

DISTANCE EDUCATION EFFECTIVENESS AND BARRIERS IN DEVELOPING A POSITIVE ATTITUDE TOWARDS SUSTAINABILITY: MEDIATION OF INNOVATIVENESS

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Received: 16/08/2021 Accepted: 04/04/2022

ABSTRACT

The objectives of this study are to investigate the effectiveness of distance education in fostering a positive attitude towards sustainability, examine the effects of barriers to sustainability in distance education in terms of the attitude towards sustainability and investigate the mediating effect of innovativeness in the aforesaid relationship. Online survey questionnaires were used to collect data from 663 final-year students enrolled in courses offered through distance education mode at selected universities in Malaysia. The data analysis was based on the partial least squares structural equation modelling (PLS-SEM) approach. This study attests that distance education is effective in nurturing a positive attitude towards sustainability through the mediation of innovation. Although the barriers related to distance education seemed to pose an inverse effect on the attitude towards sustainability, it did not seem to have any significant effect on innovativeness. Future research may investigate the further applicability of this study's model in various contexts related to the role of distance education in achieving the goals of the sustainable development agenda.

Keywords: Attitude, barriers, distance education, innovativeness, online education, sustainability.

INTRODUCTION

The recent coronavirus disease 2019 (COVID-19) pandemic has drastically changed the higher education landscape and given rise to long-term impacts on institutions of higher education. The movement control order and the need to stay at home have necessitated holding classes online for distance learning students at institutions of higher education. Notably, there has been a surge in enrolments for online courses since March 2020 (Impey, 2020), where people aged 25 to 49 expressed greater enthusiasm for online-only options than people aged 18 to 24 or 50 or older (McKenzie, 2020). Together with the rising public participation in lifelong learning (Ministry of Higher Education Malaysia, 2011), the contribution of developing communication technologies and the increasing demand due to changing lifestyles have created an educational niche opportunity for distance education to be upgraded from being a supplementary aid to a distinctive solution. Universities that are successful in this transition period will be able to provide quality education that caters to the needs of future graduates. Since distance education seeks to equip this digital generation with learning that is necessary for their survival, its essence is in nurturing sustainability or a way of life that balances the immediate needs for commerce, living, habitation, food, transportation, energy and entertainment with the future needs for these resources.

Distance education has a history that spans almost two centuries; thus, it has experienced significant changes in the way learning occurs and is communicated (Moore et al., 2011). Modern distance education involves the employment of technology to aid and enhance learning (Al-Arimi, 2014). It has also been acknowledged as a mechanism through which sustainability can be achieved (Aleixo et al., 2018; Azeiteiro et al., 2015; Ramos et al., 2015). Since sustainability has not been well integrated into mainstream university operations and curricula (Larran Jorge et al., 2015; Waas et al., 2010), there is a crucial need to incorporate sustainability into university courses and programmes.

Although distance education has been acknowledged in previous studies as a mechanism through which sustainable development can be achieved (Aleixo et al., 2018; Ramos et al., 2015), learners' grasp of knowledge and practice regarding the concept of sustainability has been below expectations (Azeiteiro et al., 2015). This has made the assessment of the sustainability nurtured through distance education programmes/courses a complex issue (Md Harizan & Hilmi, 2019), particularly in achieving the intended outcome of the sustainability agenda among students. To date, only a few studies have addressed this topic (Bacelar-Nicolau et al., 2009; Azeiteiro et al., 2015). Meanwhile, Bacelar-Nicolau et al. (2009) evaluated the extent to which a master's programme with environmental and social science content would succeed in expanding students' awareness and knowledge through e-learning. Azeiteiro et al. (2015) conducted a descriptive analysis to assess the effectiveness of e-learning in delivering education related to sustainable development using a case study approach.

Attitude has been found to be an important determinant of most sustainable behaviours (Kim et al., 2020; Passafaro, 2019; Pouratashi & Zamani, 2021). Indeed, attitudinal change is a prerequisite to behavioural change (Arbuthnott, 2009). The significance of attitude in transforming the sustainability agenda in the context of higher education has also been acknowledged (Anderson, 2017; Chawla & Manhas, 2015). However, the method by which attitude towards sustainability is formed through the process of delivering lessons via the distance education mode has yet to be explored further. The importance of online and distance education in shaping the right attitude towards sustainability cannot be ignored since the graduates of these programmes are expected to be well equipped with learning that is of great economic significance and with strong social and environmental impacts.

To understand the notion of attitude towards sustainability derived from enrolment in online and distance education programmes, it is important to focus on the criteria that define the nature and effectiveness of online and distance education programmes in shaping learners' attitudes towards sustainability. This can be done by evaluating the key criteria that give rise to the sustainability behavioural outcome of learners. The evaluation of the effectiveness of distance education starts with the distance learning experience, which shows an extremely high level of student motivation and satisfaction with the distance education programmes (Martinho et al., 2010; Pinto de Moura et al., 2010). Student's motivation, satisfaction and quality issues have been found to be greatly linked with the effectiveness of distance education in delivering the sustainability message (Dimitriou, 2015; Harris & Martin, 2012; Markova et al., 2017). However, it has also been revealed that although the new virtual technologies are important, they are not sufficient because they do not encourage the development of key learning skills, attitudes and values towards environmental conservation and sustainable development on the same level as face-to-face fieldwork (de Oliveira, 2012; Oliveira et al., 2017). Therefore, further investigation is needed to explain the influence of the effectiveness of distance education in forming distance learners' attitudes towards sustainability.

Meanwhile, barriers are seen as obstacles to building a positive attitude towards sustainability in higher education settings (Aleixo et al., 2016, 2018; Bell et al., 2017; Berge, 2013; Lloyd et al., 2012; Markova et al., 2017). Studies have rarely investigated the impact of barriers within the context of online and distance education on attitude towards sustainability. Thus, it is important to understand the barriers hindering sustainability in distance education and their impact on the development of a positive attitude towards sustainability in an empirical manner.

In striving for sustainability in higher education, innovative teaching approaches and methodologies are essential (Laurie et al., 2016). As courses run via distance education mode are mainly facilitated by technology, innovativeness is pertinent in shaping an individual's attitude towards sustainability. Researchers have rarely conducted empirical studies examining the influence of innovativeness on the attitude towards sustainability of distance education. Hence, by applying the conceptual basis posited by Siti Hajar Mohd Roffeei et al. (2016), which underlies the notion, it can be stated that innovativeness will mediate the relationship between the effectiveness of distance education, barriers to sustainability in distance education and attitude towards sustainability in distance education. Therefore, the objectives of the study are as follows: 1) to investigate the effectiveness of distance education in fostering a positive attitude towards sustainability of learners; 2) to examine the effect of barriers to sustainability in distance education on the attitude towards sustainability of learners; and 3) to investigate the mediating effect of innovativeness in the relationship between the effectiveness of distance education, barriers to sustainability in distance education and attitude towards sustainability of learners.

LITERATURE REVIEW

Attitude Towards Sustainability

Attitude is a learned predisposition to behave in a consistently favourable or unfavourable way with respect to a given object' (Schiffman & Wisenblit, 2015) and is considered to result from individual beliefs regarding behaviours and their consequences (Fishbein & Ajzen, 1975). It is important to focus on attitude because one's personal attitude towards the norm has a clear impact on intentions to act in a certain manner (Ajzen, 1991). Having a favourable attitude towards an object, people or idea is almost always an essential prerequisite for future behaviour or behavioural intention (Pouratashi & Zamani, 2021). Studies have reported significant positive effects of pro-environmental attitude on sustainable consumption behaviour (Jung, Choi, & Oh, 2020; Sesini, Castiglioni, & Lozza, 2020), tourism behaviour (Fang et al., 2018; Passafaro, 2019; Verma, Chandra, & Kumar, 2019) and general pro-environmental behaviour (Ertz & Sarigollu, 2019; Tian, Zhang, & Li, 2020).

