

Future Trends Report

Based on Analysis of the Team's Chosen Community / Organisation in Mid-Term and Final Evaluation

Community / Organisation Studied: Education

STEP 1. Identify Challenges

Read the Future Scene carefully and generate ideas for challenges, concerns, and possible related problems. Choose the 5 most important challenges and write them in the space provided. Include applicable research with appropriate in-text citations.

Challenge #1: Ensuring the safety of students online

[Observation] In an interview with Dr Chia Hui Peng, Dean of Studies in Hwa Chong Institution, when asked on ensuring safety of students online, she acknowledges that "we can prevent them from accessing undesirable materials on one device, but we cannot prevent them from using other device, you know, at home that they may have access to, to access those information. So, it boils down to the student himself, he needs to be responsible for his own learning." In another interview with Mr Tsering Wangyal, Lecturer at the National Institute of Education, Mr Wangyal said "...sometimes when you use technology without thinking through why you are using technology, you may have unintended consequences as well... it may lead to videos that you don't want students to see, for example".

[Challenge] With the move towards a blended learning curriculum post-pandemic, at least in Singaporean schools, the issue of ensuring safety of students online will be a real issue to tackle. The issue is exacerbated especially in this age of technology which enables easy access to many harmful materials online as seen from interviews conducted. Digital technology is a double-edged sword, and increased exposure to the dangers of the cyberworld can affect students mentally and emotionally.

[Research] According to a press release by UNICEF, children are at increased risk of harm online during the global COVID-19 pandemic. Spending more time on virtual platforms can leave students vulnerable to online sexual exploitation and grooming, as predators look to exploit the COVID-19 pandemic. Increased and unstructured time online may expose students to potentially harmful and violent content as well as greater risk of cyberbullying (UNICEF, 2020). Early into the pandemic, cybercriminals took advantage of Zoom's security weaknesses to break into private meetings early into the pandemic. This resulted in several reported incidents of online classrooms being interrupted by users making inappropriate comments and behaviour (Kaspersky, 2021). The increased exposure to the dangerous cyberworld may risk students getting exposed to inappropriate content unintentionally. In order to enable digital learning to deliver lessons well, without causing harm to students, it will be of paramount importance to tackle this issue of keeping students safe online. Even when the pandemic does end, most agree that digital learning is here to stay, with a recent global survey by Pearson Education, showing that nearly 90% of the 7,000 individuals surveyed expect online learning to continue to play a role at all education levels (Kaspersky, 2021). In fact, even before the pandemic, some universities had already developed blending curricula with a growing number of academic institutions considering this as an option for future programs. It is certain that digital learning will continue to grow in popularity and thus cybercriminals and predators will continue to attempt to exploit this fact for their own gain and the education sector will continue to face a growing number of cyber risks in the future (Kaspersky, 2021).

Challenge #2: Ineffective use of digital technologies to deliver lessons

[Observation] In an interview with Dr Chia Hui Peng, Dean of Studies in Hwa Chong Institution, Dr Chia noted that they were certainly busier as "it is probably anytime easier to go to class to deliver a lesson" in response to how this will impact teachers. Teachers are also "very mindful of how the lessons are designed effectively, such that students can learn effectively as well. If they do their part properly, then we have more than half the battle won." However, achieving this ideal will not be an easy feat. A similar point is raised in another interview with Mr Tsering Wangyal, Lecturer at the National Institute of Education, in which Mr Wangyal warned against "using technology for the sake of using technology, because it sounds very flashy and interesting" as it can "become a distraction or a waste of effort."

[Challenge] There is no doubt that the delivery of lessons with digital technologies effectively will remain a challenge especially in the changing digital landscape. In addition, with the quantity of digital content, it can be overwhelming to vet and curate a set of top-quality digital learning materials independently. As Singapore moves towards a more blended learning approach, it is crucial to deliver quality lessons which can be conducted through online means. Otherwise, digital learning just becomes a replacement for physical learning and the lesson becomes lacklustre and boring, completely opposite of the intended goal of digital learning which is to provide an interactive, collaborative, innovative, interesting and out of the box learning experience for students.

