Impact Of The Germane Load On Students’ Behavioral Intention On Online Courses During Covid-19: Mediating Role Of Instructional Design And Moderating Role Of E-Learning Personalization

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Abstract

The study is carried out to examine the impact of the germane load on the Students’ Behavioral Intention of students studying in the public universities of China. Meanwhile, the study has also examined the mediating role of instructional design and moderating role of e-learning personalization. The study has used the SEM-PLS is to examine the relationship between and among the variable. The current study has investigated the relationship between germane load and instructional design, future behavioral intentions and instructional design, and future behavioral intentions with the germane load. The survey was conducted among the university students of China who participated in online learning programs during the COVID-19 pandemic. Moreover, the mediation influence of germane load on the relationship of future behavioral intentions and instructional design has been studied. It was found that all the relationships were positively correlated. The mediation influence of instructional design was found between the relationship of future behavioral intentions and instructional design. The study has examined the instructional design as a mediator. The analysis of an instructional design focusing on setting course plans results in improved germane load, which improves the process of learning, and future behavioral intentions among students are increased. It is important to note that usage intention and germane load are benefitted through an effective instructional design. Therefore, the association between usage intention and germane load is important to be examined for analyzing a good understanding of the content among students and their plan for continuing e-learning in the future. In literature, studies have worked on instructional design, which results in improved learning and intention to continue e-learning and among students. However, there is a need to explore instructional design that focuses on general course planning to improve behavioral intention in the future based on the previous learning experience. The study is among the pioneers on the issues related to e-learning mechanisms in eastern Malaysia.

Keywords: Germane load, behavioral intention, China,

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INTRODUCTION

Due to the COVID-19 pandemic, the conventional way of learning has been transformed worldwide. Because of the global wave of COVID-19, 180 countries, or more than 180 countries, had to shut down their learning institutions. All over the world, learning programmes have been faced with many issues, so they switched towards e-learning...
programmes for their survival. Firstly, China tried to cope with the situation through e-learning programmes for the provision of uninterrupted education. Due to the shutdown of educational institutions, the system of education has been facing various challenges in the country. Moreover, in China, the implementation of virtual programmes supported the slowing down of the spread of this virus outbreak. China faced many challenges during the implementation of the online educational system. Since the online education platform was newly adapted, many questions were initially in mind, such as how to teach, what to teach, and then how to fulfil all the basic requirements of the educational system. For the execution of virtual learning, the Government of China supported infrastructure development and arranged different gadgets for learning and facilitation, such as laptops, desktop computers, and smartphones, among teachers and learners, through which they actively joined the virtual programs. Due to the COVID-19 wave, where all sectors of life were facing challenges, the education sector also came up with its own unique challenges. Teachers who were specialists in conventional or face-to-face learning switched towards virtual programmes because it was one of the best modes for reducing the inadequacies due to the lockdown situation in China rather than having a break in the education programme due to school closure. In these tough times of the pandemic, virtual learning developed an exclusive chance that supported overcoming the calamitous situation. Although the online learning programme is the alternative way of educating, especially during the lockdown situation due to COVID-19, online education has numerous benefits as well. For example, there are no geographical limitations since learners can learn in any part of the world without any intervention, and through virtual learning, learners and teachers can continue their educational programme without interruption. Without a second thought, it is a fact that virtual programmes of learning introduce a modern environment for gaining education, online programmes motivate learners to improve their attitudes, skills, and abilities, and online learning makes learning very easy.

During COVID-19, the traditional face-to-face courses offered by universities have been replaced mainly by online courses using e-learning systems. The utilisation of the e-learning system replaces the offline courses offered in classrooms by the universities (Leire, McCormick, & Richter, 2016). With the increase in sourcing of alternative modes of learning by students in high education, the popularity of courses such as online courses has increased during COVID-19 (Leire et al., 2016). Specifically, an increase in online learning has been experienced in China because of higher funding by the government and technological advancements (Costley & Lange, 2017a). The online courses are diverse in nature as they can be offered anywhere in the world to students of different ages, genders, and professional backgrounds (Ferranti, Accarrino, & Cofelice, 2016). The students are offered convenience in terms of time and place, and the schedule is flexible. Moreover, online courses are available when there is no availability of such courses locally. The enrolled students aim at gaining future economic benefits, professional achievements, or simply enjoyment (Costley & Lange, 2017a; Leire et al., 2016; Sarfarz et al., 2021). Moreover, the reason for students' participation in online courses is that there is a need to analyse the reasons that influence students' decisions to continue learning through online courses in the future. In online courses, the issue of participation is clear. The motivation level of students may decline, resulting in lower engagement (Leire et al., 2016). The reputation of online courses, perceived usefulness, openness, and satisfaction of students are the potential influences on the intentions of students to continue the use
of online courses in the future (Alraimi, Zo, & Ciganek, 2015). However, it is crucial to
overview the decisions of instructional design and grade load, which may influence the
continuing decisions of online course users.