The formation of a sustainability-oriented attitude has also been found to be vital within the higher education context, for example, sustainable behaviour on campus (Ibiapina, Cunha, Paiva, & Romero, 2020), even though we know it is an important determinant of sustainable behaviours in various contexts (Kim et al., 2020; Passafaro, 2019; Pouratashi & Zamani, 2021). Many sustainability programmes in institutions of higher education are designed to change attitudes towards the natural environment, society and economic well-being. Thus, if attitude change is to translate into altered behaviour, the process of education must extend beyond attitudes to assisting people to act in such ways (Arbuthnott, 2009). Various pieces of evidence have been found to support this notion. Anderson (2017) found a strong correlation between taking related university courses and attitude towards engaging in environmentally sustainable behaviour and activities, while sustainability-related modules have deeply impacted students' attitudes towards the sustainability agenda (Chawla & Manhas, 2015). Nevertheless, studies have yet to discover the attitudinal outcome pertaining to sustainability as the result of enrolling in online and distance education programmes (Oliveira et al., 2018; Silas Marques de Oliveira, 2012). It is believed that the concept of attitude towards sustainability within the distance education context may be understood in the context of learners' beliefs when they have been impacted by their respective distance education programmes. Thus, it is important to focus on the criteria that define the nature and effectiveness of online and distance education in shaping learners' attitudes towards sustainability. Apart from focusing solely on the attitudinal outcome of sustainability-related courses among learners, it is also imperative to investigate the criteria that provide a holistic view of the essence of online and distance education towards sustainability. This can be done by evaluating the key criteria of distance education from which the sustainability behavioural outcome of learners emanates.

Effectiveness of Distance Education in Fostering Sustainability

Over the past decade, a large number of distance education programmes have met the needs of learners, maintained a competitive edge for providers and created various learning opportunities in conventional learning both locally and internationally. Distance education is important because it enables the attainment of environmental preservation and sustainability due to its fewer travel requirements; although some face-to-face lectures have to be attended, the use of resources is still minimised due to the shorter duration of student time on campus and the utilisation of a paperless environment as a result of online and electronic-based lessons (Campbell & Campbell, 2011; Din, Haron, & Ahmad, 2013; May, Cox, Kroder, & Franklin, 2010; Md Harizan, Hilmi, & Atan, 2015, 2016, 2017). The environmental dimension of sustainability aims to achieve environmental protection by conserving and enhancing the resource base and staying within the earth's environmental limits in the long term (Waas et al., 2011). Other dimensions of sustainability, such as economic and social areas, have rarely been investigated (Md Harizan & Hilmi, 2019). Without sufficient insights in understanding the essence of the triple bottom line model (Elkington, 1994) within the distance education context, it will be much harder for institutions to evaluate the sustainability attainment of their distance education courses and programmes.

Various approaches have been used to evaluate the effectiveness of distance education in achieving sustainability. Some of these approaches include pedagogical challenges, teaching techniques and curriculum orientation (Figueiro & Raufflet, 2015), student motivation, satisfaction and quality issues (Dimitriou,

2015; Harris & Martin, 2012; Markova et al., 2017). General expectations, learning quality, teaching resources, pedagogical tools and evaluation, sustainability competencies acquired, satisfaction, interactions and reasons to pursue a new enrolment in distance learning programmes are the other approaches (Azeiteiro et al., 2015). Each approach has been deemed significant in forming a distance learning experience with the sustainability outcome to be embraced by learners.

Successful distance education and learning consists of text-based learning materials, organisational and instructional support, intensive study schools and tutorials, learning event designs, assessment tasks and material development teams, among others (Joliffe, Ritter & Stevens, 2012). Salmon (2004) suggested a five-stage framework comprising activities such as access and motivation, information exchange, online socialisation and knowledge development for a successful distance education approach. Based on existing studies, several elements underlying the effectiveness of distance education in sustainability may be analysed, namely, expectations of students, motivations and reasons for pursuing distance education programmes or courses, the quality of learning, evaluation and assessment, sustainability competencies acquired and satisfaction of learners.

Expectations of Students

Expectations can be defined as the preliminary thoughts that set the standard or reference point while one is carrying out a performance evaluation of a product (Akinci, Yurcu & Kasalak, 2018). Understanding students' expectations is the prerequisite that underlies the effectiveness of distance education in ensuring sustainability awareness and practices to be nurtured among them. The embodied elements of learning experiences gained while enrolling in courses via distance education mode are important factors that signify the expectations of distance learners from the programme. Student expectations normally deal with the acquisition of knowledge, research skills, competency development, and professional improvement and validation (Azeiteiro et al., 2015) as results of enrolling in the programme for future application in their work or jobs. It has also been revealed that students' general expectations of online and distance education are similar to those of face-to-face education (Martinho et al., 2010; Pinto de Moura et al., 2010). The majority of learners expect sustained improvements in their enrolled programme, including their interactions with the instructor, course content, course structure, facilities and assessment (Harizan & Hilmi, 2019). Such factors can be taken into consideration in developing a positive attitude towards sustainability after enrolling in distance education programmes/courses.

Motivation and Reasons to Pursue Distance Education Programmes/Courses

Students are motivated to pursue distance education programmes for various reasons, which include the will to pursue knowledge and competencies in sustainability, aside from attaining professional advancement (Azeiteiro et al., 2015), knowledge improvement and recognition, job requirements and self-development. This encompasses the achievement of personal ambition and higher living status, the desire to experience campus life, family and peer pressure and external factors such as reputation in the university and its surroundings (Harizan & Hilmi, 2019). Students with high motivation for distance learning programmes would also have a reason to return for new training sessions provided by the same university (Azeiteiro et al., 2015). Martinho et al. (2010) and Pinto de Moura et al. (2010) found that an extremely high level of student motivation for online programmes changed their attitudes about the environmental domains, thereby contributing to others' changing attitudes and behaviours as well.

Quality of Learning

Research has revealed that the quality of teaching activity significantly improved the attitude towards energy saving and carbon reduction among students in Taiwan (Chou et al., 2015). Notably, the quality of online and distance learning programmes can be indicated by several components, namely, the materials, electronic/online activities, learning strategies and acquired skills, group or collaborative work, teachers or instructors and e-learning management systems/portals (Azeiteiro et al., 2015). Learners were reported to be very positive about the learning quality via distance education, although a few of them expressed

unfavourable opinions regarding course materials and collaborative work (Md Harizan & Hilmi, 2019). Learning quality is strongly linked to the well-rated teaching resources by students, such as bibliographic resources, supporting texts and Moodle (e-learning platform) lessons (Azeiteiro et al., 2015). Therefore, it is believed that the quality of learning in distance education may also nurture a positive attitude towards sustainability among learners.

Evaluation and Assessment

The emergence of new educational materials in implementing innovative teaching approaches and pedagogies has, in turn, broadened the range of the assessment methods for students' competencies and deeper knowledge (Laurie et al., 2016). Project-based learning is generally preferred as a method of exposing students to sustainability issues since it enables assessment through case studies, games, simulations or roleplays (Thurer et al., 2018). On the other hand, evaluations based on slideshows, Internet sites, videos and online exams via Moodle/Learning Management System were rated low by the students (Azeiteiro et al., 2015). Transmission, which is susceptible to the quality of Internet infrastructure, may affect the audio and visual quality of the materials, thus causing a certain level of distraction while students attempt to answer online quizzes (Md Harizan & Hilmi, 2019). This situation may affect the attitude towards sustainability in distance education. Besides, the assessment of sustainability's key competencies in higher education also requires further research (Rieckmann, 2012).