[Research] In a case that happened during Circuit Breaker, mathematics teacher Choo Choong Huat, lessons that would normally take a few hours to plan, took days to prepare. Furthermore, content cannot simply be copied from a face-to-face to an online setting. While HBL is necessary during this Covid-19 period, she felt it "cannot go on for long as it is hard for online lessons to meet the needs of each student." (Chia, 2020) A 2017 research paper on the challenges and issues for teaching successful online courses also reaffirmed that it is worth noting that simply incorporating multimedia into the design of online courses is not always the right answer. Similar to what Mr Wangyal said, the research paper noted that educators will need to question the purpose and meaning the technology will add to the learning activity. Afterall, multimedia used in the wrong way can be a detriment to the learning process (Yue, Bjork, & Bjork, 2013; Kebritchi et al., 2017). The "bells and whistles" do not necessarily provide the best outcomes for students who might be easily distracted by the videos, graphics, and other such technologies within the class, thus losing the opportunity to engage in the class discussions that might provide learning (Fein & Logan, 2003, p. 47; Kebritchi et al., 2017). There is also a shift from faculty-centred education to a more student-centred approach, where students decide how they wish to learn, producing a new role for the instructor as a facilitator. The faculty role changes from "performer" in front of the face-to-face class in the lecture-style delivery of information to "guides" who must make adjustments to the delivery of content based on their online environments (Coppola et al., 2001; Kebritchi et al., 2017). In this role, instructors facilitate student learning, rather than teach students. The lecture format of the traditional classroom is less likely to work online as the delivery of the content must be adjusted to meet the demand of an evolving interactive environment (Kember & Kwan, 2000; Kebritchi et al., 2017). Solving the issues in the delivery of lessons with digital technologies will be a challenging task to do, and as education is experiencing a digital revolution, utilising technology to teach lessons effectively will remain even in the years to come.

Challenge #3: Lack of digital competency

[Observation] When asked about the challenges possibly faced in this process, Dr Chia Hui Peng, the Dean of Studies in Hwa Chong Institution, acknowledged that there will be challenges such as teachers' and students' competencies on learning new technologies, so that students and teachers can see the "beauty of technology" to teach and learn. Rather than seeing the process of "constantly looking for new things to enhance our practices" as challenges, Dr Chia sees it as a way of "moving forward to do things better", like how "schools have to move in a changing landscape". In another interview with Mr Tsering Wangyal, Lecturer at the National Institute of Education, in which Mr Wangyal also said, "Competencies on whether if (teachers) have initial required skills to, for example, to create lessons to design lessons, to design learning resources, use a range of technologies."

[Challenge] This can be a problem in the future as technology will become more commonly used, such that even young children must use it. Without digital competence, many students and teachers will not be able to fully utilise technology while learning. As time goes on, so will the improvement of technology. At a certain point, technology will be so commonly used that not knowing how to use and benefit from technology will be a disadvantage. Students and instructors with low digital competence are liable to lag behind in online learning as they are not familiar with technology.

[Research] According to the Digital Agenda Scoreboard 2015, 40% of the EU population has an insufficient level of digital competence, including 22% who do not use the Internet. Not everyone born in this modern era where technology is commonly used possesses digital competence. (Akgün, 2021) In the US, about 1 in 3 workers have limited or no digital skills and, in the UK, about 43% of STEM vacancies go unfilled as workers do not have the competent skills needed. According to the Digital Agenda Scoreboard 2015, 40% of the EU population has an insufficient level of digital competence, including 18% who do not use the Internet. (European Commission, 2021) Educational institutions will need to equip educators with the relevant technological skills in order to unleash the full potential of education technology. A certain digital proficiency, including the ability to successfully log in, participate in classes, submit work, and communicate with teachers and classmates, will contribute to an effective and conducive online lesson. (Purdue University Global, 2020) Furthermore, technology is in the state of constant flux. Technological skills picked a few years ago or even now, might become obsolete just years down the road. Thus, there will always be pressure for teachers to keep up with the new technology.

Challenge #4: Lack of digital infrastructure

[Observation] In an interview, Mr. Tsering Wangyal, Lecturer at the National Institute of Education said "So there are many barriers. At the student level again, it is the same. First, do the students have access to technology?" when asked about what are some of the challenges in the process of integrating digital learning into traditional classroom teaching.

[Challenge] The gaps in usage and access to digital infrastructure and digital services between people, households, companies, or geographical areas are still very broad for emerging countries and it particularly affects certain population groups, for example, rural and low-income communities, due to the lack of digital media infrastructure and affordability. The need to universalize digital access is essential. The lack of digital infrastructure will remain a difficult challenge to the different governments around the world to continue the efforts to develop infrastructure in schools. Hence, if this problem continues to exist in the future, it would create a more divisive society and would particularly affect the learning of children of impoverished families.

