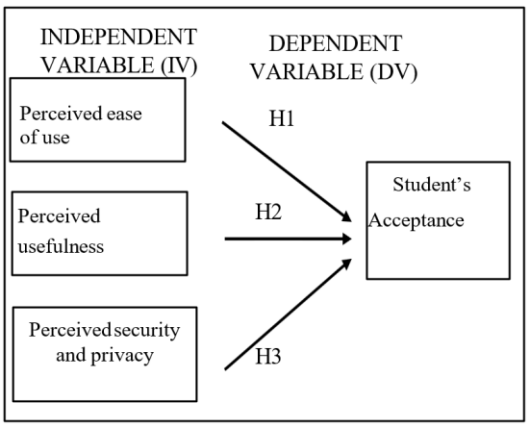

Figure 2. Conceptual framework based on TAM framework

2.4 Hypothesis development

By referring to the proposed theoretical framework with conceptualized model as illustrated in Figure 2, the research testable hypotheses are formulated as below to guide the research for ensuring all variables that interrelated are included and achievable with research design.

H1: Perceived ease of use has a positive effect on student acceptance to use AI chatbots during online classes

H2: Perceived usefulness has a positive effect on student acceptance to use AI chatbots during online classes.

H3: Perceived security and privacy has a positive effect on the student acceptance to use AI chatbot during online classes.

When there is student acceptance on the artificial intelligence chatbots, constructive teaching and learning experiences will be possible to implement, leveraging interactive, participatory, and communication tools made possible by chatbot technology. Kumar and Silva [25] conducted research on student acceptance of chatbots in studio-based learning and found that students' attitudes toward chatbots and willingness to use them in the future are positive due to their quick responses, ease of use, user-friendliness, guidance, and ability to provide personalised feedback. This study, it is crucial to prioritise the students' acceptance on utilising chatbot in education by providing all their needs especially when it helps to increase their communication way and productivity yet their uncertainty on communication is reduced.

3. METHODOLOGY

The main aim of this study using explanatory approach is to describe the clarity and verify the data and attributes that influence on the factors manipulating the acceptance of AI chatbot among tertiary level students in order to see the effectiveness. In the implementation of the explanatory approach, researchers focused on understanding and explaining the underlying mechanisms and processes of how AI chatbots function in education. This research looks for the cause and reason on the issues by seeking on the desire to know why on the research question used to collect the response. Student's acceptance towards this technology and situations are the most common topics to be addressed while having a virtual education system. Therefore, explanatory research design is used in this study to study about the issue and fill those existing research gaps. Explanatory research design is used in this study with a structured questionnaire to collect the data for a detailed analysis. The explanatory approach in research is used to explain the causal relationship

between variables and hypotheses through statistical analyses and data interpretation. It aims to provide a deeper understanding of the phenomenon being studied by examining the relationships between variables and explaining the reasons behind observed outcomes.

In this research, the questions asked to be responded are formed on the research question and the student's perspective on the adoption of chatbots in education amidst the COVID-19. In order to reach the maximum level of creating an effective and consistent questionnaire questions, the researcher must first structure the question in a proper organized way. The question developed should also be explained in an appropriate and logical manner. To achieve that, the questions can be divided into several sections with detailed instructions for the understanding of the respondent.

The questionnaire was distributed through online communication channel like social medias (Facebook and Instagram) and online messaging platforms (WhatsApp and Telegram). Such method is used to reach respondents easily and get a quick respond from them rather than using a traditional way which through paper distribution. Through some constraints, using these electronic online mediums to communicate and get data from the respondents in an easier, convenient yet safer way for both researcher and respondents. The question of the questionnaire is developed using Google form which help integrate the sum of data altogether and the link from it is distributed to the respondents using the channels mentioned above. Since access to the internet and digital devices is not universal, using an online platform may exclude certain segments of the population from participating in the study. Online platforms may exclude certain demographic groups, such as those without internet access or who are less technologically literate. Another limitation is that the online platform may attract a self-selecting group of participants who are more likely to have a specific interest or opinion related to the research topic, leading to potential bias in the data collected, however through the close monitoring, the number of respondent response to the questionnaire is very convincing.