Sustainability Competencies Acquired

Competencies for sustainable development in higher education programmes are important to achieve sustainability in the higher education context (Lambrechts et al., 2013). Courses in education for sustainable development pedagogies promote the learning of skills, perspectives and values necessary to foster sustainable societies (Laurie et al., 2016). Findings on the competencies derived from curricula pertaining to sustainability indicate mixed reactions in studies conducted in the field. According to a survey by Byrne et al. (2013), none of the delegates agreed that sustainability knowledge and skills are thoroughly embedded within the curricula at their university. Science-based sustainability fundamental seminars also constitute a less effective intervention in producing favourable sustainable behaviour among practicing engineers in comparison to non-engineers (Wilson, 2014). Meanwhile, students in Irish higher education institutions possess inadequate knowledge and a narrow understanding of sustainable development and know extraordinarily little about social issues (Nicolaou & Conlon, 2012). According to Chawla and Manhas (2015), most students found that the term 'sustainability' is rather unclear, although they were somehow engaged in sustainability-related matters. The findings exemplify a lack of understanding of the complexity of the sustainability agenda, which is largely associated with environmental issues. It has been reported that students acquire important sustainable development competencies that are implicitly integrated into the programmes, such as personal involvement, action skills, emotional intelligence and interdisciplinary work. However, interpersonal competencies and competencies related to the application of knowledge to practical situations are not yet sufficiently developed (Azeiteiro et al., 2015). A strong correlation was reported between taking related university courses and attitudes towards engaging in environmentally sustainable behaviours and activities among students (Anderson, 2017), suggesting that the linkages have to be explained further.

Satisfaction

In the educational context, students' satisfaction can be understood as the level where their expectations are fulfilled in educational institutions (Akinci, Yurcu & Kasalak, 2018). Satisfaction in electronic and distance learning is stimulated by several related aspects, namely, content, user interface, learning community, customisation and learning performance (Wang, 2003). Students have also reported high satisfaction with electronic learning due to its flexible pedagogical model compared to equivalent classroom courses, with communication tools, instructor expertise or motivating skills, and learning electronic activities as the contributing factors (Azeiteiro et al., 2015). Material conditions and learning facilities, lecturers, instructional activities, learning environment and peer relationships have also been found to engender satisfaction among

students (Topala & Tomozii, 2014). Positive feedback on satisfaction with learning materials or resources, pedagogical tools and assessments are commonly reported among respondents who enrolled in distance education programmes (Md Harizan & Hilmi, 2019).

Satisfaction with the online programmes often changed the students' attitudes about environmental domains and contributed to others' changing attitudes and behaviours as well (Martinho et al., 2010; Pinto de Moura et al., 2010). Students with high levels of satisfaction with the distance learning programmes often have reasons to return for new training sessions at the same university (Azeiteiro et al., 2015). Thus, it is believed that satisfaction with distance education programmes/courses may lead to favourable attitudes towards sustainability among learners.

Barriers to Sustainability in Distance Education

The progress towards the goals established in Rio de Janeiro has been slower than what was hoped for, and the implementation in higher education institutions has had its ups and downs, as well as some barriers (Velazquez et al., 2006). Barriers are obstacles to promoting the effectiveness of e-learning as a sustainable education approach (Azeiteiro et al., 2015), as well as in building a positive attitude towards sustainability in higher education settings (Aleixo et al., 2016). Among the barriers to the implementation of sustainability in higher education institutions are ambiguity and complexity in understanding the actual concept of sustainability, lack of financial resources or funding and lack of commitments among students and faculty members (Aleixo et al., 2016). These barriers are also believed to hinder the attainment of sustainability in distance education programmes and courses. The barriers faced by distance learners are also associated with the lack of individual assistance, which impedes the socialisation of individuals. In addition, the lack of immediate feedback depends too much on access to facilities and communication technologies. Limitations have been associated with communication due to an excessive number of students, development of affectional and psychomotor behaviours and high costs attributed to the used technology (Tavukcu et al., 2011). Russian students have reportedly encountered learning challenges with regards to effective teaching practices and communication patterns (Markova et al., 2017). Lower awareness of local and global environmental issues and the lack of extrinsic motivation among faculty members, alumni and students, aside from the limited focus on staff training programmes, are also identified as barriers to sustainability in higher education (Thurer et al., 2018).

Among the identified barriers that may impact the effectiveness of distance education in nurturing sustainability among learners are lack of time to manage studies well, work and family commitments for part-timers, a lack of knowledge regarding sustainability, poor interaction between peers and instructors, financial problems in sustaining studies, programme structure, the quality of instructors and learning materials, and accessibility to the Internet (Md Harizan & Hilmi, 2019). Thus, it is important to highlight the adverse impact of barriers to sustainability in distance education and the way it jeopardises the shaping process of attitudes towards sustainability among learners.

Innovativeness

Education for sustainable development has necessitated the application of innovative teaching approaches and methodologies, which has also increased the use of information and communications technology (ICT) in teaching and learning activities (Laurie et al., 2016). As courses run via the distance education mode are mainly facilitated by technology, innovativeness is found to be pertinent in shaping an individual's attitude towards sustainability. Innovativeness is defined as the degree to which an individual is relatively 'more ready to adopt' an innovation than other members of the social system (Rogers & Shoemaker, 1971). Innovativeness is believed to affect the attitudes of individuals (Eastlick & Lotz, 1999) and has a significant positive effect on the receptiveness to new ideas (Crespo & del Bosque, 2008) and products (Mansori, Sambasivan, & Md Sidin, 2015) and on various innovative behaviours (Siti Hajar Mohd Roffeei et al., 2016, 2018).

The process of designing and developing any kind of in-class activities that contribute to innovativeness is important in identifying individuals who have high levels of such traits (Kilicer, Bardakci, & Arpaci, 2018). It is asserted that computer self-literacy has been significantly associated with personal innovativeness of

learners in the ICT domain in the e-learning environment (Kim & Park, 2018). Since the level of self-efficacy in computer applications among learners has much to do with the process of distance education in enhancing innovativeness among learners, it is believed that the effectiveness of distance education could significantly impose a positive effect on innovativeness. On the other hand, barriers seem to hinder the successful implementation of various aspects of distance education, including innovation (Williams, 2020). Based on this notion, it is believed that barriers could also impose a significant adverse effect on innovativeness.

It is believed that innovativeness could significantly mediate the relationship between internal/external organisational environment and innovative behaviour (Siti Hajar Mohd Roffeei et al., 2016). This suggests that innovativeness may also mediate the relationship between the effectiveness of distance education, barriers to sustainability in distance education and attitude towards sustainability in distance education.

HYPOTHESES

Several hypotheses have been formulated in this study:

- H1: The effectiveness of distance education has a significant positive impact on the attitude towards sustainability.
- H2: The barriers to sustainability in distance education have a significant negative impact on the attitude towards sustainability.
- H3: Innovativeness has a significant positive impact on the attitude towards sustainability.
- H4: The effectiveness of distance education has a significant positive impact on innovativeness.
- H5: The barriers to sustainability in distance education have a significant negative impact on innovativeness.
- H6: Innovativeness mediates the relationship between the effectiveness of distance education and the attitude towards sustainability.
- H7: Innovativeness mediates the relationship between the barriers to sustainability in distance education and the attitude towards sustainability.

THEORETICAL FRAMEWORK

The model of the study can be explained clearly as it is based on the notion of social modelling expounded in the Social Cognitive Theory for personal and social change (Bandura, 2004), whereby the determinants and psychosocial mechanisms through which symbolic communication promotes personal and social changes are analysed in an agentic conceptual framework. In this study, to be an agent for a better world is to influence the learner's own functioning and life circumstances. In this transactional view of learners and society, the graduates are both considered producers and products with respective attitudinal outcomes of their social environment, which, in this study, is the distance education environment milieu. By formulating their respective social environments through effective distance education programmes/courses, the learners are driven to get involved in the enhancement of their lives, which, in this study, is their ideal attitude towards sustainability. Impediments to personal and social change are expressed in the form of barriers to sustainability in distance education, inhibiting the development of a positive attitude towards sustainability. A sense of efficacy, expressed in the form of innovativeness, may be able to strengthen learners' ability to overcome the barriers while attenuating the impacts imposed by the effectiveness of distance education in yielding the ideal attitude towards sustainability. Specifically, the model can be explained through the Transformational Learning Theory (Mezirow, 1997), which asserts that changes in meaning evolve in two domains of learning. The first domain, which is instrumental learning, focuses on acquiring knowledge through task-oriented problem-solving and determining the cause-and-effect relationship, which, in this study, is created and developed through the course activities related to sustainability awareness and involvement. This process will enhance learners' sense of innovativeness and further empower them to grasp more opportunities and increase their capabilities to build the ideal attitude towards sustainability. The second domain is communicative learning, which is the knowledge acquisition involved in understanding

the meaning of others concerning values, ideals, feelings, moral decisions, freedom, justice, labour, love, autonomy, commitment and democracy (Haron et al., 2012), which are parts of the main essence of the sustainability agenda itself.