[Research] As of January 2021, there were 4.66 billion active internet users worldwide, out of which is disproportionately lesser in developing countries. (Johnson, 2021) Most households in Singapore have access to the Internet, but having the Internet at home is a luxury for low-income students. This indirectly "forces" them to go to public libraries or community centres for a free wireless connection to conduct digital learning. According to Professor Jean Yeung's recent Straits Times article on her study of a nationally representative sample of over 5,000 children aged six and under, 8% of the families who lived in rental units were without internet access and 44% were missing a home computer or laptop. (Ng & Lim, 2020) This means that there is a huge lack of digital infrastructure affecting especially lower-income families. In a webinar that focuses on how the Digital Divide is impacting children, especially girls' education during the ongoing Covid-19 pandemic in Pakistan, panellist Sumera Mehboob, Director Mechanism for Rational Change (MERC) said: "Schools have been shut since January in Balochistan (a province in Pakistan) and the biggest challenge for us is reaching out to the parents and students who do not own smartphones, even if some parents own mobile phones they are shared with the entire household and not easily accessible to the girl child." (The Nation, 2021) Another panellist Marvi Soomro, founder of IEI Pakistan, noted that due to the lack of digital infrastructure available in remote areas in Pakistan, the biggest challenge is connecting with students. Students in Gilgit-Baltistan (a region in Northern Kashmir) were further isolated due to lack of internet access and students and teachers couldn't be connected and get access to educational material (The Nation, 2021). Even before the pandemic, some universities had already developed blending curricula with a growing number of academic institutions considering this as an option for future programs. If governments around the world do not step up and provide adequate digital infrastructure for students, the divide between the high and low-income families will further increase and divide up societies.

Challenge #5: Learning attitude of students

[Observation] In our interview with Mr Tsering Wangyal, Lecturer with the Learning Sciences and Assessment Academic Group at National Institute of Education, he opined that online learning "depends on the readiness level of students" and their preferences as some "may be highly competent in using technology, but they may not be self-directed learners" and "some students really need scaffolding and guidance from the teacher".

[Challenge] This could pose a challenge 5 years from now as education in the subsequent post-pandemic years, at least in Singapore, are likely to be a blend of physical lessons and Home-Based Learning. While MOE and schools are trying their best to enhance student readiness by ensuring that all students have access to personal learning devices at home, there are other inherent issues that impact the readiness of students, such as students' learning attitude and ability to cope with independent learning, which are largely out of the locus of control of external parties. Consequently, because of the difficulty in solving such inherent issues, it would be hard for blended learning 5 years from now to have the same efficacy as traditional learning as long as student mindsets do not change.

[Research] In a study done in early 2000s, on the student characteristics and learning outcomes in a Blended Learning Environment Intervention in a Ugandan University, it shows individual student characteristics that play a part in student learning particularly in a blended learning environment. Studies show that there has been satisfaction with blended learning thereby showing a positive attitude to such a learning environment. Thus, the learners' positive attitudes are a significant factor in their intrinsic motivation according to this research, even though some of the items under self-regulation and learner attitudes scored below 3.5 which reduced these variables in regard to becoming a significant factor in some of the learning outcomes (Kintu, Zhu & Kagambe, 2016). Therefore, this study recommends that blended learning design should take into consideration the various learner characteristics and examine the ability of learners to make use of and interact with learning management systems for successful blended learning undertakings.

STEP 2. Craft the Underlying Problem

Using the challenges listed in Step 1, identify a problem of major importance to the chosen community / organization in the future. Write your Underlying Problem making sure your question clearly explains the action that will be taken and the desired results/goal of that action.

Incorporating Challenge(s) #3, #4 and #5

Underlying Problem:

Given our interview findings with Dr Chia Hui Peng, Mr Tsering Wangyal and Mr Hamilton Lau that teachers and students' digital competencies, acceptance levels of blended learning as well as access to digital infrastructure continue to pose challenges in education in the post-pandemic world (Condition Phrase), how might we enhance the blended learning readiness of both teachers and students (Key Verb Phrase) so that we can fully leverage the benefits of digital learning (Purpose) from now on in Singapore (FSP)?

STEP 3. Produce Solution Ideas

Generate solution ideas to the Underlying Problem in Step 2. Choose the 5 most effective solutions and write the elaborated ideas in the space provided. Include applicable research with appropriate in-text citations.

Solution #1: Digital course for students

We will lobby the Ministry of Education (MOE) to work with IT experts to design a course incorporated into the curriculum across all levels. The course, conducted every fortnight by teachers, will teach students about the different digital tools and enhance their digital skills as well as knowledge on cyber wellness. With this course, students will be equipped with digital skills and cyber wellness, enabling them to leverage technology in blended learning. The course includes lessons about cyber wellness and digital skills as well as hands-on activities and cyber wellness simulations for students to apply what they have learnt in the course. Through increased hands-on activities, the course will effectively enhance students' digital competency and be proficient in using learning applications and platforms. Furthermore, students will know about the harms of the digital world and ways to prevent exposure to these harms. With such digital competency courses, it can bridge the digital skills gap between students and even help teachers to deliver lessons with digital technologies more efficiently as students are digitally competent and hence fully leverage on the benefits of digital learning.