3.1 Sampling techniques

According to Taherdoost [26] sampling can be used to make inference about a population or to make generalization in relation to existing theory. Sampling techniques can be divided into two types which are probability or random sampling and non- probability or non-random sampling. In this research, the sampling frame are the students at Universiti Teknikal Malaysia Melaka. Students who experience virtual learning during this current pandemic are considered as the specific sampling frame. One of the reasons why students are used as sampling for Virtual Collaborative Learning is because it allows researchers to assess the effectiveness and impact of collaborative learning in a controlled and manageable environment. Virtual Collaborative Learning provides a platform for students to interact, communicate, and collaborate with their peers regardless of physical proximity. It enables students from different geographical locations to engage in collaborative activities, expanding their social interaction skills and communication abilities. Additionally, using students as participants in virtual collaborative learning allows researchers to gather data about the cognitive benefits associated with group learning. This includes factors such as enhanced problem-solving skills, critical thinking abilities, and increased knowledge retention. Furthermore, student sampling in virtual collaborative learning allows for the exploration of the impact of technology on student engagement and motivation. In traditional classrooms, group work is common for certain activities, and virtual collaborative learning aims to replicate and enhance this aspect of education [27]. In addition, a part of population to undergo an observation process and data from it are collected. From the interpretation and analysis of data researcher can make interferences for the whole population. Based on this research topic, the population that is focused on is the students at Universiti Teknikal Malaysia Melaka. In this case, the sample size as related is the targeted respondent which are among over 12,000 students at Universiti Teknikal Malaysia Melaka. Determination of sample size from a given population is based on Krejcie & Morgan [28] sampling technique.

3.2 Data analysis method

In this study, the qualitative data is collected through content analysis to find the effectiveness of chatbot in education system. According to Kinley et al. [29] defined that data analysis is a technique of reviewing documentation texts in order to make replicable and valid inferences according to the aim of research. Besides that, in quantitative analysis few types of statistical method can be used to analyse data collected through questionnaire and this can be done using the Statistical Package for Social Science (SPSS) software. SPSS was chosen as the software for analysis because of its comprehensive and scientific capabilities in analyzing questionnaire data [30]. By using SPSS, the research team was able to obtain objective and comprehensive indicators from the questionnaire data. These indicators provided a basis for supporting the hypotheses of the research. In addition to data cleaning and preliminary analysis, SPSS was used to conduct exploratory factor analysis [31] The collected data were then analyzed using SPSS to examine the participants' perceptions and acceptance of AI chatbots in virtual collaborative learning. The researchers used various statistical analyses in SPSS, such as descriptive statistics, inferential statistics (such as t-tests or ANOVA), and correlation analyses. These analyses were conducted to determine the level of acceptance and satisfaction with AI chatbots, as well as to explore any relationships between participant demographics and their perceptions of AI chatbots in virtual collaborative learning.

3.2.1 Multiple linear regression

Multiple linear regression is a statistical method uses the independent variable and dependent variable to predict the outcome of a response variable. Based on this a researcher, multivariate regression analysis is normal distribution, linear, freedom from extreme values and also have no multiple ties between the independent variable [32]. By using Multiple linear regression, this research can examine how changes in two or more independent variables are associated with changes in the dependent variable [33]. This allows to determine the specific impact of each independent variable on the dependent variable while controlling for the other variables where it can provide valuable insights into the underlying factors driving the dependent variable, make predictions and understand the overall relationship between the variables. The regression equation shows the way independent variables overall fits and observe the relative contribution of each of the predictors of total variance. The equation of multiple regression is shown as below:

The formula for multiple regression analysis is:

$$Y=a+B1X1+B2X2+B3X3$$

where, Y=Employee productivity; A=y-intercept; Bp=Slope Coefficient; X1=Perceived Usefulness; X2=Perceived Ease of Use; X3=Perceived Security and Privacy.

3.2.2 ANOVA test

Analysis of variance or also called as ANOVA is a method that have access to find out whether the result of a survey or experiment are significant. It is used to get in-depth information on the relationship between the variables and to know the acceptance of hypothesis made. There are several advantages to using the ANOVA test in this research. ANOVA allows for the comparison of more than two groups simultaneously, providing a comprehensive analysis of group differences. It also can detect interactions between variables, and examine how different factors may interact and contribute to differences in the dependent variable.

