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Students Perception in Technology Integration and its Alignment within the ISTE Standards

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Abstract

This is an article on students' perception of the integration of technology in a college during the Spring of 2019. The SAMR Model was used as the framework which categorizes four different degrees of classroom technology integration. The study identified that there were positive results in students' performance based on the experiment which was conducted between two groups of control and experimental. There were 60 college students who participated and 30 went through interventions while the rest 30 students were controlled group. A questionnaire was distributed to the experimental group to gather information on their perception of the effectiveness of the integration. The survey identified that the perception of students on the impact of technology was positive based on eight factors such as enjoyment, building confidence, enhancing skills, active involvement of students to name a few. These factors were also discussed based on the Social Cognitive Theory of behavioral, cognitive, and environmental factors. The study also was found aligned with the 7 ISTE Standards for Students (2016).

Keywords

Technology Integration, Students Perception, SAMR Model, ISTE Standards

1. Introduction

Technology is fast becoming the knowledge transfer highway in many countries, whereby its integration has gone through innovations and transformed the way people think, work and live. In response to this, schools and other educational institutions need to consider Information and Communication Technologies (ICT) integration to prepare students to live in "a knowledge society" in their school programs. (Ghavifekr, Afshari, & Amla Salleh, 2012). In order to realize this mission in Malaysia, educators need to be guided in the integration of technology in their classrooms. In Malaysia, the national education policy reflects a significant role in promoting digital education. Nevertheless, the degrees of success in technology integration vary in the Malaysian educational context (Zainal & Zainuddin, 2020). Technology integration when teaching students whether in classrooms or online means teachers have 'to adapt to new pedagogical concepts and modes of delivery of teaching for which they have not been trained' (Schlichter, 2020). The transition is not easy, and the success of the implementation depends heavily on educators having the skills, knowledge, and competencies for both methods of teaching (Winter, et al, 2021). Technology is here to stay, whether we are teaching online or face-to-face. It is an important tool in the classroom and educators must know how and when to use technology appropriately (Hollebrands, 2020) in order to meet the quality and quantity of the given curriculum. Pettersson's (2018) review indicates that research has tended to overlook the wider contextual factors affecting teachers' integration of technology and focused more on teachers' competencies in ICT use. It is argued that although teachers can develop

their individual competencies in ICT use, it is imperative to seek ways to disseminate effective uses of ICT to support their use on a wider scale and in directing the change (Agélii Genlott, Grönlund, & Viberg, 2019).

An experiment was conducted using a modified technology instructional model between 60 students. There were two groups which were controlled and experimental. The controlled group was taught in a traditional method while the experimental group was taught using technology. The SAMR Model was used to help integrate technology in supporting learning. This article writes about the students' perception on the success of the integration of technology using the modified four-tier SAMR Model and its alignment within the ISTE Standards for Students (2016).

2. Technology Integration, Perception, SAMR Model, ISTE Standards

2.1. Technology Integration

Technology refers to computer-based tools such as computers, multimedia, and the Internet used for teaching and learning purposes (Aloraini, 2012). Technology integration is defined as the use of computer-based communication that is incorporated in the classrooms for teaching and learning (Ghavifekr & Rosdy, 2015). Other scholars describe technology integration in terms of types of teachers' computer use in the lecture rooms, like students doing Internet searches and multimedia presentations,

Collecting and interpreting data for projects (Cuban, Kirkpatrick, & Peck, 2001). Technology integration is also referred to the blending of computer-based tools with learning and instructional activities that provide a richer teaching and learning environment (R. Sudha Nair & Tay Choo Chuan, 2021).

Technology integration is important due to the reason that it gains information and communication that can be utilized in a million ways for both educators and students in their respective domain or subjects in a condition where both parties can master their skill better from what they had learned from colleges and universities and the surrounding environment (Thomas, 2016; Virkus, 2008). The learning process is not one-step learning but is an ongoing process where one will discover the many uses and benefits that technology can provide (Jamieson Proctor et al., 2013) and how one can use it to the fullest. Technology integration in a learning environment will enhance learning for learners. It delivers a motivational learning setting as students are encouraged and given chances to be constructively active with learning. Past researchers have identified that, if properly implemented, learners can gain positive outcomes of technology integration in the classroom. Experts today progressively promote the application of the constructivist model of learning rather than of the older instructive model (Means & Olsen, 1997; Williams, 2000).