[Research] As digital technology plays a key role in blended learning, it is expected that students need a certain level of digital literacy for them to learn effectively (Eshet, 2004). In addition, the Organisation for Economic Cooperation and Development (OECD) Learning Framework 2030 cites digital literacy as a core fundamental competency for future education. And as concluded by Mohammadyari and Singh (2015), people who have high digital literacy can adapt well to e-learning as they would find it easy to learn the technologies specific for educational purposes, and are more efficient and effective in information management. Hence, it will be necessary to raise the digital competence of students. Even as there have been extensive efforts to create digital skills education programs, until recently, there was weak coordination between programs and no globally accepted meaning of concepts such as digital literacy. Hence, the impact of digital skills education programs was limited even while the digitalization of K12 student education accelerated (Jackman et al., 2021). To address this issue, the Coalition for Digital Intelligence—comprising the OECD, IEEE Standards Association, and DQ Institute, in association with the World Economic Forum—spearheaded development of the recently approved IEEE Standard for Digital Intelligence (DQ) Framework for Digital Literacy, Skills, and Readiness. Looking beyond current times, digital literacy needs to be renewed as digital technology evolves over time (Tang & Chaw, 2016). Another study observed that students can exhibit different levels of digital literacy (Prior et al., 2016). Assuming that all students have the same level of digital competence can lead to a problem in digital learning; what the students are capable of doing might be different from the expectations of teachers (Tang & Chaw, 2016). Therefore, there is added importance to bridge the digital skills gap to raise the efficacy of blended learning on the digital front. As a good fit of digital literacy level to course expectations is necessary for successful blended learning, it is concluded in one study that some students have low digital literacy levels, additional exercises and tutorials can be used to help these students improve their digital literacy capabilities (Tang & Chaw, 2016). Ensuring that digitalisation in education occurs inclusively while stemming the tide of rising inequality will be of paramount importance (Jackman et al., 2021). As a conclusion, empowering students with a core set of digital skills will go a long way in enhancing the digital learning experience for students, enabling them to fully leverage on the benefits of digital technology.

Solution #2: Digital training for teachers

We will lobby the Ministry of Education (MOE) to work with education and IT experts to discuss and design a basic digital skills set course for Subject heads, teachers and NIE-trainee teachers to attend and learn. This course should be relevant to the current education, making use of the current technology. It should be about a 3 days course, and to be conducted once every term. This is to ensure that the educators are kept abreast of the latest application available in the market and suitable for teaching. Most probably, it will be conducted during school holidays when most of the educators will be available. Since this skill set is to be applied on designing courses for students, the IT experts will impart skills to the teachers on learning the software application and the NIE lecturers will teach and give guidance on how to make use of the application during home-based learning. Today, the advancement of technology has permeated every aspect of our lives. So, when preparing pupils for the world of work, our educators need to have a basic digital skill set. This not only will allow the teachers to pick up the necessary skills in order to plan, design, present and engage the students into the contents of the subjects, it also enhances the teachers' acceptance of the technology in the education industry and result in our students being more digital savvy. Furthermore, by setting a standard basic course for all teachers to attend, it standardizes the teachers' digital skills and ensures no teachers are left behind in the new education industry. As a result, it will also warrant the same set of educational materials for the students to be taught in the whole of Singapore. Finally, as teachers master digital skills with their lessons, they can collaborate with peers to share technology and work toward improving learning outcomes for their students.

[Research] When preparing pupils for the world of work, our educators need to have a basic digital skill set, else the teachers cannot pass on skills to students if they do not possess any related IT skills initially. Research showed although students were familiar with ICT tools, they did not use those beyond social communication applications. Similarly, while students were very capable at finding information on the Internet, they were not always good at evaluating its accuracy. Teachers needed to be able to help students learn how to use social media such as blogs and wikis to collaborate and learn. Teachers would need to be competent in these same skills to be able to pass the skills onto their students. (Luterbach and Brown, 2006) Firstly, the teachers will learn and include 'teaching for understanding' in their approach to delivering lessons, connecting the main concepts and skills students need with the appropriate integration of technologies. In this way, skills such as critical thinking and problem solving would be integral to the lessons. Secondly, the teachers should be provided with rich in-school experiences that will allow them to connect theory to practice. Thirdly, the teachers should be given opportunities to take part in technology supported "personal learning communities" (PLCs) that would give them the opportunities to share their reflections on what they were learning and thus deepen their understanding. 21st century competencies can be seen as necessary to navigate contemporary and future life, shaped by technology that changes workplaces and lifestyles. (Caena and Redecker, 2019). Furthering students' 21st-century competencies poses fresh challenges for teachers, particularly in the assessment of learners and more widely in teacher professional development. Therefore, it is imperative that our educators' frontiers are equipped with the necessary skills and knowledge in technology, so that they have the necessary means or skills to coach and tutor our younger generation.