4. DATA ANALYSIS

The summary of quantitative research is presented in detailed and comprehensive. To ensure the accuracy of the hypothesis, data analysis is essential in a study. Therefore, in this part of the study discusses on the reliability analysis, descriptive data, and objectives testing. There are a total of 376 respondents who are students from University Teknikal Malaysia Melaka.

4.1 Reliability test

Table 1 shows the reliability of the Effectiveness of AI chatbot in Higher Education to solve virtual Class Issues Amidst the COVID-19 Outbreak questionnaire of all the 376 respondents. The questionnaire contains 19 items with the Cronbach's alpha value of α=.96. The Cronbach's Alpha value of .96 shows that there is a high level of effectiveness of AI chatbot if implied in virtual classes to the students in University Teknikal Malaysia Melaka. Cronbach's alpha is a measure of reliability and internal consistency in research. It assesses how closely related a set of variables are as measures of the same construct.

Table 1. Reliability of test

Cronbach's Alpha	N of Item
0.957	19

Table 2 shows the reliability of The Effectiveness of AI chatbot in Higher Education to Solve Virtual Class Issues Amidst the COVID-19 Outbreak based on each subscale. This questionnaire has four dimensions which are perceived usefulness, perceived ease of use, perceived security and student acceptance. The first dimension which is the perceived usefulness consists of item number 1, 2, 3, 4 and 5 has the Cronbach's Alpha value of α=.861. The Cronbach's Alpha value of reliability for the second dimension which is the perceived ease of use consists of item number 6, 7, 8, 9, 10 and 11 is α=.887. Whereas dimension 3 which is the perceived security consists of item number 12, 13, 14 and 15 has the Cronbach's Alpha value of α=.867. Lastly, the fourth dimension which is the student acceptance consists of item number 16, 17, 18 and 19 has the Cronbach's Alpha value of α=.848.

Table 2. Reliability test according to each subscale

Subscales	NO of Items	Reliability Cronbach's Alpha Coefficient
Perceived Usefulness	5	.861
Perceived Ease of Use	6	.887
Perceived Security	4	.867
Student Acceptance	4	.848

4.2 Descriptive analysis

Based on the Table 3, students' acceptance which is the dependent variable of this study has a mean score of (M=16.65, SE=.12). The mean scores of the independent variables such as perceived usefulness, perceived ease of use, and perceived security should be taken into consideration in order to achieve the research's purpose of determine students' acceptance (dependent variable) on the effectiveness of AI chatbot.

From the table above, it can be seen that the variable, perceived usefulness has the mean score of (M=20.71, SE=.15). On the other hand, the perceived ease of use has the mean score of (M=24.96, SE=.18) which shows the highest among all three-independent variable. Lastly, the variable perceived security has the mean score of (M=16.45, SE=.13) that has the lowest mean score among all the variables.

Hence, it can be concluded that the perceived ease of use has higher score which is (M=24.96, SE=.18) with the standard deviation of σ=3.46 as compared to the other two independent variables, perceived usefulness and perceived security which has the standard deviation value of σ=2.84 and σ=2.56 respectively.

Table 3. Results of students' acceptance

	N	Min	Max	Mean	Standard Deviation	Standard Error Mean
Perceived Usefulness	376	13.00	25.00	20.710	2.835	.1462
Perceived Ease of Use	376	14.00	30.00	24.960	3.459	.1784
Perceived Security	376	8.00	20.00	16.446	2.555	.1317
Student's Acceptance	376	10.00	20.00	16.648	2.291	.1181

4.3 Pearson correlation analysis

The strength of the linear relationship between the independent factors and the dependent variable is measured using Pearson's Correlation Analysis which it is represented by the letter r. The absence of a relationship between the variables is indicated by a coefficient value of zero. Pearson's Correlation Coefficient is a number that goes from +1 to -1. The positive number indicates a positive correlation between the variables, whereas the negative value indicates a negative correlation. The validity of the overall questionnaire based on all 376 respondents is tested using Pearson correlation coefficient.