Technology integration in a learning environment will enhance learning for learners. It delivers a motivational learning setting as students are encouraged and given chances to be constructively active with learning. According to Thomas (2016), in a blended learning environment, whereby technology is combined with face-to-face learning, learning occurs online and in-person augmenting and supporting teacher practice. Blended learning often allows students to have some control over time, place, path, or pace of learning. In many blended learning models, students spend some of their face-to-face time with the teacher in a large group, some face-to-face time with a teacher or tutor in a small group, and sometimes learning with and from peers.

2.2. Perception

The perception of undergraduates on technology integration is important to be analyzed. Perception is defined as the tendency of the individual behavior about the variables that require acceptance or rejection response towards different subjects, or it is a psychological state when an individual character carries a positive or negative towards something (Simpson & Weiner, 2014). Perception is the process whereby people select, organize, and interpret sensory stimulations into meaningful information about their work environment (Rao & Narayan, 1998). Another definition of perception is an act of being aware of "one's environment through physical sensation, which denotes an individual's ability to understand" (as cited in Gichaba, 2013). In this article, it is defined as undergraduates' acceptance or rejection of the use of technology towards learning.

2.3. SAMR Model

The four-tiered SAMR Model which encompasses Substitution, Augmentation, Modification, and Redefinition (SAMR) (Puentedura, 2006) is a popular framework that discusses the innovative usage of technologies for transforming learning. The SAMR model has been used as a means for educators to tackle any pedagogical changes when introducing learning technologies to students (Hogan, 2010). It was also claimed to help educators strive to personalize learning and help students visualize complex concepts**.** Sudha and Tay Choo Chuan (2021) in their article highlighted

that at the Substitution level, one is replacing an older technology in doing exactly the same activities one had done in their previous classroom. It may stage for future development however it will not form a significant impact on student outcome at this level. The second tier is augmentation where one needs to question whether we can enhance our teaching and learning with the technology that we have on hand! Rather than seeing how the students were carrying out their given task before, now we have to see the certain features in the technology that they use to accomplish the given task in a more effective, informative, and swifter manner. This will encourage improvements in students in the way they complete the given task. At the modification tier, an educator needs to accomplish the provided goals for the day's lesson. The technology will enable us to modify our teaching methods. The syllabus remains the same, but the approach used to teach the syllabus is modified so that the students can accomplish new goals which they were unable to do previously. Finally, the redefinition tier provides freedom for an educator to replace some of the old methods with newer effective ideas of teaching with the use of technology to gain students' interest (R. Sudha Nair & Tay Choo Chuan, 2021).

The study incorporated four levels of the SAMR Model in integrating technology. In the first stage of Substitution, students were tested on the responses of the given task between two groups. The second stage of Augmentation students' frequency of communication between control (through meetings) and experimental groups (through Facebook) was noted down. In the third stage of Modification, students were given essay writing and then their grades were noted between the two groups. Finally, under the Redefinition stage, students were required to do a recorded presentation and upload them in YouTube. Overall, students' performance was found positive (R. Sudha Nair & Tay Choo Chuan, 2021).

2.4. ISTE Standards

Schools, colleges, and universities in Malaysian are embracing the need for technology to be embedded in education. These initiatives are supported by the government in the Malaysian Education Blueprint (2013-2025) as it is one of the main components in stressing national education in concentrating on quality education for future development using technology. In recognizing this transformational decision, there were 11 strong and operational shifts suggested in the Blueprint. In the 7th shift of the ICT, it was stated that in order to improve the learning quality of the nation, the need for internet access and a virtual learning environment should be seriously analyzed and implemented. This is not the case in Malaysia only, but globally. However, the concern is that few plans were focused on the learning goals for technology integration. Stakeholders are more focused on tools and apps worldwide rather than concentrating on technology transformation based on learning outcomes.