Solution #3: Rewards for using digital devices and applications

We will lobby the Ministry of Education (MOE) to work with business partners (Google, Microsoft, Razer, etc) to come up with a series of rewards for students and teachers to encourage them to use digital devices and platforms for learning and teaching. The rewards system works by providing "missions" for students and teachers to complete. By completing a mission, the person receives a set number of points (depending on the difficulty). The points can be used to redeem a variety of rewards. An app can be created for users to view and log in their progress on the "mission tree". Some examples of missions can be: Take a screenshot of you trying out a new productivity tool online and write a simple reflection about it. The points will be given out upon verification of a moderator (a person who checks if the task is properly completed). Some rewards can include free Google Suite, free Office 365 and computer equipment like a mouse. The rewards vary in price. The more expensive the reward, the more points needed to redeem it. This app can be mass publicised with help of the Ministry of Communication and Information (MCI) and Mediacorp with advertisements and endorsements by celebrities. With this rewards system in place, students and teachers can be motivated to try out new digital tools and through the process of exploration, they may find something useful which they can use. This will encourage them to enjoy using digital devices and therefore make them ready for blended learning.

[Research] Research showed although students were familiar with ICT tools, they did not use those beyond social communication applications. Similarly, while students were very capable at finding information on the Internet, they were not always good at evaluating its accuracy. Teachers needed to be able to help students learn how to use social media such as blogs and wikis to collaborate and learn. Teachers would need to be competent in these same skills to be able to pass the skills onto their students. (Luterbach and Brown, 2006) From the learning platform, the teachers will learn and include 'teaching for understanding' in their approach to delivering lessons, connecting the main concepts and skills students need with the appropriate integration of technologies. In this way, skills such as critical thinking and problem solving would be integral to the lessons. Likewise for the students, they can pick up the necessary skills set in ICT and will be very part of their integrative learning. An article also suggests that offering team or individual incentives in the short term can help to speed up the usage of learning platforms and more take-upgrowth (Ayer, 2020). And it takes almost no time to implement. However, in the long term, evidence shows that offering goals rather than incentives that allow users to see the progress they're making, will appreciate the usefulness of the learning platform (Ayer, 2020)

Solution #4: App that incorporates all learning platforms into one place

We will lobby The Ministry of Education (MOE) to work with app developers to develop an app that incorporates all learning platforms into one place. This app can include tools like document writing platforms (Google Docs, Microsoft Word), slides making platforms (Google Slides, PowerPoint), etc. This app is necessary as there is a wide variety of learning tools out on the internet and they should be collated in an app for users to easily access. This app should be available to all students and teachers free of charge and may be installed on all Personal Learning Devices. This app can help students and teachers explore online learning tools and have a step-by-step tutorial guiding them through. This is especially beneficial as it enhances their digital skill by exploring new digital tools and teaching them how to use them to cope with digital learning. We can encourage students and teachers to use this app by letting them have free subscriptions to paid applications like Adobe and Microsoft 365 when they create an account in this app. With such a recommendation, MOE can improve the collation of learning resources and enable both teachers and students to use these resources and improve their digital capabilities.