Table 4. Pearson correlation coefficient analysis

		PU	PEU	PS	SA
PU	Pearson Correlation	1	.847**	.773**	.765**
	Sig. (2-tailed)		.000	.000	.000
	N	376	376	376	376
PEU	Pearson Correlation	.847**	1	.791**	.813**
	Sig. (2-tailed)	.000		.000	.000
	N	376	376	376	376
PS	Pearson Correlation	.773**	.791**	1	.725**
	Sig. (2-tailed)	.000	.000		.000
	N	376	376	376	376
SA	Pearson Correlation	.765**	.813**	.725**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	376	376	376	376

**. Correlation is significant at the 0.01 level (2-tailed).
Note: (Independent variable) PU= Perceived Usefulness, PEU= Perceived Ease of Use, PS= Perceived Security, (Dependent variable)- Students' acceptance

Table 4 illustrates the findings for the Pearson correlation coefficient Analysis for the interval-scale variables. Based on the result above, it is proven that all the independent variables which are the perceived usefulness, perceived ease of use and perceived security are positively and significantly correlated with the dependent variable, students' acceptance.

The correlation value between perceived ease of use and students' acceptance are the highest among the other variables which constitutes r=0.813 with the significance level of 0.000. This represents that there was a strongly positive significance relationship between these two variables due to the correlation value of above 0.8. Besides, the correlation value between perceived ease of use and the students' acceptance is r=0.765 with the significance level of 0.000. Whereas the correlation value of perceived security and students' acceptance is r=0.725 with the significance level of 0.000. The two-independent variable, perceived usefulness and perceived security have a moderately positive significant relationship with the dependent variable (students' acceptance). All three-independent variable has a large strength of relationship with the dependent variable, students' acceptance.

Therefore, from this analysis it can be concluded that there is a significant relationship between the independent variables which consist of perceived usefulness, perceived ease of use and perceived security with the dependent variable which is the students' acceptance that can be seen from their correlation value which are high and moderate value between the variables. This shows that the independent variable will positively influence the students' acceptance, the dependent variable.

4.4 Multiple linear regression

The Model Summary table consist of Multiple Correlation Coefficient (R), coefficient of determination (R Square), adjusted R Square, and the Standard Error of the Estimate, which are used to evaluate the effectiveness of regression model towards the data in this research. The model summary from Multiple linear regression analysis is shown in Table 5. The value of R in the findings is 0.831, indicating that all three independent variables are highly associated. The coefficient of determination, R Square, of 0.691 indicates that the independent variables can explain 69.1 percent of the overall variation in students' acceptance (Perceived Usefulness, Perceived Ease of Use, Perceived Security). The R Square value is larger than 0.5, which is regarded a positive number since there is less variation in the dependent variables in the regression model, which is students' acceptance. However, 30.9 percent of the variance remains unexplained.

Table 5. Model summary of multiple linear regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.831[a]	.691	.688	1.27918

Table 6 shows the ANOVA results to test whether the overall regression is a perfect fit for the data gathered from respondents. The value of F-test from the above analysis is 277.242 which is significant as when the value of F-test is higher where from the result of this analysis shows that the value of (df=3, 372). The significance is also proven the p-value is 0.000 which is lower than ($p<0.05$) that indicates that there is a significant relationship between the perceived usefulness, perceived ease of use, perceived security and students 'acceptance. The researcher accepts that the overall of the multiple regression model is significant at 5% level of significance and the alternative hypotheses are well fitted in the model and accepted.

Table 6. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1360.955	3	453.652	277.242	.000[b]
	Residual	608.705	372	1.636		
	Total	1969.660	375			

a. Dependent Variable: Students' Acceptance
b. Predictors: (Constant) Perceived Usefulness, Perceived Ease of Use, Perceived Security

Table 7 illustrated that estimated coefficient where beta (constant) is β=2.353. Beta value for perceived usefulness is β=0.171; beta value for perceived ease of use is β=0.336; and beta value for perceived security is β=0.144. According to the data that has been analysed from coefficient table, equation of multiple regression for this study was formed as below:

Students' Acceptance=2.353+0.171PU+0.336PEU+0.144PS

Table 7. Coefficients of multiple linear regression

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	2.353	.505		4.664	.000
	PU	.171	.046	.211	3.693	.000
	PEU	.336	.039	.508	8.569	.000
	PS	.144	.045	.160	3.230	.001

a. Dependent variable: (Constant); Students' Acceptance
Note: PU= Perceived Usefulness, PEU= Perceived Ease of Use, PS= Perceived Security

This equation indicates the relationship between the dependent variable which is the students' acceptance with the independent variable consist of perceived usefulness, perceived ease of use and perceived security. Based on the result, each of the independent variables has a different level of contribution towards the dependent variable and provide a significant prediction towards the students' acceptance on the effectiveness of AI chatbot.