METHODOLOGY

The study employed the cross-sectional approach using online survey questionnaires as the main data collection method. The population of the study consisted of final-year students currently enrolled in management or social science courses through the distance education mode at selected universities in Malaysia. Prior to data collection, a letter of consent was sent to each participating university to obtain permission for undertaking the survey. A notice with a link to the online questionnaires via the SurveyMonkey online survey platform was requested to be posted on the e-learning portal of each institution prior to the actual date of the survey. Four main variables were investigated in this study: attitude towards sustainability (dependent variable), effectiveness of distance education (independent variable), barriers to sustainability in distance education (independent variable) and innovativeness (mediating variable). Measurement instruments were adapted from previous studies. Attitude towards sustainability was adapted from Gale et al. (2014) and Yatim et al. (2012), effectiveness of distance education was adapted from Harizan and Hilmi (2021), barriers to sustainability in distance education was adapted from Aleixo et al. (2016) and innovativeness was adapted from Herrero Crespo and Rodríguez del Bosque (2008). All items, except for the socio-demographic characteristics, were measured using a four-point Likert scale (1 = Strongly disagree to 4 = Strongly agree). All items were referred to field experts for face validation before conducting a pilot study (n=70).

RESULTS AND FINDINGS

A total of 663 responses were acquired. Most of the respondents were between 25 to 34 years of age (54.9%), female (60.5%), married (58.5%), with a personal monthly income between RM2,000.00 to RM2,999.00 (37.9%) and had previously obtained a diploma (55.5%). Most of the respondents were Muslims (87.5%) from the Malay ethnic group (85.4%), working in the government sector (57.0%) and pursuing management studies (58.4%). The data were analysed based on the partial least squares structural equation modelling (PLS-SEM) approach using SmartPLS 3 software. The analysis involved the assessment of the measurement model and the presentation of the structural model.

Reliability and Validity Measurement

The assessment of reflective measurement models comprises composite reliability to assess internal consistency, individual indicator reliability and average variance extracted (AVE) to evaluate the convergent validity and discriminant validity (Hair et al., 2017). The Fornell-Larcker criterion, cross-loadings and Heterotrait-Monotrait Ratio of Correlations-HTMT can be used to examine discriminant validity.

Internal Consistency Reliability and Convergent Validity

Table 1 demonstrates the reliability analysis through composite reliability (CR), whereby values greater than 0.7 indicate that this study's research instrument has a high internal consistency (Nunnally, 1978; Hair et al., 2014). This table also presents the AVE, whereby values above 0.5 indicate that the study's constructs have established convergent validity (Henseler, Ringle, & Sinkovics, 2009). The factor loadings reported a value of 0.7 or higher, which is an acceptable measure. Items with low loadings were removed.

Table 1. Measurement Model

Second order construct	AVE	CR	Construct	Items	Loadings	CR	AVE	
Effectiveness of distance education	0.718	0.930	Acquired skills	acq_skill1	0.758	0.925	0.711	
				acq_skill2	0.835			
				acq_skill3	0.847			
				acq_skill4	0.893			
				acq_skill5	0.876			
			Assessment	assessment1	0.903			
				assessment2	0.913			
				assessment3	0.852			0.919
			Expectation	exp1	0.872			
				exp2	0.893			
				exp3	0.872			
				exp4	0.916			
				exp5	0.816			
				exp6	0.913			
				exp7	0.907			
				exp8	0.894			
				exp9	0.868			0.97
			Group work	group1	0.87			
				group2	0.889			
				group3	0.9			
				group4	0.846			0.93
			Learning strategy	learning_strategy1	0.89			
				learning_strategy2	0.877			
				learning_strategy3	0.798			
				learning_strategy5	0.822			0.911
			Motivation	motif1	0.763			
				motif10	0.797			
				motif11	0.834			
				motif2	0.83			
				motif4	0.704			
motif5	0.852							
motif6	0.839							
motif7	0.799							
motif9	0.746	0.94	0.636					
Quality - eportal	eportal1	0.933						
	eportal2	0.92						
	eportal3	0.924	0.947	0.857				
Quality-Instructor	instructor1	0.907						
	instructor2	0.928						
	instructor3	0.922						
	instructor4	0.903						
	instructor5	0.888	0.96	0.827				

Second order construct	AVE	CR	Construct	Items	Loadings	CR	AVE
Quality-Materials				materials1	0.866	0.93	0.726
				materials2	0.873		
				materials3	0.833		
				materials4	0.822		
				materials5	0.867		
Quality-Online				online1	0.821	0.936	0.71
				online2	0.845		
				qonline3	0.877		
				online4	0.868		
				online5	0.839		
				online6	0.803		
Sustainability competencies acquired (SCA)				sustain6	0.848	0.891	0.671
				sustain7	0.855		
				sustain8	0.741		
Satisfaction				satisfaction1	0.844	0.903	0.7
				satisfaction2	0.83		
				satisfaction3	0.876		
				satisfaction4	0.794		
Barriers to sustainability				barrier1	0.723	0.776	0.636
				barrier6	0.866		
Innovativeness				innova1	0.885	0.882	0.788
				innova4	0.891		
Attitude towards sustainability				att1	0.751	0.928	0.649
				att2	0.777		
				att4	0.777		
				att5	0.825		
				att6	0.86		
				att7	0.774		
				att8	0.868		

Discriminant Validity

Discriminant validity is the extent to which a construct is truly distinct from other constructs by empirical standards (Hair et al., 2017). The cross-loadings are the first approach to evaluate the discriminant validity of the indicators. Each indicator loads highest on the construct it is intended to measure (Chin, 1998). Thus, this model has good discriminant validity (see Table 2).

Table 2. Indicator Item Cross-Loadings

	Acquired skills	Assessment	Attitude	Barriers	Expecta- -tion	Group work	Innova- -tiveness	Learning strategy	Motiva- -tion	Quality - eportal	Quality- instructor	Quality- materials	Quality- online	SCA	Satisfaction
acq_skill1	0.75														
acq_skill2	0.83														
acq_skill3	0.84														
acq_skill4	0.89														
acq_skill5	0.87														
assessment1		0.90													
assessment2		0.91													
assessment3		0.85													
att1			0.75												
att2			0.77												
att4			0.77												
att5			0.82												
att6			0.86												
att7			0.77												
att8			0.86												
barrier1				0.72											
barrier6				0.86											
exp1					0.87										
exp2					0.89										
exp3					0.87										
exp4					0.91										
exp5					0.81										
exp6					0.91										
exp7					0.90										
exp8					0.89										
exp9					0.86										

	Acquired skills	Assessment	Attitude	Barriers	Expecta- -tion	Group work	Innova- -tiveness	Learning strategy	Motiva- -tion	Quality - eportal	Quality- instructor	Quality- materials	Quality- online	SCA	Satisfaction
group1						0.87									
group2						0.88									
group3						0.9									
group4						0.84									
innova1							0.88								
innova4							0.89								
instructor1											0.90				
instructor2											0.92				
instructor3											0.92				
instructor4											0.90				
instructor5											0.88				
learning_ strategy1								0.89							
learning_ strategy2								0.87							
learning_ strategy3								0.79							
learning_ strategy5								0.82							
motif1															0.76
motif10															0.79
motif11															0.83
motif2															0.83
motif4															0.70
motif5															0.85
motif6															0.83
motif7															0.79
motif9															0.74
eportal1															0.93