[Research] Digitisation has transformed the education sector where digital learning is an integral part of education. In a digital world where technology continues to impact the education sector and students, the need for digital literacy is growing. Digital literacy means the ability and awareness to use emerging technologies to perform academic tasks online while demonstrating a proper online attitude in a digital environment (Perera, Gardner, & Peiris, 2016). As society becomes more digital in their everyday tasks, knowledge, attitude, and skills are essential to be digitally literate. Being digitally literate today is not confined to understanding just the hardware and knowing how to use the software. In a digital learning environment, digital literacy represents one of the prerequisites that are necessary for students to navigate their learning process in a digital learning environment. Furthermore, to excel in a digital learning environment, students need to equip themselves with digital literacy (Tang & Chaw, 2016; Techataweewan & Prasertsin, 2017). Scholars mentioned that an individual's level of digital literacy affects a student's performance positively (Mohammadyari & Singh, 2015; Scholastica, Nkiruka, Ifeanyichukwu, 2016). Tang and Chaw (2016) also reported that digital literacy is a prerequisite for students to learn effectively in a blended learning environment. When the level of students' digital literacy is high, it can make it easier for students to participate in the learning process, giving learners a more positive feeling about their educational experience. Hence, students' learning performance may be increased. Digital literacy means more than just being able to use computers or technologies for a task. An individual needs to develop function skills, values, attitudes, and behaviour to become a digitally literate person. Although digital literacy is used to measure learners' quality in a digital environment, research supports the fact that students lack digital literacy such as not engaging in a thoughtful process while learning online (Vissers, Rowe, Islam, & Taeymans, 2017), not being able to evaluate and integrate digital information effectively (Tang & Chaw, 2016; Ng, 2012; O'Sullivan & Dallas, 2010; Tenku Shariman, Talib & Ibrahim, 2012), not able to critically judge the suitability of a large amount of information online (Greene, Yu & Copeland, 2014), not understanding the ethical and social usage of information, interpret reference to a paper or journal, search databases effectively (Shopova, 2014), discern the validity and value of information found online (Tenku Shariman et al., 2012) and not understanding copyright issues when using digital information for sharing purposes (Tenku Shariman et al., 2012). This study shows that digital literacy is key in allowing students to learn effectively in a blended learning environment. Therefore, it reaffirms the need for MOE to develop a platform for students and teachers to develop their digital literacy and technological capabilities.

Solution #5: Roll out digital infrastructure to schools and homes

We will lobby the Ministry of Education (MOE) to work with the Ministry of Communications and Information (MCI) to provide digital infrastructure, including digital devices and infrastructure such as Wi-Fi at schools and homes as well as facilities for digital technologies such as Artificial Intelligence, Augmented Reality, Virtual Reality and many more. They can extend the one-to-one distribution of laptops to all school-going students, including those in primary school. This can start with a subsidised basic laptop listed as part of schools' book lists in primary 1. On the issue of cost and funding, the government can set aside a sum of money in the budget for the fiscal year as well as from the taxes. Given that this will provide an enhanced digital learning experience, the benefits of the provision of such infrastructure will greatly outweigh costs in the long run. Although there is currently the National Digital Literacy Programme (NDLP), this programme only ensures that secondary school students and older receive a personal learning device, neglecting the needs of the primary school students. Not only that, this programme does not include internet access and paid digital applications. This means that lower income families with no access to the internet and digital tools are left behind during blended learning. With the provision of digital infrastructure, the government can close the digital divide and increase access to digital technologies for all regardless of their socioeconomic background. The government can also make use of this provision to provide schools with adequate digital resources to keep up with the evolving digital landscape and to allow schools to provide the best blended learning experience possible for students.

[Research] COVID-19 has exposed and deepened the digital divide in our society. Given the speed at which most of society is moving ahead, closing this gnawing digital divide must be an urgent priority if we are to have a Smart Nation that is also united (Ong, 2020). Singapore has among the highest digital coverage in the world. The Infocomm and Media Development Authority (IMDA) reports that 89% of resident households have access to a computer, and 98% have access to the internet (IMDA, 2019). Only 45 per cent of households residing in 1- and 2-room HDB flats have internet access, compared to 96 per cent of households living in private condominiums and other apartments. Only 31 percent of the 1-2 room HDB households have a personal computer, in contrast with 95 per cent of households in private condominiums and other apartments. These numbers mean that some of us are almost guaranteed to have internet connectivity and a personal computer, while more than 5 in 10 households living in 1-and 2-room HDB flats have no internet access or personal computer (Ong, 2020). This is also reflected in the ground realities exposed by home-based learning (HBL). When the Circuit Breaker led to home-based learning, many low-income students did not possess the necessary computers and/or internet access connections to engage in HBL. Covid-19 has unearthed different ways that various disadvantaged groups lack digital resources (Ong, 2020). It is now widely acknowledged that Covid-19 has accelerated digital adoption. Post-pandemic, digital usage will no longer be a choice but has become, and will continue to be a need, not a want. Yet, as the example above shows, this means that individuals and households who lack the digital resources and know-how will be left further behind. They will also be subject to greater online risks. Although their numbers are not sizable compared to other countries, the 10% of our population who are digitally excluded will be more isolated and underprivileged as the rest of Singapore speeds along the digital highway. Thus, as digital inclusion becomes a key national priority, the urgency is in getting all in Singapore on board, especially those who are already disadvantaged. This demands a paradigm shift towards viewing digital resources as public utilities that should be universally provided by governments, like piped water and electricity. Otherwise, in a world where inequality is already high, digital inequality will become a source of social divide and an impediment to social mobility. The sudden digital gaps revealed due to Covid-19 have offered precious learning points to accelerate digital inclusion plans. The NEU-PC Plus programme, which offers households with a student or a person with disabilities (PWD) a subsidised PC and broadband, has been in place since 1999, and has helped more than 63,000 beneficiaries (IMDA, 2020). This has no doubt resulted in the high PC ownership rate of 89% (IMDA, 2019). However, the scramble to loan and donate laptops to many students without a PC when the Circuit Breaker required HBL clearly underlined that many households who need PCs still lacked them. Besides the 12,500 PCs and tablets that MOE loaned out (Ang, 2020), ground efforts such as Engineering Good provided more than 3,000 refurbished laptops as of November 2020, while Bridge the Digital Divide provided another 400. With donations from Facebook, TOUCH Community Services loaned out 500 new laptops to their clients and distributed another 500 to other agencies.