The perceived ease of use factor is the strongest predictor variable where, the unstandardized beta, β=0.336,

t(376)=8.569, p<0.05. The standardized beta, β=0.508 has also the highest value compared to the other independent variables. It can be seen clearly that perceived ease of use has positively influence the dependent, students' acceptance on the effectiveness of AI chatbot in education.

Next, perceived usefulness has subsequent stronger predictor where β=0.171, t(376)=3.693, p<0.05. The standardized beta, β= 0.211 is also the second highest positive value among the independent variables. Lastly the perceived security has the lowest predictor value of variable where the beta, β=0.144, t(376)=3.230, p<0.05. The standardized beta, β=0.160 of perceived security is the lowest among the other two independent variables. From the result, perceived security has lowest positive value of all independent variables and is the third factor influencing students' acceptance on the effectiveness of AI chatbot in education. In conclusion of the result, it is shown that the higher beta values are usually supported with higher t-values and smaller p-values. This means that the independent variable positively influences the dependent variable when the beta value contributes a larger coefficient value.

4.5 Hypotheses testing result

From Table 8, the hypothesis result demonstrates that there are significant relationships between all the independent variables consist of perceived usefulness, perceived ease of use and perceived security with the dependent variable (student acceptance). The result shows that all the significant value is below 0.05 where p <0.05. As a result, null hypothesis (H0) of each independent variable is rejected while the alternative hypothesis of each independent variable is accepted.

The first objective of this study is to identify the effectiveness of AI chatbot in assisting students of tertiary education with virtual class issues which is achieved by using Pearson's Correlation Coefficient Analysis by Statistical Package for Social Sciences (SPSS) software. The critical factors affecting the effectiveness of AI chatbot is proven by previous researchers which are stated Literature Review. The critical factors are the independent variables consist of perceived ease of use, perceived usefulness, and perceived security. The effectiveness of the factors is then proved using the Pearson's Correlation Coefficient Analysis resulting into a strong correlation value.

There is a strongly positive relationship between perceived ease of use and student acceptance as the r-value is 0.813 in which is higher than 0.8 and below 1 and a moderately positive value for both perceived usefulness and perceived security which the r=0.765 and r=0.725 respectively.

According to Chen et al. [34] perceived ease of use is based on how strongly they agree that the AI chatbot is simple to use and that it allows students to do their duties with minimal effort. Perceived usefulness in AI chatbot is expected to help students solve and improve the problem they are facing educationally in the online classes especially during this pandemic. Technology such as this AI chatbot is making education of tertiary level during these online classes easy and helpful as a guidance and assistance for students learning process [5]. Besides, perceived security attracts the trust of students to use the AI chatbot if they feel secured by the privacy protection and the quality of information and services provided by the system.

This objective is tested and achieved using Pearson's Correlation Coefficient Analysis by Statistical Package for Social Sciences (SPSS) software. Based on the analysis, it has been proven that there is a significant relationship between the independent variable consist of perceived ease of use, perceived usefulness, and perceived security with students' acceptance. This is because the significance value of all the variables is p=0.000 which are <0.05. The correlation between the variables is also positively strong because all the values are above 0.7 that shows their strength of the relationship are large.

The theoretical model relating to AI chatbots in hospitality and tourism reveals that perceived ease of use and perceived usefulness of a new technology impacts the intention of users to accept it [35]. Thus, it is proven that the perceived ease of use and perceived usefulness influences student acceptance to use AI chatbot during online classes. Besides that, the perceived security is needed as the students prioritize chatbots to not only provide them with feedbacks and answers but also be safe to use that keeps their personal information safe. The security level of a chatbot need to be sufficient in order to convince users to use them [36].

The third objective analysed the most critical variable towards the effectiveness of AI chatbot in which is the perceived ease of use. This objective is achieved through the multiple linear regression analysis from Statistical Package for Social Sciences (SPSS) software. Perceived ease of use factor contributes most of the effectiveness on AI chatbot to solve virtual class issues based on students' acceptance with the value of β=0.336, t(376)=8.569, p<0.05.