For this reason, The International Society for Technology in Education (ISTE) has developed the ISTE Standards for Students. As the ISTE is committed to empowering connected learners in a connected world, these standards concentrate more on pedagogy than tools or apps. The 2016 ISTE Standards for Students have been designed to prepare students for work and life. The ISTE Standards for Students embrace the challenges and envision shifts to education that support students as they become agentic, future-focused and adaptable. They also expand upon skills long considered necessary for digital age work and life. These skills include communication, creativity, critical thinking, and collaboration. In addition, the standards recognize that human life is increasingly hybrid between digital and physical, and so push for students to embrace being citizens of the digital space as well as of the globe. Lastly, the standards focus on key areas likely to be of increasing importance in future careers, most notably design processes and computational thinking, combined with the problem-solving and solution-making mindsets that come from both of these areas (Education 1STE, 2016).

The ISTE Standards claimed to support a holistic vision for technology adoption and a re-visioning of digital age learning that goes beyond devices and connectivity to get to the unfulfilled potential of technology to transform learning (ISTE, 2016). Thus, the ISTE Standards for Students provide an approach for implementing models that work collaboratively to deepen and extend learning with technology. ISTE maintains that, like with content-area standards, various implementation frameworks are deepened and supported by the ISTE Standards for Students (ISTE, 2016). There are seven standards highlighted in the ISTE Standards for students. They are empowered learning, digital citizen, knowledgeable instructor, computational thinker, creative communicator and global collaborator (Figure 1). Each standard has its own definition.

The ISTE had highlighted that the standards emphasized on a re-vision pedagogy to meet the promise of technology to significantly change and improve education. As such, the ISTE assures that the standards do not supersede other education initiatives but will work alongside them. The ISTE has lay out a path to follow for educators building their lessons based on SAMR, TPACK or other implementation frameworks (Education ISTE, 2016). Therefore, in the current study, it was felt needed to identify if the revised SAMR Model is compliant with the ISTE Standards for Students,

as it is assured that it is not merely another set of standards to target but rather, a dynamic useful guide to support and deepen the many other initiatives derived from content-area standards including the Malaysian Education Program Standard (EPS), Pedagogical Standards for Language Teaching (ELTC), and others.

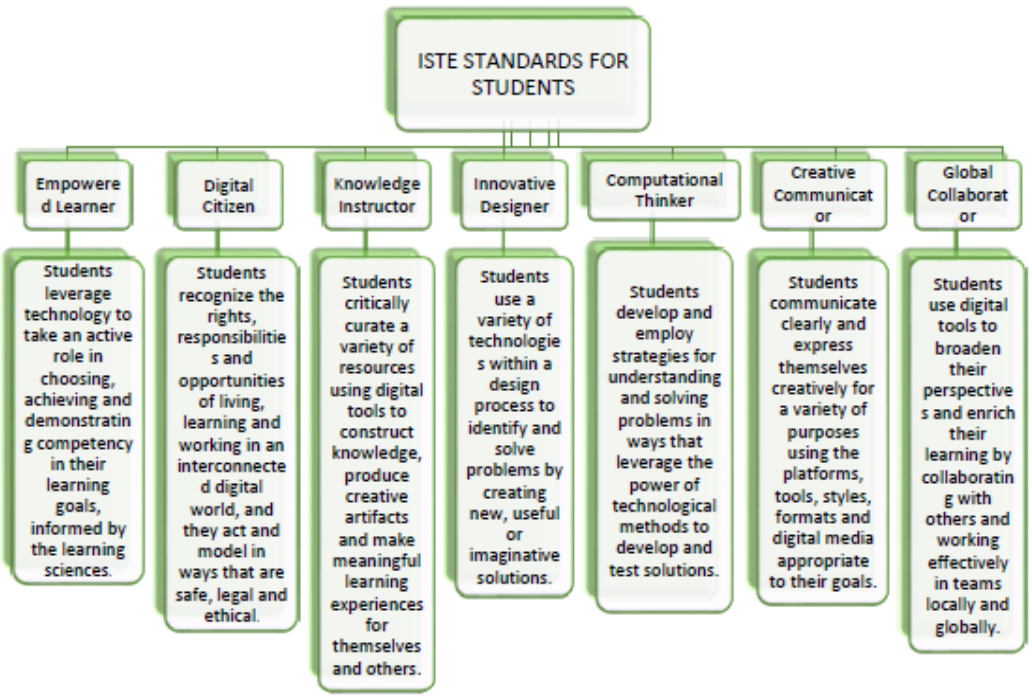

Figure 1. The ISTE Standards for Students (2016).