The germane load is defined as a set of congenital resources that are deployed for the
installation of schemata in human memory. It is a fact that the human capacity to hold
information in the long run is vast; however, the working human memory is limited and
can overburden easily. The current study argued that there was a greater load when
they observed that some instructional formats could increase cognitive load and
learning as well. In an online learning system, there is a need for an effective instructional
design because of the physical absence of the teacher. Through an effective
instructional design, students become able to process information and maintain focus
with improved understanding, which is often lacking in e-learning systems (Horzum, 2017;
McAdoo, 2018; Tseng & Walsh, 2016). In this regard, it is important to investigate the
instructional design and germane cognitive load. The level of understanding of content
delivered through instructional design among the students is revealed through the
general cognitive load (Lange, Costley, & Han, 2017). The COVID-19 period can be seen
as the best time to test the cognitive load theory, as the paradigm shift to online earning
has raised many issues related to workable human memories. The cognitive load theory
argues that the amount of working memory can be used to permanently store
knowledge, and the storage ability can be enhanced by the optimal usage of certain
cognitive resources. Moreover, the combination of an effective design of instructions can
be used to improve the behavioural intention towards online courses, which may help in
exploring new ways of promoting e-learning in the future.

Many prior studies have examined that the instructional designs are advantageous for
the continuing intention of students towards online courses. Researchers generally
accept that a high level of germane load results from the use of an effective instructional
design (Ginns & Kydd, 2019; Roelle, Glogger, & Waldeyer, 2020). A high level of germane
load results in learning, which positively influences the instructional design. The focus of
an instructional design is on the instructor controlling the learning environment (Costley &
Lange, 2017b). Additionally, focusing on the structure and layout of the overall course
plan in the instructions improves how well online students perceive their learning
(Caskurlu, 2018; Naseem et al., 2021). The research studies have found a positive
association between e-learning intention among students and instructional design. The
instructional design has been conceptualised as a method to support learning among
individuals and increase interaction (Wongwatkit, Panjaburee, & Srisawasdi, 2020). Law,
Geng, and Li (2019) have promoted factors of instructional design, including the design
of methods, curriculum development, time parameter establishment along with norms,
and effective use of the medium.

The research regarding virtual learning growth describes that the development of online
learning is associated with the satisfaction level of teachers and learners and their
willingness to continue participating in these online programs. The achievement of online
education depends on the learner’s acceptance and willingness to practice and
participate in these programs. The actual achievement of virtual education is
participation from the learner’s side, with their complete interest and involvement.
Therefore, Chinese educational institutions have their own point of view about online
learning courses; they considered online programmes as a tranquillizer factor during the
Outbreak of COVID-19. Various institutions transformed their courses into fully online courses from a single course. The institutions used the course outline for the virtual educational programs with content from the Chinese Ministry of Education during the course restructuring.

During this outbreak of COVID-19, the learners developed more expertise for online learning programs, and they showed their interest in learning about all methods of online education programs. The learners accepted this transformation from conventional learning, so during the lockdown in China, students actively showed their interest in the virtual education program rather than staying home with no learning. These online platforms provided by the institutions with the support of the Ministry of China will have a strong influence on the education system. Teachers and students will willingly participate in these programmes and find ease in virtual learning as a result of the post-pandemic period that will continue. The cognitive processing load of the online learners during COVID-19 can be alleviated by e-learning personalization. E-learning personalisation (ELP) is a set of options that, instead of receiving instructions in a uniform manner, aid and guide learners in processing the contents. The ELP basically represents the system that enables learners to find the most suitable online course. This process has been shown to reduce negative aspects of cognitive load (Mayer, 2017).

The present research has been based on a survey of a group of students at Fuzhou University, China. It was done to analyse whether students are receiving instruction as per the instructional design model of Law et al. (2019), also reflecting higher usage intention and greater load. The instructional design model by Law et al. (2019) enhances the learning experience of students. Moreover, it contributes to the continuing intentions of students to use e-learning in the future because of good experience. Keeping these factors in consideration, the present research investigates the association between germane load and instructional design, future behavioural intention and instructional design, and future behavioural intention and germane load. Moreover, it is supposed that students have the intention to continue e-learning because of the higher understanding received by the instructional design. Therefore, the instructional design is considered to have a mediation influence on the association between future behavioural intentions and German load. The impact of the German load on the intentions of students to use e-learning is also determined by ELP. Thus, the study has employed the ELP as a moderator between the general load and the intentions of students for using e-learning.