Table 8. Hypothesis testing result

Independent Variable	P-Value	Result
Perceived Usefulness	.000	H1 Accepted
Perceived Ease of Use	.000	H2 Accepted
Perceived Security	.000	H3 Accepted

5. CONCLUSIONS

According to a research, AI chatbots would be advantageous for online studies since they would make it easier for users to obtain educational resources, give fast support to students, and complete tasks with less stress [12]. AI chatbots are designed to be simple to use in education, as they can help students with a variety of topics such as campus updates, professor schedules, assignment help, and study resources, all of which can improve learning quality, strengthen students' talents, and assist students who are deficient in certain areas.

This study can help us learn more about student acceptance and the usefulness of AI chatbots in online learning. Furthermore, other researchers conducting research relating to this study might utilise the researcher's findings on the critical factors influencing students' acceptance to validate their findings. This data is usually useful, and it may also be used as a source of justification in future study.

In practical implication, the outcome of this study could be reviewed or provided as a guideline for the for other researchers to understand and analyses the acceptance of students on the effectiveness of using AI chatbot during online classes. In this study, researcher was able to achieve the objectives of the research using Pearson's Correlation Coefficient and Multiple Regression analysis and to test the hypothesis on the relationship between independent variable

(perceived usefulness, perceived ease of use and perceived security) with the dependent variable (students' acceptance). The findings stated that the three-independent variable, consisting perceived usefulness, perceived ease of use and perceived security influence students' acceptance to use AI chatbot in online classes. The perceived ease of use variable contributes as the most significant and influence among other variables towards student acceptance to use AI chatbots during online classes.

It is very important to have a perceived ease of use factor in platforms suggested to be used in education especially in tertiary in order to get the acceptance from students. The AI chatbot should be easily accessible to the students and provide them with the intellectual scope of higher education. Hence, higher education institutions and system developers and system managers should concentrate on the ease of use of the system. They should be thorough in their efforts to reduce the number of difficulties associated with research. This would aid in the adoption and implementation of this new innovation among the students. To do this, the authorities of the institutions must be serious about accurately providing the developers with the students' important requirements. The technology used should be more in line with the demands of the student's scope of education in the higher education institution.

Besides that, the AI chatbot technology should not be complex in a way it is easy to use for students to do what they want and receive understanding of their uncertainty in education. The students should be given proper awareness and instructions on the capabilities of the system by showing a live demonstration, through product brochures and manuals. By doing this, students' confidence level would increase and the more they would accept to adopt AI chatbot in higher education. Briefly, the findings of this study can be reviewed as a guideline and could be beneficial for other researchers to understand about the variables involved could influence the students in accepting on AI chatbot for their online learning experience.

There are several recommendations for future research to better understand about the topic of this study. The first recommendation is improving the way of using the online questionnaire instrument in a way it could draw the attention and willingness of participants to report it honestly. This can be done by providing close ended questions with short answers and variety answers option in questions rather than using Likert Scale questionnaire which does not give interest to the respondent to respond to it. If this method is implemented, the result of the study would be different. As the self-reported data is reliant on participants' honesty, increasing anonymity may increase participants' willingness to express their true thoughts.

Furthermore, obtaining a larger sample size in which representing all the students involving more university in Malaysia would make the result and findings more precise and broader. Since the study focusses just on the students from University Technical Malaysia Melaka (UTeM), the results are limited. The research sample size should represent students from the other higher educational institutions to know their opinion and acceptance towards this topic in which also increase generalization on AI chatbot in online classes.

ACKNOWLEDGMENT

The authors would like to express their gratitude to the Center for Research and Innovation Management (CRIM), and the Faculty of Technology Management and Technopreneurship at Universiti Teknikal Malaysia Melaka (UTeM) for supporting this publication.