3. Students Perception

A survey using questionnaire was administered during Spring 2019 on the eighth week after conducting research between two groups: control and experimental. There are eight factors that were identified and analyzed, which are enjoyment, confidence, enhancing skill, easy and affordable, active involvement, academic performance, not boring and difficult and no time-wasting. Students felt that by using technology learning is enjoyable, it increases confidence, enhances student skills, is easy and affordable, increases academic performance, is not boring or difficult and nor is it time-wasting. However, for active involvement, there are some who feel that there is lesser active involvement involved. Students were encouraged to google and find information relating to the topic taught (Carter, Greenberg, & Walker, 2017) and that has provided positive results.

Ahern, Feller, and Nagle (2016) identified a few factors that encouraged the use of Facebook in an academic setting based on their study with undergraduate students. The first factor is the ease of use and ease of control when using Facebook (Ahern, Feller, & Nagle, 2016; Zaidieh, 2012). FB has grown in popularity because it allows people, especially adolescents, to socialize and interact with peers in the comfort of their own homes (Yunus & Salehi, 2012). The survey identifies that students' perception of technology integration was that it was easy to use.

Ahern et al. (2016), also identified that students are connecting from all parts of the area and collaborating for educational purposes which goes with active involvement. The study also found that Group timeline is the most preferred communication mode of the Facebook Group and students are keen on uploading and downloading documents to the Facebook Group which enables knowledge sharing which enhances students' skills in technology (Ahern, Feller & Nagle, 2016). Besides that, the survey identified that students found the use of technology as giving them enjoyment. This can be observed where students were recording clips and uploading them on YouTube to complete the assigned tasks. They shared the links with their friends, parents, and lecturers. This provided a broader audience due to technology integration. Besides, it also promoted active involvement, whereby students were in groups to complete writing

tasks and presentation tasks. Ajjan and Hartshorne (2008) stated that social network supports cooperative learning and critical thinking as well as enhances interaction (Ajjan & Hartshorne, 2008). FB allows students to contribute to learning tasks (Madge, Meek, Wellens, & Hooley, 2009) and to develop a productive attitude towards learning and improve its quality (Kirschner & Karpinski, 2010).

The current study identified that student perception of technology integration had enhanced their skills and provides good academic performance. A survey conducted by Neo and Neo (2010) for the students from the Faculty of Creative Multimedia, Multimedia University, Malaysia, studied students' perceptions in developing a multimedia project. Students agreed that their understanding had increased, and they were able to realize the importance of the project and that they had enhanced their skill through the project (Neo & Neo, 2010). Similarly, Khan, Wohn, and Ellison (2014) and Lambić (2016) highlighted that academic involvement on FB was linked with academic performance, besides that, students being conscience and providing support to their FB friends, along with higher-order Internet using skills, and influential support from FB friends which provide ideas and thoughts to give a different perspective on a certain topic that builds new knowledge all contribute to academic performance.

The current survey also identified that many students felt technology in teaching is not boring nor time-wasting. Milon and Iqbal (2017) who used the same survey instrument found similar findings. However, in Milon's study, students agreed that technology integration encourages active participation between them. More than 70% of students in Milon's study in Bangladesh with 120 students agreed that technology encourages students' involvement. In contrast, in the present study, students felt there was not a very active involvement among members in a group. The reason could be that students meet each other during classes and communicate and discuss their group work at that time rather than communicating through FB.

Milon and Iqbal (2017), findings indicated that technology tools like software, social networking sites, online videos, mp3 podcasts, smartphone and tablet apps have positive impacts and can be very much effective in improving students' language skills. They also felt that incorporating technology in classrooms will not be boring or a waste of time. Around 90% of the result showed that students disagreed that technology integration would be boring and more than 60% disagreed that it was a waste of time (Milon & Iqbal, 2017). The current study had similar results as well. Students found the use of technology improves their academic performances.