STEP 4a. Select Criteria

Generate criteria to determine which solution idea does the best job of solving your Underlying Problem and/or addressing the Future Scene situation. Select the 5 most important criteria for measuring solution ideas and write them in the spaces provided.

Criterion #1:

Which solution will be the cheapest to implement (superlative adjective) for the government and schools (Who) so that the government need not spend too high a budget and can continue to fund the solution for years to come (Why)?

Criterion #2:

Which solution will be the fastest to implement (superlative adjective) for the government and schools (Who) so that schools will not lag behind for a long time especially in this pandemic situation (Why)?

Criterion #3:

Which solution will be the easiest to maintain (superlative adjective) for the government and schools (Who) so that the implementation of the solution will be met with the least resistance (Why)?

Criterion #4:

Which solution will be the longest lasting effects (superlative adjective) for students and teachers (Who) so that they can continue reaping the benefits of the solution even after a long period of time (Why)?

Criterion #5:

Which solution will be the most appealing (superlative adjective) for students and teachers (Who) so that after spending so much money on the solution, it will not go to waste (Why)?

STEP 4b. Apply Criteria

List the solution ideas from Step 3 on the grid. Use each criterion to rank the solutions on a scale from 1 (poorest) to 5 (best). The weighting for one important criterion may be doubled if necessary.

Step 3 Sol'n #	Solution Idea	Criteria					Total
		1	2	3	4	5	
#1	Digital course for students	4	5	3	4	2	18
#2	Digital training for teachers	5	4	5	5	1	20
#3	Rewards for using digital applications and devices	2	2	2	2	4	12
#4	App that incorporates all learning platforms into one place	3	3	4	1	5	16
#5	Roll out digital infrastructure to schools and homes	1	1	1	3	3	9

STEP 5. Develop an Action Plan and Evaluate its Feasibility

Develop your top-scoring solution idea into an Action Plan. Thoroughly explain how the Underlying Problem is solved, how the plan will be implemented, and how the community / organisation will be affected. Explain how this Action Plan is feasible with secondary research consulted, preferably also with primary research (feedback from chosen community / organization)

Action Plan derived from Solution #1 and #2:

Details and Outline:

We will lobby the Ministry of Education (MOE) to work with IT experts to design a digital skills course incorporated into the curriculum across all levels for the students and customized basic digital skills set course for the teachers to attend & learn.

A committee consisting of officials from the Education Technology Division of MOE, NIE Lecturers and IT experts can be formed to discuss the course design as well as the scope of the course.

After the design of the course is completed, the students' course will be rolled out to all educational institutions in Singapore across all levels. The course, which is mandatory in all education institutions in Singapore, will be taught every fortnight for one hour each session. This is to ensure that there is a good balance on upping students' digital competency as well as setting appropriate frequency so that it brings minimal disruption to the current curriculum. The students' course will teach students about the different digital tools and enhance their digital skills as well as knowledge on cyber wellness. The course difficulty will be pitched at an appropriate level for different levels. The course includes lessons about cyber wellness and digital skills as well as hands-on activities and simulations for students to apply what they have learnt in the course.

The teachers' course is a 3-day course, and to be conducted once every year. It should be relevant to the current education, making use of the current technology so as to ensure that the educators are kept abreast of the latest application available in the market and suitable for teaching. The scope of the course should include web page designing, computer programming language, Python programming, Google and Microsoft office applications etc.

The committee formed for the designing of the digital skills course will also review the course contents every year so as to ensure that the digital skills taught will not be obsolete. In a fast-changing world, it is crucial for the course content to keep up with the times.

Timeline:

For the first 3 to 4 months, the committee will discuss the scope, necessary information and content, as well as create the digital skills course. The next 1 month will be for pilot testing of the course and getting the corresponding feedback. There will be another 1 month of fine-tuning the software course. The committee will review the curriculum and scope of the digital skills course annually.

Potential Assistors:

IT experts are teaching the course.