**LITERATURE REVIEW**

According to the report of UNESCO in 2017, there are approximately 264 million kids and teenagers who were unable to seek education from an educational institution. Due to the outbreak of COVID-19, the prevailing situation has created more challenges to cope with this alarming issue. Due to the widespread wave of this virus, the country implemented lockdown as a result of this uncertain environment, which resulted in a transformation of conventional face-to-face learning to virtual teaching and learning programs. Because of this lockdown, all educational institutions, including universities, colleges, and schools, were closed for an undefined period, which was a need of an hour, and for the health and life safety of people (Martinez, 2020). However, in such an emergency all over the world, it emerged as the need of the hour to seriously restructure,
restore, and mainly reconsider the policies of the education system because this pandemic affected all sectors of life, so it hit badly the educational sector as well. Learning through education, either formal or informal degree programmes, had a huge impact due to pandemic situations all over the world. Therefore, it was a firm belief among the educational sector, students, and teachers that nothing could replace the conventional face-to-face educational method for important formal programmes and degrees; however, teachers and learners also believed that face-to-face communication was considered an essential part of learning, but on the other hand, successful virtual programmes transformed this mindset as well. However, it is considered an aftershock of the emergency that conventional teaching transformed into a virtual learning method. These online educational programmes are the latest way of transformation, such as seminars being transformed into webinars and communication shifting into virtual from personal and face-to-face classrooms being transformed into Zoom classrooms.

During the pre-COVID period before the spread of pandemic crises, all the courses and degrees through virtual learning were generally considered non-formal learning programmes; however, the transformation in the educational system emerged in the emergency as the new way of academics. This situation gradually changed the formal programmes of learning, and it would continue until the emergency exists in this world. Many platforms are famous for their virtual communication programmes that would support in a post-COVID-19 situation to transform the complete system of learning and give the system a unique direction globally, so some platforms are such as Start.me, Neo, Classsime, Classwize, Ted-Ed, Coursera, Google Classroom, Bakpax, Pronto, Skillshare, ClassDojo, Edmodo, Blackboard Learn, Parlay, Docebo, Feedback Fruits, Udemy, WeVideo, WizIQ, Flipgrid, Codeacademy, Gynzy, Adobe Captivate, Seesaw, Edx, GoGuardian, Elucidat, Kami, Pluralsight, G Suite, Otus, Articulate 360, Floop, Future Learn, Hapara, Shift, Lectora Inspire, Kialo Edu, Buncee, LanSchool, and many more. Virtual programmes develop inquisitive behaviour among learners, and due to this pandemic situation, the learners exist in the de-schooling culture. After all, the coronavirus transformed our traditional schools into Zoom classrooms, where students study online for their formal degrees.

According to Lederman (2020), the prevailing emergency in the world has made the learners and students bound to accept the e-learning programmes because they have no other option due to the uncertainties; they learn and interact with each other online rather than to give a break to their degree. DQ Institute (2019) stated that the teaching staff offers digital skills to their students with the support of digital intelligence, and these skills are on the verge of challenges regarding cyber issues, whereas the achievement and success of these online platforms depend upon the students and teachers active participation and their all upcoming new online opportunities, which depend upon the success of digital learning programmes, particularly due to the current emergency all over the world due to the COVID wave, in which the learners have no other option other than online learning. After the outbreak of the coronavirus, life has drastically changed upside down. All sectors of life have been facing alarming issues. In the same way, the education sector has also threatened challenges at all levels, such as the elementary level to the kindergarten level. With the passing time and uncertainties due to the undefined lockdown, the number of challenges has increased at the institution, teacher,
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and learner’s level (EdSource, 2020). Besides all the efforts made to minimise the challenges during the wave of viruses, some people are trying to avail themselves of this period as an opportunity to get some business rewards.

CONCEPTUAL FRAMEWORK

In the theory of reasoned action, a theoretical foundation for behavioural intention could be found. The process resulting in an individual’s course of action is defined by the theoretical framework of behavioural intention (Nisson & Earl, 2020). A cognitive decision is involved in behavioural intention, which influences an individual to conduct a specific behavior. The COVID-19 period can be seen as the best time to test the cognitive load theory, as the paradigm shift to online earning has raised many issues related to workable human memories. The cognitive load theory argues that the amount of working memory can be used to permanently store knowledge, and the storage ability can be enhanced by the optimal usage of certain cognitive resources. Thus, based upon the theories of reason action and cognitive load theory, the study has drawn the following conceptual framework (Figure 1).