	Acquired skills	Assessment	Attitude	Barriers	Expecta- -tion	Group work	Innova- -tiveness	Learning strategy	Motiva- -tion	Quality - eportal	Quality- instructor	Quality- materials	Quality- online	SCA	Satisfaction
eportal2										0.92					
eportal3										0.92					
materials1												0.86			
materials2												0.87			
materials3												0.83			
materials4												0.82			
materials5												0.86			
online1													0.82		
online2													0.84		
online3													0.87		
online4													0.86		
online5													0.83		
online6													0.80		
satisfaction1															0.84
satisfaction2															0.83
satisfaction3															0.87
satisfaction4															0.79
sustain6														0.84	
sustain7														0.85	
sustain8														0.74	

The Fornell-Larcker criterion is another approach that can be used to assess discriminant validity. It compares the square root of the AVE values with the latent variable correlations (Hair et al., 2017). If we want to have an ideal figure for discriminant validity, each construct's AVE should be higher than its squared correlation with any other construct (Fornell & Larcker, 1981). The diagonal values shown in Table 3 are the square root of the AVE of the latent variables, which are the highest in any column or row, thereby indicating good discriminant validity (see Table 3).

Table 3. Discriminant Validity (Fornell-Larcker Criterion)

	Attitude towards sustainability	Barriers to sustainability	Effectiveness of distance education	Innovativeness
Attitude towards sustainability	0.806			
Barriers to sustainability	-0.381	0.798		
Effectiveness of distance education	0.553	-0.465	0.758	
Innovativeness	0.348	-0.151	0.297	0.888

Besides the Fornell-Larcker criterion, the Heterotrait-Monotrait Ratio of Correlations-HTMT was also used to assess the discriminant validity of the model. HTMT is the ratio of between-trait correlations to within-trait correlations (Hair et al., 2017). HTMT that are equal to the disattenuated correlation between two constructs and the HTMT and which are not close to 1 indicate good discriminant validity (Henseler, Ringle & Sarstedt, 2014). In Table 4, it could be claimed that the measurement paradigm of this model corresponds to the reliability and validity criteria of the measurement model.

Table 4. Discriminant Validity (Heterotrait-Monotrait Ratio of Correlations-HTMT)

	Attitude towards sustainability	Barriers to sustainability	Effectiveness of distance education	Innovativeness
Attitude towards sustainability				
Barriers to sustainability	0.591			
Effectiveness of distance education	0.584	0.683		
Innovativeness	0.426	0.259	0.352	

Assessing Structural Model Results

The assessment of the structural model results involves the evaluation of the model's predictive capabilities and the relationships between the constructs. The structural model assessment procedure starts with the assessment for collinearity issues, followed by assessing the significance and relevance of the structural model relationships, level of R_2 , effect size f_2 , predictive relevance Q_2 , and q_2 effect size.

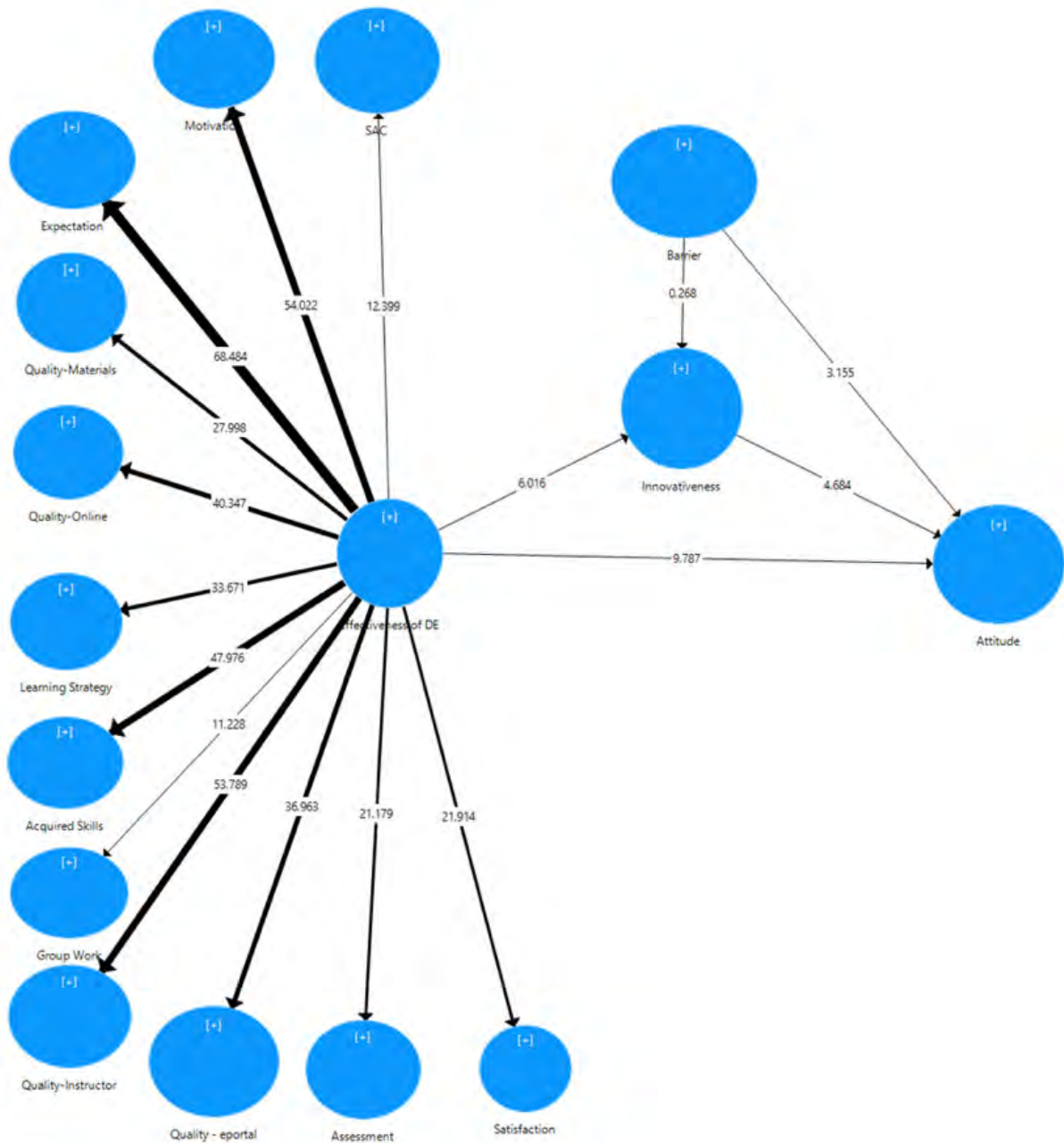


Figure 1. Structural Model

Step 1: Collinearity Assessment (Model Fit)

The standardised root mean square residual (SRMR) and root mean square residual covariance (RMS_theta) are two main approaches that have been used recently to judge the fit of the hypothesised model structure with the empirical data and, hence, to identify model misspecifications (Henseler, Ringle & Sarstedt, 2014). SRMR measures the difference between the observed correlation and the model's implied correlation matrix. If the SRMR is < 0.1 or < 0.08, the data fit the model (Henseler et al., 2014). RMS_theta follows the same logic as SRMR but depends on covariance. RMS_theta values below 0.12 indicate a well-fitting model, whereas higher values indicate a lack of fit (Henseler et al., 2014). The results show that the SRMRs' values for saturated and estimated models are 0.074 and 0.087, respectively. The RMS_theta is 0.119. Therefore, the model fits and has predictive power.