REFERENCES

[1] Cioffi, R., Travaglioni, M., Piscitelli, G., Petrillo, A., De Felice, F. (2020). Artificial intelligence and machine learning applications in smart production: Progress, trends, and directions. Sustainability, 12(2): 492. https://doi.org/10.3390/su12020492

[2] Khanna, A., Pandey, B., Vashishta, K., Kalia, K., Pradeepkumar, B., Das, T. (2015). A study of today's AI through chatbots and rediscovery of machine intelligence. International Journal of U-And E-Service, Science and Technology, 8(7): 277-284. https://doi.org/10.14257/ijunesst.2015.8.7.28

[3] Molnár, G., Szüts, Z. (2018). The role of chatbots in formal education. In 2018 IEEE 16th International Symposium on Intelligent Systems and Informatics (SISY), Subotica, Serbia, pp. 000197-000202. https://doi.org/10.1109/SISY.2018.8524609

[4] Nambiar, D. (2020). The impact of online learning during COVID-19: Students' and teachers' perspective. The International Journal of Indian Psychology, 8(2): 783-793. https://doi.org/10.25215/0802.094

[5] Sandu, N., Gide, E. (2019). Adoption of AI-Chatbots to enhance student learning experience in higher education in India. In 2019 18th International Conference on Information Technology Based Higher Education and Training (ITHET), Magdeburg, Germany, pp. 1-5. https://doi.org/10.1109/ITHET46829.2019.8937382

[6] Smutny, P., Schreiberova, P. (2020). Chatbots for learning: A review of educational chatbots for the Facebook Messenger. Computers & Education, 151: 103862. https://doi.org/10.1016/j.compedu.2020.103862

[7] Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., Umek, L. (2020). Impacts of the COVID-19 pandemic on life of higher education students: A global perspective. Sustainability, 12(20): 8438. https://doi.org/10.3390/su12208438

[8] Al-Kumaim, N.H., Alhazmi, A.K., Mohammed, F., Gazem, N.A., Shabbir, M.S., Fazea, Y. (2021). Exploring the impact of the COVID-19 pandemic on university students' learning life: An integrated conceptual motivational model for sustainable and healthy online learning. Sustainability, 13(5): 2546. https://doi.org/10.3390/su13052546

[9] Selvanathan, M., Hussin, N.A.M., Azazi, N.A.N. (2023). Students learning experiences during COVID-19: Work from home period in Malaysian Higher Learning Institutions. Teaching Public Administration, 41(1): 13-22. https://doi.org/10.1177/0144739420977900

[10] Haseski, H.I. (2019). What do Turkish pre-service teachers think about artificial intelligence? International Journal of Computer Science Education in Schools, 3(2): 3-23. https://doi.org/10.21585/ijcses.v3i2.55

[11] Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., Felländer, A., Langhans, S.D., Fuso, M.T., Nerini, F. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. Nature Communications, 11(1): 1-10.