![Figure 1. Conceptual Framework](image)

The intention of individual results in certain behavior. Moreover, individual perception as a result of specific behavior influences the decision to commit a specific behavior. The decision of intention is contributed by subjective norms and attitudes. The positive or negative feeling of an individual about the behavior is represented by attitudes. Social pressure is based on subjective norms, which influence an individual to conduct a certain behavior. The plans of an individual are represented by the behavioral intention depending on the cognitive processes in the decision-making process for conducting an act. Moreover, it was described by Yu, Qian, and Zhou (2018) that the perceived ability of an individual to complete a certain act successfully beyond social norms and attitudes plays a role in making a decision based on the intention. The significance of understanding anything for doing it is highlighted, which is regarded as perceived behavioral control. The future behavioral intention of students to enroll in e-learning courses is a crucial success factor in e-learning environments (Costley & Lange, 2017a).
The process of learning is benefited by higher levels of germane load in contrast to extraneous load and intrinsic load (Ginns & Kydd, 2019). How content is understood by students is represented by the germane load. It has a direct influence on the learning of students. Moreover, it has been claimed by some studies that the effort to develop a schema for having an improved understanding of the information processed is a germane load.

When fewer cognitive restrictions are imposed on students, this results in a germane load (Chang et al., 2017; Ginns & Kydd, 2019). It is rational to say that when fewer cognitive restrictions are experienced by students within their working memory, their perception of ease of use is high. They need less effort to understand the learning content within an e-learning environment. Thus, it can be concluded that perceived ease of use results in a higher germane load, which enhances future behavioral intention. The positive relationship between germane load and future behavioral intention for learning through online courses is supported by rare studies. However, evidence exists for an indirect association between the cognitive load and the intention to use mobile devices for the completion of certain tasks (Costley & Lange, 2017b). This refers to the existence of three elements linked with the process of learning, including extraneous load, intrinsic load, and germane load (Roelle et al., 2020). The complexity of learning content and previous knowledge of students is reflected by the intrinsic load (Daramola, Oladipupo, & Afolabi, 2017; Lange et al., 2017). Lack of an effective instructional design can result in extraneous cognitive load, which may cause unnecessary processing. Thus, extraneous cognitive load creates a negative influence on the students’ learning experience (Chang, Liang, & Chou, 2017; Ginns & Kydd, 2019). Though the studies on the issues related to germane load are increasing over last decade, however, the impact of the germane load on the online course is still an unexplored area. Thus, the study has proposed the following hypothesis.

**H1:** Germane load has a significant impact on the behavioral intention of an online course.

Concerning germane load, processes are used to construct schemas such as exemplifying, interpreting, differentiating, inferring, and information organization (Lange et al., 2017; Mohsin et al., 2021). The effort of students to develop schema reflects germane load. It is related to the motivation and interest of students, which are involved in the formation of such schema. The formation of a schema is linked with the germane load. Thus, it is contradictory to say that schema formation is not related to germane load. However, it refers to the development of learning strategies, which are adopted by students. Irrespective of the relationship between schema formation and formation of learning strategies and germane load, it is generally accepted that how learning content is understood by students is referred to as germane load. This notion has been reflected by Chang et al. (2017) through a construct, which relates germane load and understanding of certain instructions given to the students. The germane load can be improved through the development of a high-quality instructional design. This results in an improved experience of learning among the students (Lange et al., 2017).

The instructional design increases with the effective use of germane load (Ginns & Kydd, 2019) (Roelle et al., 2020). Different ways can be used to improve the level of germane loads, such as presentation style of content, clarity of instructions for completing tasks.
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In the curriculum development or setting, the document distribution with important outcomes and goals of the course are included. In online learning, assignments and learning activities are crucial. However, for completing the activities and assignments, there is a need for clear instructions, which gives an idea to students for successful task completion. Moreover, there is a need for students to know about dates for completing successfully. There is a need for instructions to give clear instructions, which do not require further explanations. The irrelevant and redundant instructions for the learning process must not be given by instructors (Daramola et al., 2017). Moreover, the satisfaction level and learning of students are improved with tightly controlled elements of instructional design (Costley & Lange, 2017b). It is clear from previous research studies that material should be presented in a way that draws a student’s attention. Moreover, clear explanations should be given for the achievement of tasks and learning obligations. It has been found that germane load improves the level of instructional design techniques. When the online learning experience is effectively and efficiently supported by instructors, a high level of learning is perceived by students. It was shown by Caskurlu (2018) that different instructional behaviors such as organization and design result in improved learning of students within an e-learning environment. The instruction design model of Law et al. (2019) was examined by Caskurlu (2018), which is based on a general plan of the course. Thus, the present study has proposed the following hypothesis.