The calculation to analyze the factors was made based on the coefficient of variance (CV). Based on the results, students felt that technology integration using technology is enjoyable, increases confidence, enhances student skills, is easy and affordable, increases academic performance, is not boring or difficult, and no time-wasting. However, for active involvement, there are some who felt that there is lesser active involvement involved since the CV shows 22.5% which is acceptable compared to the rest of the factors which were below 20% and shows positive results. Students were encouraged to google and find information relating to the topic taught (Carter, Greenberg & Walker, 2017) and that has provided positive results.

Figure 2 shows in percentage the perception of students in each factor that contributes to the integration of technology in the study. In a glance at the graph, one can conclude that each factor plays an important role in technology integration.

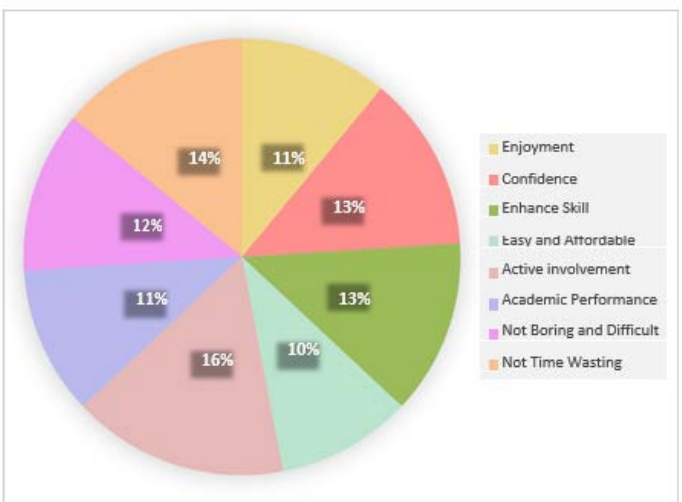

Figure 2. Factors Representing Student's Perception on Technology Integration.

In the investigation of student perception on technology integration, the social cognitive theory (SCT) (Bandura, 1986) is linked where it is found that cognitive, behavioral, and environmental factors (Saldana & Omasta, 2016) are very much affected when technology is integrated into a learning environment (Table 1).

Table 1. Percentages of Behavioral Factors Based on SCT

Student Perception Factors	Percentage based from questionnaire	Behavioural Factors (Social Cognitive Theory)	
Enjoyment	11	Behavioural	36%
Confidence	13	Behavioural	
Boring and Difficult	12	Behavioural	
Enhances Skills	13	Cognitive	24%
Academic Performance	11	Cognitive	
Active Involvement	16	Environmental	40%
Easy and Affordable	10	Environmental	
Time wasting	14	Environmental	

The percentages involved in the three factors based on SCT are cognitive factors 24%, behavioral factors 36%, and environmental factors 40%. From this result, one can conclude that student performance is very much influenced based on environmental factors rather than behavioral and cognitive factors. Students' participation in FB in the current study is very much influenced by their performances.

Social Cognitive Theory (SCT) is relevant to education for three reasons. First, this theoretical approach brings elements of knowing, feeling, and behaving socially into a synergistic complex. Second, it suggests that there are varying avenues for explaining human behavior when something new is introduced. Third, it provides an opportunity to bring the fields of psychology and student performance together in a synergistic fashion. The factors involving the environment, their cognitive skills, and behavior that are important in learning business subject adherence to a new behavior embedded in SCT.

4. ISTE Standards for Students

It was found a need to investigate if the study complies with the ISTE Standards for Students (2016). Each stage of the SAMR Model (substitution, augmentation, modification, and redefinition) that was used to integrate technology, was analyzed if it is encompassed with the seven standards of the ISTE Standards, being empowered learning, digital citizen, knowledgeable instructor, innovative designer, computational thinker, creative communicator, and global collaborator.

In the first stage of the SAMR Model, known as substitution, students create accounts in social media in order to incorporate technology in given tasks. Besides that, students also uploaded their writing tasks and presentation tasks. They recorded their created skits and acted it out and later uploaded the skits on YouTube for public viewing. At this level, it shows empowered learning based on the ISTE Standards as communication takes place through FB. FB substitutes the traditional method of communication in the first stage of the SAMR Model. As this is the first stage of the model, there were only one and no other ISTE Standards which had complied.