Step 2: Structural Model Path Coefficients

The bootstrapping analysis suggested by Preacher and Hayes (2008) was run to test the correlation of bootstrapping samples with a 95% confidence interval (CI) on 5,000 sub-samples. This was done to test all the hypotheses. The analysis of the mediating role of innovativeness was based on the indirect effect analysis shown in Table 5. The results illustrate that the effectiveness of distance education has a significant positive influence on the attitude towards sustainability ($\beta = 0.419$, $p < .001$), thus supporting H1. The barriers to sustainability in distance education have a significant negative effect on the attitude towards sustainability ($\beta = -0.16$, $p < .001$), thus supporting H2. There is also a significant positive influence of effectiveness of distance education on innovativeness ($\beta = 0.29$, $p < .001$), which validates H3. On the other hand, the barriers to sustainability in distance education imposed no significant impact on innovativeness ($\beta = 0.018$, $p = .268$), which refutes H4. Innovativeness has a significant positive influence on attitude towards sustainability ($\beta = 0.199$, $p < .001$), backing H5. The indirect effect analysis was used to show the mediating role of innovativeness between effectiveness of distance education, barriers to sustainability and attitude towards sustainability.

Table 5. Direct and Indirect Relationships Between Constructs

Relationship	Std. beta	Std. Error	T-value	Decision	F ₂	Q ₂	95% CILL	95% CI UL
Effectiveness of distance education -> Attitude towards sustainability (H1)	0.419	0.043	9.787**	Supported	0.201	0.105	0.347	0.488
Barriers to sustainability -> Attitude towards sustainability (H2)	-0.16	0.049	3.155**	Supported	0.028	0.016	-0.241	-0.081
Innovativeness -> Attitude towards sustainability (H3)	0.199	0.043	4.684**	Supported	0.055	0.031	0.129	0.271
Effectiveness of distance education -> Innovativeness (H4)	0.29	0.048	6.016**	Supported	0.072	0.051	0.21	0.369
Barriers to sustainability -> Innovativeness (H5)	-0.018	0.06	0.268	Not Supported	0.001	-0.002	-0.115	0.081
Barriers to sustainability -> Innovativeness -> Attitude towards sustainability (H6)	-0.004	0.012	0.262	Not Supported	-	-	-0.023	0.016
Effectiveness of distance education -> Innovativeness -> Attitude towards sustainability (H7)	0.058	0.017	3.47**	Supported	-	-	0.034	0.09

**p<.01, *p<.05

The direct paths between the predictors and endogenous construct were compared between the events with and without the inclusion of innovativeness in the analysis to further investigate whether innovativeness has a full or partial mediation effect. It can be concluded from the results that innovativeness has a partial mediation effect in the direct path between the effectiveness of distance education and the attitude towards sustainability. The path was significant but reduced in terms of the standardised beta values with the inclusion of innovativeness as the mediating construct. On the other hand, there was no mediating effect between the barriers to sustainability in distance education and the attitude towards sustainability following the non-significance in both the direct and indirect paths between the constructs. Thus, H6 is not supported. Since the indirect and direct effects are both significant and point in the same direction, innovativeness is said to have a complementary mediation effect between the effectiveness of distance education and the attitude towards sustainability. Therefore, H7 is supported.

Step 3: Coefficient of Determination (R₂ value)

The coefficient of determination (R₂) is a measure of the model's predictive power and is calculated as the squared correlation between a specific endogenous construct's actual and predicted values (Hair et al., 2017). The R₂ values of 0.75, 0.50 or 0.25 describe the substantial, moderate or weak predictive power of the

model, respectively. In this study, the R_2 value for attitude towards sustainability is 0.405, which indicates a slightly moderate level, whereas innovativeness is 0.125, which indicates the weak predictive power of the model (see Table 5).

Step 4: Effect size f_2

Effect size (f_2) refers to the change in the R_2 value when a specific exogenous construct is omitted from the model; it is used to evaluate whether the omitted construct has a substantial impact on the endogenous constructs (Hair et al., 2017). According to Cohen (1988), an effect size (f_2) value of 0.35 indicates a large effect size, 0.15 indicates a medium effect size and 0.02 indicates a small effect size. The relationship between effectiveness of distance education and attitude towards sustainability has a medium effect size, whereas other relationships have a small effect size (see Table 5).

Step 5: Blindfolding and Predictive Relevance Q_2

Stone-Geisser's Q_2 value is an indicator of the model's out-of-sample predictive power or predictive relevance (Hair et al., 2017). Q_2 values larger than zero ($Q_2 > 0$) for a specific reflective endogenous latent variable indicates the path model's predictive relevance for a particular dependent construct. In this study, the Q_2 for attitude towards sustainability is 0.245 and that for innovativeness is 0.044, indicating that the model has predictive relevance.

Step 6: Effect size q_2

The relative impact of predictive relevance can be compared by means of measuring the q_2 effect size. It allows assessing an exogenous construct's contribution to an endogenous latent variable's Q_2 value (Hair et al., 2017). With regards to the predictive relevance (q_2) of the predictor exogenous latent variable q_2 , a value of 0.35 indicates a large predictive relevance, 0.15 a medium predictive relevance and 0.02 a small predictive relevance (Henseler, Ringle & Sinkovics, 2009). In the study, the relationship between the effectiveness of distance education and attitude towards sustainability has a medium predictive relevance, whereas other relationships have a small predictive relevance (see Table 5).

DISCUSSION

Studies have revealed that learners' grasp of knowledge and practice regarding the concept of sustainability has been below expectations, although distance education has been acknowledged as a mechanism through which sustainable development can be achieved (Aleixo et al., 2018; Ramos et al., 2015). Although the assessment of the sustainability nurtured through distance education programmes/courses has been a complex issue, the importance of online and distance education in shaping the right attitude for sustainability is beyond doubt since the effectiveness of the latter is deemed to play an incredibly significant role in encouraging a positive attitude towards sustainability. The realisation that graduates from the programmes are of great economic significance and have strong social and environmental impacts makes it essential to focus on the influence of the effectiveness of distance education on fostering an ideal attitude towards sustainability among learners. With regards to enhancing the explanatory power of such an influence as a mediator, which is rarely investigated, innovativeness is found to be an undeniably important trait to be instilled in learners, along with their studies, to further enhance the outcome of the effectiveness of distance education on their attitude towards sustainability.

Effectiveness of Distance Education and Attitude Towards Sustainability

From the findings, it can be deduced that the effectiveness of distance education will surely create a positive attitude towards sustainability and produce a sense of innovativeness among learners. If we are to understand the way by which the effectiveness of distance education fosters a positive attitude towards sustainability and innovativeness, an in-depth explanation of the factors influencing the construct needs to be carried out. The

expectations of students, motivations and reasons to pursue, quality of learning, evaluation and assessment, sustainability competencies acquired and satisfaction among learners need to be considered in a systematic manner.

Expectations of Students

The expectations of students are an inevitable factor in nurturing the ideal attitude towards sustainability, aside from sharpening the innovativeness of learners. Prior to and during the enrolment, expectation is the foremost aspect that determines the smoothness of the subsequent process of nurturing a positive attitude towards sustainability and innovativeness among distance learners throughout their studies. There is a consensus that learners do not only expect the same extent of lessons delivered in face-to-face teaching (Ana Pinto de Moura, Luís Miguel Cunha, Ulisses Miranda Azeiteiro, Luísa Aires, Pedro Graca, 2010; Martinho et al., 2010) but also the benefits resulting from enrolling in the distance education programme, especially in their work or jobs (Azeiteiro et al., 2015). In addition, the study has extended such benefits expected beyond the job requirements of learners, such as acquiring more knowledge and being more up to date than others in their fields of expertise, being able to apply different aspects of knowledge in life and being a role model for others in the family, which are topics that have not been discussed to a great extent by researchers. The higher their expectations from distance education programmes, the more positive their attitudes towards sustainability and innovativeness.