**H2:** Germane load has a significant impact on instructional design.

The influence of high cognitive load on the users of mobile phones while performing certain activities with their gadgets was examined by Costley and Lange (2017a). The research was based on previous studies reflecting auditory and visual distractions resulting in a high level of extraneous cognitive load. Different auditory and visual distractions in the environment represented a high cognitive load. It was reflected by the findings that such distractions were not received by individuals experiencing high cognitive load because of visual and auditory distractions differing from the group. Moreover, increased satisfaction is linked with a higher efficiency level. The satisfaction of users resulted in a higher behavioral intention for the future. In general, it was found by the findings that environmental distractions causing an increase in cognitive load create a negative influence on perceived efficiency. This ultimately creates a negative impact on the satisfaction level of users and the intention to use mobile devices in the future. The levels of germane load to be linked with the behavioral intention for the future were not analyzed by Costley and Lange (2017a). However, an indirect relationship was found between future behavioral intentions and cognitive load. There are five segments of instructional design, which include curriculum development, developing methods, time parameters establishment, developing norms, and effective use of the medium (Law et al., 2019). Some of the established norms in-classroom courses may not exist in online classes. Thus, there is a need for instructions to be transparent and explicit in the process of planning (Law et al., 2019). The significance of the process of design has been emphasized by Law et al. (2019). The researchers stated that students should be given a clear idea for the general course plan by incorporating all the five aspects of design for maintaining their direction and focus. A descriptive account of content to be addressed in every category proposed by Law et al. (2019) has been provided by Caskurlu (2018). This can make students understand the course design and get maximum benefits for achieving success.
these activities and assignments. For this reason, time parameters are established to support students in going on with the course. The focus of effective utilization of the medium is to help students deal with technological adoption problems for course completion. This has been described by Caskurlu (2018) to support students in taking advantage of the e-learning environment. Further, group norms are established, which means sticking to ‘netiquette’ proposed by Law et al. (2019). In this regard, students must be supported by instructors to ensure that they adhere to the behavioral norms, which are acceptable within the online learning environment, such as interacting online in a good way.

The current study argues that the intention to use is determined by germane load and instructional design. Therefore, instructions should be designed in a way to lead these perceptions among students for online courses (Almajali, 2020). Researchers have highlighted this sentiment and claim that there is a need for developing strategies, which aim at adding to the behavioral intentions for the future. The behavioral intentions in the future can be promoted through specific design methods of instruction, but this has no empirical evidence. The behavior intention for the future among students enrolled in online course design was analyzed. The course design aimed to increase interaction with instructions and fellows. It has been revealed that future intention behavior is influenced significantly by the course design. This increase is attributed to a high level of perceived ease of use and perceived usefulness. The findings are useful for instructional design focused on students’ interaction. A high level of behavioral intention for the future is based on students’ perceptions of the design. The way in which future behavioral intentions for using online learning systems are influenced by instructional design was analyzed by Cheng and Chau (2016). The focus of the researchers was on perceived learning support as an element of instructional design. Therefore, the acceptance of e-learning systems by students is based on instructional design. The findings reveal that there is a positive relationship between the future behavioral intentions of students and instructional design. A few research studies have revealed positive influences created on future behavioral intentions by an instructional design. There is a need for extensive research on comparing new design techniques, which can influence students’ future behavioral intentions. The analysis of learning support and its role in formulating future behavioral intentions can be expanded further by incorporating the way in which student learning is supported by effective course planning (Law et al., 2019). Moreover, the future behavioral intention of students is positively influenced by some elements of in-class design, such as diversity media usage (Costley & Lange, 2017b).

As per the previous studies, the effectiveness of such a design in decreasing extraneous cognitive load will result in improve germane cognitive load. Moreover, the intention of using e-learning in the future will be increased. The current study examines the mediating role of instructional design in the relationship between the germane load and students’ behavior intention about the online course. The present research has tried to expand a little further by relating high germane load with the behavioral intention for the future. Moreover, the focus of the current research is on detailed decisions for instructional design rather than user interface to improve communication with the students for the achievement of learning tasks. The researchers examined the formulation of an instructional design in an e-learning environment as a part of an effective design of instructions. It was depicted by results that the focus of developing an instructional design
on reducing cognitive load results in an improved level of behavioral intention for using e-learning in the future. However, it was revealed by the study that there is a need for reducing cognitive load while the development of instructional design. This would lead to high behavioral intention among the users for using e-learning in the future. Thus, the present study has proposed the following hypothesis.