In the augmentation stage, five of the seven standards of ISTE complies based on the research conducted. The students shared information on Facebook, and this provided peer feedbacks which showed empowered learning. They also made sure of sharing links with their group mates. Students were careful on what should be written when communicating via Facebook and also had a good communication level with team members. Some students have made their accounts private to maintain privacy and security. These factors contributed to the standard of them being digital citizens. By sharing information, providing ideas and references from reliable sources made them knowledgeable instructors to their group mates. Each member in the group googles various websites for information and shared their findings. They became creative communicators when they summarize the articles that they have read and start to share on Facebook for group members to read. Sharing of information that they obtained online with friends and authors of diverse cultures makes them global collaborators.

In the stage of modification, six of the seven standards of ISTE comply with the research conducted. Students start to set personal goals in order to complete a given task. They develop strategies using technology to achieve them and im-

prove the learning outcomes. Students analyzed the data gathered and started organizing the information which shows empowered learning. They became a knowledge instructor when they identified information that is salient for their task and provided proper referencing to avoid plagiarism. Students learn to evaluate the accuracy of their data and started making notes and outlines. They take a series of steps to discuss the task and generate ideas for problems which makes them an innovative designer. In addition, collecting data and identifying salient data and presenting them in various ways make them computational thinkers.

Students become creative communicators when they create writing tasks using word or google documents and share the outcome among members for proofreading. They communicate complex ideas clearly and effectively by creating or using a variety of digital objects. Finally, their chat through FB with group members to complete tasks, encourages teamwork. They engage in providing feedback, making teams decision, contributing in ways that are measurable, and preparing tasks on a given time frame which makes them global collaborators.

In the final stage of redefinition on the SAMR Model, all seven standards of ISTE for students are reflected based on activities and tasks accomplished by students through technology integration. Students are empowered and able to transfer their knowledge to explore emerging technologies. They engage in positive, safe, legal, and ethical behavior when using devices which makes them a digital citizen. Students become knowledge instructors when they employ effective research strategies for completing given tasks. They become innovative and computational thinkers when recording tasks and editing them to suit their preferences using relevant software. By creating skits ideas and preparing them for publishing to meet the desired objectives makes them creative communicators among friends. Students become global collaborator when they start to communicate with people all around the world who views their uploaded clips and provide constructive feedback. They enrich their knowledge by getting feedback from people of various backgrounds and cultures. Figure 3 shows the alignment of ISTE Standards with the current study.

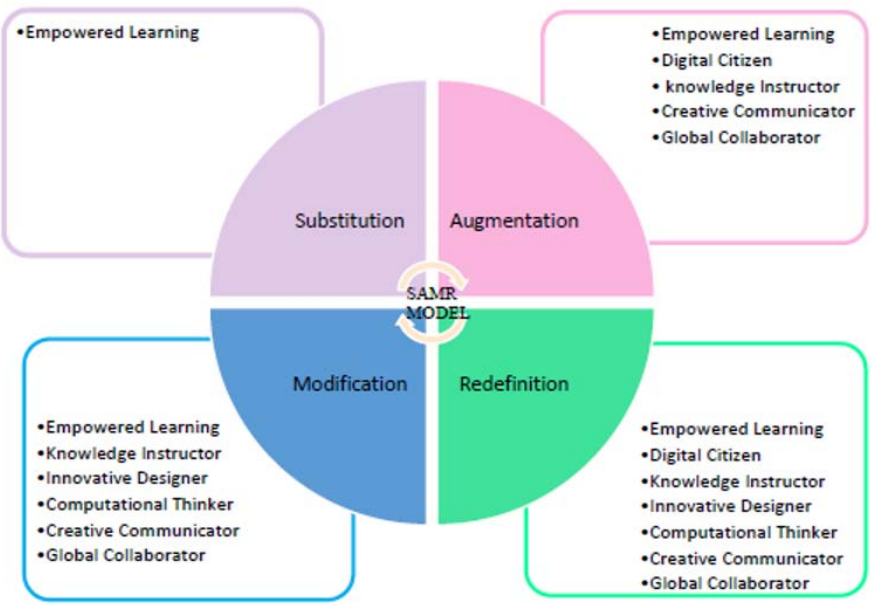

Figure 3. Compliance of the stages of SAMR Model with ISTE Standards.