https://doi.org/10.1038/s41467-019-14108-y
[12] Sandoval, Z.V. (2018). Design and implementation of a chatbot in online higher education settings. Issues in Information Systems, 19(4): 44-52. https://doi.org/10.48009/4_iis_2018_44-52
[13] Smith, G.G., Ferguson, D., Caris, M. (2002). Teaching on-line versus face-to-face. Journal of Educational Technology Systems, 30(4): 337-364. https://doi.org/10.2190/ffwx-tjje-5afq-gmft
[14] Winkler, R., Söllner, M. (2018). Unleashing the potential of chatbots in education: A state-of-the-art analysis. In Academy of Management Proceedings, 2018(1): 15903. https://doi.org/10.5465/ambpp.2018.15903abstract
[15] Perveen, A. (2016). Synchronous and asynchronous e-language learning: A case study of virtual university of Pakistan. Open Praxis, 8(1): 21-39. https://doi.org/10.5944/openpraxis.8.1.212
[16] Amiti, F. (2020). Synchronous and asynchronous E-learning. European Journal of Open Education and E-Learning Studies, 5(2). http://doi.org/10.46827/ejoe.v5i2.3313
[17] Shahabadi, M.M., Uplane, M. (2015). Synchronous and asynchronous e-learning styles and academic performance of e-learners. Procedia-Social and Behavioral Sciences, 176: 129-138. https://doi.org/10.1016/j.sbspro.2015.01.453
[18] Jethro, O.O., Grace, A.M., Thomas, A.K. (2012). E-learning and its effects on teaching and learning in a global age. International Journal of Academic Research in Business and Social Sciences, 2(1): 203.
[19] Xu, D., Jaggars, S.S. (2014). Performance gaps between online and face-to-face courses: Differences across types of students and academic subject areas. The Journal of Higher Education, 85(5): 633-659. https://doi.org/10.1353/jhe.2014.0028
[20] Gulsecen, S., Zerrin, A.R., Çiğdem, E. (2013). Comparison of on-line and F2F education methods in teaching computer programming. World Journal on Educational Technology, (5): 291-300.
[21] Lidén, A., Nilros, K. (2020). Percieved benefits and limitations of chatbots in higher education. Retrieved from Technologies. https://doi.org/10.1007/s10639-021-10542-y
[22] Davis, F.D. (1989). Perceive usefulness, perceive ease of use and user acceptance of information technology. MIS Quarterly, 13(3): 319-340. http://doi.org/10.2307/249008
[23] Liu, S.H., Liao, H.L., Pratt, J.A. (2009). Impact of media richness and flow on e-learning technology acceptance. Computers and Education, 52: 599-607. http://doi.org/10.1016/j.compedu.2008.11.002
[24] Farahat, T. (2012). Applying the technology acceptance model to online learning in the Egyptian universities. Procedia-Social and Behavioral Sciences, 64: 95-104. https://doi.org/10.1016/j. sbspro.2012.11.012
[25] Kumar, J.A., Silva, P.A. (2020). Work-in-progress: A preliminary study on students' acceptance of chatbots for studio-based learning. In 2020 IEEE Global Engineering Education Conference (EDUCON), Porto, Portugal, pp. 1627-1631. https://doi.org/10.1109/EDUCON45650.2020.9125183
[26] Taherdoost, H. (2016). Sampling methods in research methodology; How to choose a sampling technique for research. International Journal of Academic Research in Management, 5(2): 18-27. https://doi.org/10.2139/ssrn.3205035
[27] Nyarko, M., Ventura, N. (2010). E-learning: Virtual classrooms as an added learning platform. In 2010 IEEE Region 8 International Conference on Computational Technologies in Electrical and Electronics Engineering (SIBIRCON), pp. 426-431. https://scite.ai/reports/10.1109/sibircon.2010.5555116
[28] Krejcie, R.V., Morgan, D.W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3): 607-610. https://doi.org/10.1177/001316447003000308
[29] Kinley, K., Tjondronegoro, D., Partridge, H., Edwards, S. (2014). Modeling users' web search behavior and their cognitive styles. Journal of the Association for Information Science and Technology, 65(6): 1107-1123. https://doi.org/10.1002/asi.23053
[30] Wang, H., Sun, B. (2020). Firm heterogeneity and innovation diffusion performance: Absorptive capacities. Management Decision, 58(4): 725-742. https://scite.ai/reports/10.1108/md-03-2018-0245
[31] Afriyie, S., Du, J., Ibn Musah, A.A. (2019). Innovation and marketing performance of SME in an emerging economy: The moderating effect of transformational leadership. Journal of Global Entrepreneurship Research, 9: 1-25. https://doi.org/10.1186/s40497-019-0165-3
[32] Uyanık, G.K., Güler, N. (2013). A study on multiple linear regression analysis. Procedia-Social and Behavioral Sciences, 106: 234-240. https://doi.org/10.1016/j.sbspro.2013.12.027
[33] Fadjryani, N., Saputra, W. (2022). The motivation of criminality during the COVID-19 pandemic in central Sulawesi. Parameter: Journal of Statistics, 2(2): 10-17. https://doi.org/10.22487/27765660.2022.v2.i2.15680
[34] Chen, H.L., Vicki Widarso, G., Sutrisno, H. (2020). A chatbot for learning Chinese: Learning achievement and technology acceptance. Journal of Educational Computing Research, 58(6): 1161-1189. https://doi.org/10.1177/0735633120929622
[35] Pillai, R., Sivathanu, B. (2020). Adoption of AI-based chatbots for hospitality and tourism. International Journal of Contemporary Hospitality Management, 32(10): 3199-3226. https://doi.org/10.1108/IJCHM-04-2020-0259/FULL/XML
[36] Følstad, A., Nordheim, C.B., Bjørkli, C.A. (2018). What makes users trust a chatbot for customer service? An exploratory interview study. In Internet Science: 5th International Conference, INSCI 2018, St. Petersburg, Russia, pp. 194-208. https://doi.org/10.1007/978-3-030-01437-7_16