**H3:** Instructional design has significant impact on the student’s behavioral intention about the online course.

**H4:** Instructional design mediates the relationship between the germane load and the student’s behavioral intention about the online course.

According to the Lange (2018), the ELP is one of the learners’ engaging factors, that bound the learners in e-learning environment. He further continued that the ELP helps in marinating the higher level of situational interest in learning activities as well their intention towards online courses. Many prior studies have found that the ELP helps the learners in controlling the online contents, and it happens through the selection of hypertexts (Lim, 2016; Owston et al., 2011). During Covid-19, as education sector around the world has undergone a paradigm shift from face-to-face learning to the online mod of learning the institutions and online service providers around the world are striving to establish e-learning personalized platforms, that significantly affects students’ ignition towards the online courses.

Furthermore, when learners are able to process information from one portion of content before proceeding to the next portion, more efficient transfer of information from working memory to long-term memory takes place (Mayer & Moreno, 2003), which leads to higher levels of achievement (Doolittle et al., 2015). It indicates that the in the process of germane load the e-learning personalization matter. The covid-19 offers a unique sample setting and to explain the nature of the relationship between the germane load and students’ intentions towards online courses the study has broached e-learning personalization as a moderator in the relationship between the germane load and behavior intention of students in online courses. Thus, the study has proposed the following hypothesis.

**H5:** The e-learning personalization moderates the relationship between the Germane load and behavioral Intension.

**METHODOLOGY**

The objective of the present study was to examine the influence of germane load on behavior intention of the students with mediating role of instructional design. The current study also investigated the moderating role of e-learning personalization on the relationship of germane load with behavioral intention. The nature of this study was cross-sectional and the data for all the variables of the current study were gathered from the Chines students at the same point in time. The target population of the current study was Chines Universities students. In the present research, the unit of analysis was the individual. For the collection of data from the students, a questionnaire of self-administered nature was applied. The questionnaire method to collect the data is one of the suitable techniques to be applied to collect the primary data due to time and cost-effectiveness (Sekaran & Bougie, 2016). The stratified sampling technique was employed to collect the
data from the respondents of the study. Furthermore, the G*Power software version 3 was also engaged to confirm the sufficiency of the sample size based on some statistical factors (Faul, Erdfelder, Lang, & Buchner, 2007). At the level of 5%, of significance, the current study got a sample size of 145 at the statistical power of 0.95. The 290 questionnaires were distributed which was double to sample size. The 200% questionnaires were disseminated to address the problems of low response rate. Out of 290 distributed questionnaires, 208 questionnaires were returned and able to use in the analysis. The survey comprises a cover letter and questions related to the variables. The cover letter explains the objective of the study, the privacy of the gathered data, and directions on how to respond to the question. The scale items to measure the variables were adapted from the existing studies. Four items were used to measure the Germane load adapted from the study of Lange and Costley (2018), four-item for instructional design was adapted from the study of Klepsch and Seufert (2020), Five items for behavioral intention were adapted from Shroff, Deneen, and Ng (2011), and five items for e-learning personalization form (Klašnja-Milićević, Vesin, Ivanović, & Budimac, 2011). “Likert scale” of five points was applied to measure the items.

**ANALYSIS AND DISCUSSION**

The present study was analyzed the collected data by employing “Statistical Package for Social Science” (SPSS) version 22 and 2nd generation software, denoted to “Partial Least Squares Structural Equation Modeling” (PLS-SEM). The SPSS was employed to check the normality of data and characteristics of the respondents (Hair, Money, Samouel, & Page, 2007), whereas the Smart-PLS was employed to investigate the proposed association in the model of the current study (Henseler et al., 2014).

**COMMON METHOD VARIANCE (CMV)**

Variations may be a possible problem if the individual provides self-reported data to examine the items of independent and dependent constructs (Richardson, Simmering, & Sturman, 2009). SPSS was used to test CMV by performing “Harman’s single factor” test. The results indicated that the first attribute contributes only 24.21 % of the inconsistency in the data. Hence, results indicated that CVM was not a hazard in the current study.