Figure 3 shows a summary of the standards that comply with ISTE Standards for students in this article. In the first stage, there was only one standard that covered the substitution level, however, in the next stage, there were five standards that were achieved in the augmentation level, moving to the following stage, the standards that were met increased to six and finally at the redefinition stage, all seven standards were met. At the redefinition level, students' participation through the revised SAMR model, identified that they were taking an active role in choosing and achieving the goals set for them. They are also learning in an interconnected digital world by using a variety of digital tools to construct knowledge. Students identify and solve problems using technological methods making them innovative and computational thinkers. At this level, they get an opportunity to be creative using technological tools to express themselves. Finally, these digital tools broaden their perspective which enhances their learning by collaborating in teams locally or globally. To conclude, they get the skills and qualities needed to thrive in a digital world.

Based on this summary, it can be concluded that all standards cannot be achieved in each stage of the SAMR Model, as it is a process. So, as one moves from one stage to another, the standards that are met increase as well. The final stage shows that the revised SAMR Model complies with all the seven standards that had been highlighted by ISTE Standards for Students (2016). Therefore, it is found that the experiment to integrate technology using a revised SAMR Model as a pedagogical framework complies with the ISTE Standards for Students (2016).

5. Conclusion

The Malaysia Ministry of Education has introduced four strategies to be implemented during COVID-19, which are (1) flexible class schedule and pedagogies, (2) synchronous and asynchronous online class, (3) collaboration with mass media, and (4) digital learning communities for professional development (Izhar, Dhelei & Ishak, 2021). The implemented strategies enabled the education system to overcome the school's sudden closing issue and have taken the initiative to ensure the continuation of schooling via online education to overcome class disruptions for primary, secondary, colleges, and universities. The need to integrate technology is a must and there is no dispute during the pandemic. Educators, as well as students, are challenged to overcome this sudden change and start adapting to new teaching methods.

One should not forget the evolution of the web from Web 1.0 to Web 3.0 and now targeting Web 4.0 which can be used as a metaphor of how education should also be moving, developing, and evolving from Education 1.0 towards that of Education 4.0. Haseeb (2018) in a local newspaper article highlighted the expectations of higher education in the era of Industrial Education (IR) 4.0 in Malaysia. He highlighted that education experts recognize, the undeniable impact that a myriad of technological innovations in ICT is having on education and agreed that Education 4.0 will be shaped by innovations, and we need to train students towards it. In an era that focuses on smart technology, artificial intelligence, and robotics, educational institutions must produce a highly skilled and capable workforce who can take advantage of the tools available in this technologically transformed world. This is because, in the era of IR 4.0, jobs that require creativity are likely to stay irrespective of discipline, Education 4.0 is aimed at providing graduates with the capabilities and competencies required by the digital-driven industry. It must be able to produce highly creative graduates with the ability to think critically (Haseeb, 2018). As educators, we are still struggling to reach the target set in Education 3.0, now we are challenged to achieve Education 4.0. The current pandemic has made many higher learning institutions to venture more into using technology in their teaching and learning. In the Education 4.0 framework, challenges of the fourth Industrial Revolution (IR4.0) are addressed in relation to the Malaysia Education Blueprint for Higher Education 2015-2025 (Yoke, 2018). Education is expected to transform into giving importance to industry, therefore we need to prepare ourselves as educators to use the technology that we have to the best. Innovations such as mobile computing, cloud, social network, Massive Open Online Courses, virtual classrooms, remote labs, virtual labs, and game-based learning need to be incorporated into education in order to achieve Education 4.0. However, it is admitted that the research conducted using SAMR Model does not reach the level of Education 4.0, but it is a pathway to further improve the research by using more technological innovations to reach Education 4.0.

The ISTE standards are equally important when one wants to integrate technology in the education field. It is a framework that guides educators to rethink and create high-impact and sustainable learning experiences for all learners. These standards are aligned with the UNESCO's Sustainable Development Goals which have been used for over 20 years. The standards have been researched and updated continuously to reflect the latest practices when using technology when it comes to learning, teaching, leading, and coaching.

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