Motivation and Reasons to Pursue

This researcher has come to the conclusion that students' motivations (Dimitriou, 2015) and reasons for pursuing distance learning studies (Azeiteiro et al., 2015) are indeed the important factors underlying the effectiveness of distance education in nurturing a positive attitude towards sustainability among learners. By expanding the conceptual understanding of motivation and reasons to pursue distance education programmes (Md Harizan & Hilmi, 2019), the current study has provided empirical evidence of such a notion within the context of attitude formation towards sustainability as a result of enrolling in an effective distance education programme. The findings also reveal that learners with strong motivation and firm reasons to pursue their studies via the distance education mode are keen to be more innovative than those who are not. Learners are motivated the most by the flexibility of distance learning studies, their eagerness to experience university life and its milieu, as well as the reputation of the university in delivering lessons via the distance education mode. In addition, families, friends and job-related motives are also among the motivations and reasons why learners want to pursue such studies. The stronger their motivation and reasons to pursue distance education programmes, the more positive their attitude towards sustainability and innovativeness.

Quality of Learning

Issues pertaining to quality should never be taken lightly in distance education (Azeiteiro et al., 2015; Markova et al., 2017). The quality of learning is another important aspect underlying the effectiveness of distance education in shaping the ideal attitude towards sustainability, as well as enhancing innovativeness among learners. The findings are in line with Chou et al.'s (2015) study, wherein the quality of teaching activity significantly improved the attitude towards energy saving and carbon reduction of students in Taiwan in a classroom setting. However, the current study has extended such a notion by analysing the effect of learning quality on the attitude towards sustainability in the context of distance education and on the newly examined variable (i.e. innovativeness). Furthermore, the quality of learning has been classified into several dimensions, namely, online learning activities, instructors, e-portals, teaching materials, collaborative or group work among learners, acquired skills and learning strategies.

Online learning activities were found to contribute positively towards the effectiveness of distance education in forming a positive attitude towards sustainability and innovativeness. The study found that online learning activities are associated with flexibility in learners' work schedules, learning time saved, increased comprehension and achievement in the courses, preparation of assignments or projects and ease of interaction with instructors. All these activities are essential for effective learning via distance education

mode. The quality of instructors is another learning quality aspect that is significant in making distance education effective for the attitude formation towards sustainability among learners. Based on the findings, an instructor of good calibre is expected to be innovative, possess in-depth knowledge and experience in teaching the subject matter, be able to explain a particular topic in an interesting way and be capable of providing valuable feedback to students. Instructors are expected to be vibrant and flexible in time and space while equipping themselves with state-of-the-art teaching techniques and technology.

Besides instructors, the quality of the electronic portal is another important indicator of learning quality in distance education, which dictates the attitude towards sustainability and innovativeness of learners. Some of the criteria of a high-quality electronic portal are easy accessibility, ease of communication and enables prompt feedback. Such criteria should be emphasised to ease the learning curve and process for learners who need to adopt new technology that would enable them to learn effectively. Teaching materials are also another vital quality criterion for distance education courses to enable learners to attain the ideal attitude towards sustainability and innovativeness. Teaching materials are required to be comprehensive, easy to understand, compact, up-to-date and useful. Otherwise, with the rapidly evolving technology, the current teaching materials might become obsolete and less relevant within the context and needs of learners in the near future.

Learning quality also comprises the quality of the collaborative or group work for students' assignments/projects. In distance education, the quality underlying the collaborative work is expected to fulfil several criteria, such as ease in the preparation of assignments or projects, the possibility of such work to be carried out regardless of location among group members, workload reduction and nurturing teamwork. With the aid of new technology, collaborative work can be organised virtually without depending on physical face-to-face interactions among group members, which makes it an ideal option for carrying out assignments and projects during the COVID-19 pandemic. Such learning quality is truly remarkable for distance education to be sustainable amidst the pandemic. Acquired skills are another important criterion that reflects the learning quality of distance education. Learners with distance education experience have usually acquired soft skills such as being independent, having more confidence, being more responsible, mastering unique learning strategies, being better at computer-related literacy and having time management skills. These attributes are either learned directly from the courses that learners are enrolled in or indirectly through the overall learning process since the first day of enrolment in distance education programmes.

Similarly, another criterion of learning quality found to be significant is the learning strategy. The learning strategy adopted in distance education is quite different from the traditional classroom mode since it emphasises self-learning, uniqueness, attractiveness and systematic content. Such attributes are important for teaching and learning via the distance education mode, which have made it distinct from the traditional face-to-face mode. These attributes should always be taken into consideration by instructors in planning their lessons, learning activities, teaching materials, lesson delivery sessions and assessments. Meanwhile, learners should also embrace such distinctive criteria into their study plan and strategy to get the most out of their courses and programmes. In short, if the learners have a good perception of the learning quality of distance education, the higher will be the extent to which such mode is effective in fostering a positive attitude towards sustainability and a sense of innovativeness among learners.

Evaluation and Assessment

Evaluation and assessment have been found to be important aspects underlying the effectiveness of distance education in nurturing a positive attitude towards sustainability (Azeiteiro et al., 2015), as well as enhancing innovativeness among learners. Evaluation and assessment are undeniably important in measuring the extent to which the learning outcomes have been achieved by learners and constitute the benchmarks for a course or programme against its targeted aim. A multi-form approach to evaluation and assessment is appropriate and accepted by learners to provide a broader perspective and holistic feedback on their performance. The composition of various evaluation and assessment methods and their complexity should be balanced and appropriate for any given course to produce the best outcome. In short, the more appropriate the evaluation and assessment method perceived by learners in the distance education programmes, the more positive their attitude towards sustainability and innovativeness.

Sustainability Competencies Acquired

The sustainability competencies acquired through the enrolment of distance learners are crucial in guiding the effectiveness of distance education (Azeiteiro et al., 2015), as well as in shaping the ideal attitude towards sustainability and innovativeness among distance learners. Through their enrolment in distance education programmes, learners have become more responsible citizens with regards to social welfare. They have gained higher awareness of the sustainability goals and are more sensitive towards multicultural and religious communities. These competencies are crucial and need to be acquired by learners as they complete their studies to enable them to be the catalysts in transforming the world into a better place for all living species. Hence, the more sustainability competencies acquired by learners from distance education programmes, the better their attitude towards sustainability and their sense of innovativeness.

Satisfaction

Learners' satisfaction is one of the aspects that is highly essential in determining the effectiveness of distance education in developing the ideal attitude towards sustainability and a sense of innovativeness among learners. The study has expanded the importance of student satisfaction as one of the determinants of an effective distance education programme (Azeiteiro et al., 2015; Harris and Martin, 2012) and, this time, within the context of forming attitude towards sustainability among learners.

The learners are satisfied with the distance education programmes that they are enrolled in when they perceive that they can achieve the same efficiency and learning outcome as that obtained in full-time learning because of the good learning experiences provided by their study environment. Overall satisfaction with distance education as a means through which the sustainability agenda has been transformed into attitudinal outcome was found to be high among the learners. The higher their satisfaction towards distance education programmes, the more positive their attitudes towards sustainability and innovativeness.

Barriers to Sustainability in Distance Education and Attitude Towards Sustainability

Despite the significance of distance education in effectively forming the attitude towards sustainability of learners, barriers that are associated with the context were found to impose a slight threat. This is partially supported by the notion posited by various studies stating that barriers are seen as obstacles in promoting the effectiveness of e-learning as a sustainable education approach (Azeiteiro et al., 2015), as well as in building a positive attitude towards sustainability in higher education settings (Aleixo et al., 2016). Two of the barriers that were significantly highlighted in this study are time management conflict between working and studying and the lack of support from the community at large. Although distance education is preferred as a career-friendly mode of study due to its flexibility for learners who are also working adults, learners may also encounter hardship in balancing their careers and studies. This situation may affect their scholastic performance even though the completion of the course itself might be a stepping stone in climbing the corporate ladder, given that they must earn a living for themselves or/and their dependents.