**ASSESSING THE OUTER (MEASUREMENT) MODEL**

The outer model is used to assess the composition of the model based on some specific quality standards (Henseler et al., 2014). The measurement model was examined in three steps, in the first step, composite reliability was tested and then convergent validity and discriminant validity were measured. Composite reliability was assessed by the value of loadings, alpha, and CR whereas, convergent validity was tested by using the value AVE, and discriminant validity was estimated by the criteria of Fornell and Lacker (1981) and the value of HTMT. To achieve the composite reliability, the loadings must be greater than 0.50, the alpha (α) must be above 0.6 and CR must be above 0.7 (George & Mallery, 2003). For the convergent validity, AVE’s value must be above 0.5. Results of the outer model are presented in Figure 1 and Table 1, Table 2, and Table 3.
Figure 2.
Inner Model Assessment.

Table 1.
Reliability and Validity

<table>
<thead>
<tr>
<th>Construct</th>
<th>Indicators</th>
<th>Loadings</th>
<th>Cronbach’s alpha</th>
<th>Composite Reliability</th>
<th>AVE</th>
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</tr>
<tr>
<td></td>
<td>ELP3</td>
<td>0.825</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ELP4</td>
<td>0.872</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Table 1 shows that the value of loading for all items is above 0.5 and the value of alpha (α) of all variables is higher than 0.7. These values indicated that this study achieve reliability. The values of CR are higher than 0.7 and values of AVE are higher than 0.5 that confirming the convergent validity.

Table 2 presents the output of Fornell and Lacker (1981). Results show that this study achieves discriminant validity because the square root of the AVE of every variable is greater than the correlation with other variables.

Table 3 shows the value HTMT ratios. HTMT ratios are less than 0.85 which confirms the discriminant validity (Kline, 2011).

**Structural model Assessment**

After the confirmation of the reliability and validity of the outer model, there is a need to investigate the proposed associations within the constructs (inner model). The
examination of the inner model includes the estimation of the association among the variables of the model. The inner model was estimated by employing the PLS-SEM algorithm and method bootstrapping (Chin, Marcolin, & Newsted, 2003; Kousar, Zafar, Sabir, & Sajjad). The output of the inner model assessment is presented in Figure 2 and Table 4.

![Figure 2. Structural Model Assessment](image)

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Relationship</th>
<th>Beta</th>
<th>STD</th>
<th>T Value</th>
<th>P Values</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₁</td>
<td>GL -&gt; BI</td>
<td>0.259</td>
<td>0.070</td>
<td>3.723</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₂</td>
<td>GL -&gt; ID</td>
<td>0.495</td>
<td>0.058</td>
<td>8.488</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₃</td>
<td>ID -&gt; BI</td>
<td>0.297</td>
<td>0.065</td>
<td>4.587</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₄</td>
<td>GL -&gt; ID -&gt; BI</td>
<td>0.147</td>
<td>0.037</td>
<td>3.998</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₅</td>
<td>GL*ELP -&gt; BI</td>
<td>0.110</td>
<td>0.041</td>
<td>2.709</td>
<td>0.007</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Table 4 presents the results of the structural model. The results elucidated that germane load has a significant association with behavior intention (β= 0.259, P= 0.000). Hence H₁ was supported. Additionally, germane load significantly influences the instructional design (β= 0.495, P= 0.000), and instructional design has a significant effect on the behavior intention (β= 0.297, P= 0.000). therefore H₂ and H₃ were also supported. Furthermore, instructional design has a significant mediation effect in the relationship of germane load and behavior intention (β= 0.147, P= 0.000). Findings revealed that E-learning personalization significantly moderates the relationship of germane load with behavior intention (β= 0.110, P= 0.007), thus H₅ was supported.
DISCUSSION

Hypothesis H1 has been supported by the results showing a positive correlation between germane load and future behavioral intentions during COVID-19. The results are crucial concerning the use of an instructional design for using e-learning in the future. The instructional design appears to be correlated with future behavioral intention. However, the specific features of an instructional design involved in the model of Law et al. (2019) have been neglected by previous studies. A correlation was found between instructional design and cognitive load, which was based on the relationship between establishing social ties and students (Wongwatkit et al., 2020). However, the relationship is not based on the designing of an instructional design for the overall course plan. In particular, this research has found an association between instructional design and future behavioral intentions, which set the general course plan by effective communication regarding due dates, objectives, topics, and the way of using the e-learning system. The learning experience becomes useful through instructional design decisions, which develop an interest among the students for using e-learning in the future. It can be concluded that the focus of instructional design for e-learning should be on the transparency of curriculum representation for promoting its use in the future during COVID-19.

The findings of the research supported Hypothesis H2, stating a positive relationship between germane load and instructional design during COVID-19 (Ginns & Kydd, 2019; Roelle et al., 2020). The ways of improving germane load through effective instructional design have been analyzed by the research. For this, the instructional design should avoid redundant information and the creation of distraction from the learning content among students (Daramola et al., 2017). However, the current study is the first of its nature to analyze the association between ways of setting general course by the instructor and germane load. Students are given clear instructions about the use of an online learning system with a description of course goals, topics, and the development of time frames for maintaining their focus on the process of learning. This results in an improved understanding of teaching content. Instructions must develop instructions, which improve the germane load level. The findings have also supported Hypothesis 3, stating a positive correlation between germane load and level of behavioral intention for the future. The relationship between the two variables was not validated by any research. Therefore, the present study has found a direct and positive relation between germane load and future behavioral intention as the former is linked with the understanding and learning of students related to given instructions (Ginns & Kydd, 2019; Lange et al., 2017; Roelle et al., 2020; Li et al., 2021).

It is argued that during COVID-19, when students perceive a positive learning experience, it is evident that they would like to continue e-learning in the future. Moreover, learning is reflected through elements of future behavioral intentions such as germane load and real usage intention. There is an association between learning and germane load. It can be assumed that germane load results in improved future behavioral intentions. Some research studies have linked cognitive load with future behavioral intentions. In this regard, the current study is first of its nature to related germane load with the future’s behavioral intentions.

The findings also support Hypothesis 4, which stated the mediation influence of instructional design on the relationship of germane load effectiveness and future
behavioral intention. The previous research studies make it clear that instructional design is positively influenced by future behavioral intentions (Wongwatkit et al., 2020). There has been no such investigation made by previous studies on the mediation variables. The findings of the current study conclude that the relationship between future behavioral intentions and instructional design is mediated by the germane load. It is sensible to accept the mediation influence of germane load as the level increases through an effective instructional design usage; the behavioral intention for the future is increased among the students.

The findings of the study have provided support to the hypothesis as ELP moderates the relationship between the germane load and students behavioral intention towards online class. This idea has been suggested by the findings of Nikou and Economides (2019). It is suggested that a high level of usage intention is shown by the students who receive instruction designed for reducing general cognitive load. The present study has not simply promoted a low cognitive load, which makes the instructional design improve continuous usage. Rather, the study analyzes the mediation influence of germane load on the future behavioral intentions of students. It is crucial in providing empirical evidence about the mediation influence of higher germane load on the relationship between instructional design and behavioral intentions for the future. Instructors are recommended to improve germane load through the execution of an instructional design for setting a general course plan for e-learning. Moreover, the results are critical concerning the courses like online courses. The dropout rate has been high within online courses. The instructional design model of Law et al. (2019) can motivate students during COVID-19, for continuing the use of online courses because of the higher germane load.

CONCLUSION

For nearly 77 million children, the pandemic has taken away their classrooms for the past 18 months. Schoolchildren worldwide have lost 1.8 trillion hours and counting of in-person learning due to COVID-19 lockdowns. The intention of students for utilizing online courses must be kept in mind by instructors. This will allow the instructions to develop a supportive online learning environment promoting the intention to continue its use in the future. Therefore, e-learning environments must be designed in a way to promote learning among students. This notion is supported by previous studies considering the e-learning environment effective in promoting continuing intention among students for online learning in the future.

The current study has investigated the relationship between germane load and instructional design, future behavioral intentions and instructional design, and future behavioral intentions with the germane load. The survey was conducted among the students of China who participated in online learning programs. Moreover, the mediation influence of germane load on the relationship of future behavioral intentions and instructional design has been studied. It was found that all the relationships were positively correlated. The mediation influence of instructional design was found between the relationship of future behavioral intentions and instructional design. As per the model of Law et al. (2019), an instructional design is a method of communication with the students regarding the general course plan for e-learning. The findings reflect the significance of developing an effective instructional design that improves students’ understanding.
regarding course instruction and usage intention in the future (Ginns & Kydd, 2019; Roelle et al., 2020).

**SUGGESTIONS**

The research findings must consider few limitations. As the present study has used a survey questionnaire method including cross sectional data that was collected at a single point in time, future study might choose longitudinal data collection method in order to expand the research scope. The study is carried out on sample of single university, a study with much larger sample is needed. The current study suggests that the understanding of students is improved when clear instructions based on a higher germane load are given for successfully using online learning courses. Thus, instructors must properly communicate the general course plan in an effective way of promoting e-learning usage in the future during the COVID-19 pandemic.

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**Consent to Participate:** Yes

**Consent for publication and Ethical approval:** Because this study does not include human or animal data, ethical approval is not required for publication. All authors have given their consent.

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