It is also interesting to find that despite families, friends and employers being the ones who strongly support their studies, the learners perceived that the community at large did not seem to provide support, although it should be noted that the outcomes of the distance education process of graduates are significant to economic, social and environmental sustainability. This situation might be due to the nature of non-materials or physical or immediate results in the community in which the learners are currently residing, where the community at large does not seem to receive direct and instantaneous benefit from members of the community who are pursuing distance education programmes rather than those who are closer to them. One fact that should be realised is that the development of a nation does not take place immediately. It might take years or centuries for the overall change to be realised or for a country to become great. Therefore, the abovementioned barriers could jeopardise the attainment of sustainable development goals if they are not tackled well. On the other hand, barriers to sustainability in distance education were found to impose no influence at all on innovativeness. The learners' innovativeness is intact regardless of whether the barriers are present or absent. This significantly influences the effectiveness of distance education, which is heavily imbued with technology, in shaping the sense of innovativeness among learners.

Innovativeness

Another important explanatory variable that arose from the process in which distance education programmes nurture the attitude towards sustainability among its learners is innovativeness. Being part of the lifeline of distance education programmes, ICT remains essential in facilitating teaching and learning in distance education programmes. The enrolment of students has somehow enhanced the sense of innovativeness, which further mediates the impact of the effectiveness of distance education programmes on the attitude towards sustainability of learners.

The findings provided further elaboration for Eastlick and Lotz's (1999) study, whereby innovativeness is believed to affect the attitude of individuals and impose a significant positive effect on the receptiveness towards new ideas (Crespo & del Bosque, 2008), which is the sustainability agenda in this current century, and products (Mansori, Sambasivan, & Md Sidin, 2015), as well as innovative behaviour (Siti Hajar Mohd Roffeei et al., 2016, 2018). These appear to be in the form of attitudinal behavioural outcome towards sustainability among learners. Innovativeness has also been proven as an important mediator in the relationship between internal/external organisational environment and innovative behaviour, as suggested by Siti Hajar Mohd Roffeei et al. (2016), by significantly mediating the relationship between the effectiveness of distance education, which constitutes both internal/external environment for distance education and innovative behaviour. This is reflected through learners' attitude towards sustainability, which is achieved partly through the technological venture itself.

Theoretical Implications

Theoretically, the study has provided further understanding regarding the effectiveness of distance education in nurturing awareness of sustainability in developing an ideal attitude towards sustainability. Moreover, since the studies on the sustainability concept in distance education thus far are mostly understood based on a narrow environmental dimension, the study has expanded the understanding of sustainability by incorporating other mainstream sustainability dimensions, namely, social and economic domains. This study has provided further understanding pertaining to contextual-specific barriers that hinder sustainability practices in distance education since there is a dearth of studies identifying barriers to sustainability in distance education. The findings also provide empirical evidence by unveiling the impacts of such barriers in the formation of an ideal attitude towards sustainability among learners. The study has demonstrated the mediating effect of innovativeness in such a relationship in an empirical manner. It is ground-breaking research that is unique in the field, as very few researchers have explained the influence of the effectiveness of distance education and the barriers to sustainability in distance education on the attitude towards sustainability.

This study has been able to model both the Social Cognitive Theory for personal and social changes (Bandura, 2004) and the Transformational Learning Theory (Mezirow, 1997) in an empirical manner. For the Social Cognitive Theory, this study has shown the impact of the effectiveness of distance education programmes in influencing a learner's own functioning and life circumstances to be an agent for a better world. It models the transactional view of learners and society of the theory wherein graduates are considered both producers and products with the attitudinal outcome of their social environment, which, in this study, gained via the distance education environment. By formulating their social environment through effective distance education programmes/courses, the learners are made to participate in the enhancement of their life, as reflected by their attitude towards sustainability.

On the other hand, hindrances to personal and social changes expressed in the form of barriers to sustainability in distance education are found to not be significant in influencing the development of an ideal attitude towards sustainability among learners. The findings suggest that learners are resilient in overcoming any barriers that they encounter, or they might not even perceive the barriers as something that could hinder their ability to develop an ideal attitude towards sustainability throughout their studies.

A sense of efficacy, as modelled in the form of innovativeness, was found to be significant in bridging the impact imposed by the effectiveness of distance education in producing the ideal attitude towards sustainability. Being dependent on technology usage throughout their enrolment as distance learners has

yielded a form of efficacy that has materialised in a sense of innovativeness developed from the early days until the completion of their studies. Innovativeness is not found to be a part of the important outcome because of enrolling in distance education programmes but also as an enabler that might further enhance the nurturing of attitude towards sustainability among learners.

The study has also modelled the Transformational Learning Theory (Mezirow, 1997) in an empirical manner by demonstrating the changes in meaning structures that have evolved in two domains of learning, namely, instrumental learning and communicative learning. In instrumental learning, the effectiveness of course activities related to sustainability awareness and involvement reflects the notion of learning through task-oriented problem solving and determining cause-and-effect relationships. This, in turn, enhances learners' sense of innovativeness in further enabling them to nurture an ideal attitude towards sustainability. Communicative learning is demonstrated by embracing the meaning of values, ideals, feelings, moral decisions, freedom, justice, labour, love, autonomy, commitment and democracy, which constitute the sustainability agenda, as underscored in their attitudinal outcome.

From the marketing perspective, the findings may expand the literature pertaining to consumer behaviour by providing rare insights into understanding the behaviour of learners who are also consumers of higher education services. The findings may further enhance the knowledge regarding the attitudinal and behavioural profiles of environmentally friendly or green consumers.

Practical Implications

On a practical level, the study provides an avenue through which the sustainability concept can be assessed and achieved via the role of higher education providers in offering courses by means of the distance education mode. It also expands the understanding of the concept of sustainability and its nuances in the areas of curriculum delivery through online and distance learning programmes. This will enable institutions of higher education to contribute in a more dynamic manner to achieving sustainability goals. Besides encouraging sustainability in the context of distance education, the utilisation of technology in distance education may also prepare the institutions to survive the Fourth Industrial Revolution, which has changed the landscape of 21st century education. This will surely strengthen its attribute of sustainability in terms of always preserving the continuity in education for lifelong learning in all segments. The study also contributes significantly towards the national initiatives as an attempt to combat the global warming phenomenon by promoting environmentally friendly practices, such as reducing greenhouse gas emissions, increasing efficiency and reducing paper usage, which are achievable via the distance education mode of teaching and learning. The behavioural outcome of learners' attitudes towards the sustainability of distance education may add further value to the services delivered by distance education programme providers. The competitive advantage of distance education programmes that has been sorely overlooked is definitely appealing to sustainability in the higher education context and may be further harnessed.

Limitation of the Study

The limitations of the study involve the non-significant effect of the barriers to sustainability in distance education on innovativeness, which negates the mediating effect of innovativeness in the relationship between barriers to sustainability in distance education and attitude towards sustainability. Future research may re-examine the relationship to provide an explanation for the situation and further explore specific barriers that inhibit innovativeness and hinder the acquisition of a positive attitude towards sustainability. Due to the rapid change in the technology used in delivering lessons via distance education mode, the factors underlying the effectiveness of distance education in nurturing sustainability may also be limited to the current context. It is suggested that practitioners and all those involved in distance learning should continually expand the underlying factors to suit the current state of technology, such as apparatus, techniques, methods or approaches. The model may also be examined during the post-COVID-19 pandemic to better understand its applicability, as well as any remarkable change in the sustainability view.

CONCLUSION

The recent COVID-19 pandemic has witnessed a surge of enrolment in courses delivered via online and distance education modes. Apart from being the mainstream method for learning in this Industrial Revolution 4.0 era, the resilience of distance education has further highlighted its prevailing role in transforming the sustainability agenda into attitudinal outcome among learners. This study proves that distance education is effective in nurturing a positive attitude towards sustainability through the mediation of innovativeness. The barriers related to distance education did not seem to impose serious threats on innovativeness, although they may potentially hinder the development of a positive attitude towards sustainability. Future research may investigate the further applicability and relevancy of the model of this study in various contexts related to the role of distance education in achieving sustainable development.

Acknowledgements: I would like to thank Universiti Sains Malaysia for supporting the research (Grant no. 304/PJJAUH/6315204) and Ms Nur Hanis Alisa Md Hasri for assistance.

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