Parents and teachers can be encouraging to students and support their learning.

MOE develops the course and helps to review and update it every year. MOE can also help provide devices and materials for the course.

The SkillsFuture department (from MOM) will strongly encourage all the teachers and students to attend this course and upgrade their IT skills.

Potential Resistors:

For students, they might find the course unnecessary and a waste of precious time which can be used by studying other subjects.

For schools, they might find it difficult to release teachers to attend the course, especially during school terms, when teachers are required to teach students.

For teachers, they might find it difficult to find spare time to attend this course as they are very tied up in school teachings and other related stuff

For parents who are not familiar with digital technology, they might find the course a waste of time which their children can better use studying for examinations.

For taxpayers, they might find the course expensive, unnecessary and useless and they might be unwilling to fund such courses.

Obstacles:

For the school, they may find it tough and difficult to arrange and find time for both students and teachers to learn it during their school curriculum and teachers to attend the course during school terms.

During the course, the students may be uncooperative in lessons and not respond well to it. Whereas for teachers, who are not IT-savvy and teachers who are reaching retirement age may find it a hassle to attend this course, as they will not see any value in attending this course.

In addition, in some schools, they may be hampered by the lack of digital infrastructure to carry out these activities for the students.

How difficulties will be managed and overcome:

Schools can allow the course to be taught in Infocomm lessons or add a time slot into their timetable if they do not have Infocomm lessons in their curriculum. A key point to note is that the course should be in the curriculum and not an additional programme.

Some incentives can be provided to motivate students to participate actively during the course. Incentives may be rewarded according to a point system. Points may be awarded for active participation during activities within the lessons in the course and incentives may include digital device accessories such as mouse or even discounts on future purchase of digital devices.

Currently, under the National Digital Literacy Programme, all students will have their own Personal Learning Devices, which can be used for lessons in school. For future integration of digital technologies such as Augmented and Virtual Reality into education, the Ministry of Education as well as the committee set up will ensure that schools have the sufficient infrastructure and funding for these digital technologies in the future.

Currently, the Singapore government and MOM have been constantly advising its citizens to upgrade its skills. By using this promotion, the MOE also can follow the trend and ask the teachers to upgrade their IT-related skills and enhance their knowledge on it. Furthermore, MOE can incentivize the teachers who had attended the course, by giving vouchers similar to the Singapore Rediscover Voucher. In addition, MOE should also set up a team of counsellors to engage in order to understand their concern and encourage teachers who are near retirement age or not IT-savvy, to attend this course.

Finally, MOE should work with the schools on the schedule, to allow teachers to attend these courses without affecting the teaching of students. Therefore, most likely the teachers should attend it during school holidays, and webinars should be made available for teachers to revise the contents if required.

Why will the Action Plan solve the Underlying Problem?

Today, the advancement of technology has permeated every aspect of our lives. So, when preparing pupils for the world of work, our educators need to have a basic digital skill set. This teachers' course not only will allow the teachers to pick up the necessary skills in order to plan, design, present and engage the students into the contents of the subjects, it also enhances the teachers' acceptance of the technology in the education industry and result in our students being more digital savvy. As for the students' course, students will be equipped with digital skills and cyber wellness, enabling them to leverage technology in blended learning. Through increased hands-on activities, the course will effectively enhance students' digital competency and will be proficient in using learning applications and platforms. Furthermore, students will know about the harms of the digital world and ways to prevent exposure to these harms. The digital skills course can bridge the digital skills gap between students and even help teachers to deliver lessons with digital technologies more efficiently as students are digitally competent and hence fully leverage on the benefits of digital learning. Furthermore, by setting a standard basic course for all teachers and students to attend, it standardizes the teachers' digital skills and the students' learning journey. Finally, this action plan will allow us to leverage the benefits of digital learning and enhance the blending learning readiness of teachers and students in Singapore.

Research on Action Plan feasibility:

Multiple studies conclude that digital literacy is crucial in blended learning; Gurung and Rutledge (2014) share the view that digital learners need help on how to use technology effectively for learning; Ng (2012) contends that students might not know how to use technology for learning. As digital technology plays a key role in blended learning, it is expected that students need a certain level of digital literacy for them to learn effectively (Eshet, 2004). Given that a study by Tang and Chaw (2016) concluded that digital literacy is a prerequisite for successful blended learning, the study suggests that additional exercises and tutorials for students who have low digital literacy levels can be used to help them improve their digital literacy capabilities. Ng (2012) supports that students can learn to use educational technologies not familiar to them for learning if they are introduced to and given a chance to use these technologies. Prior et al. (2016) find that students who have strong self-efficacy are more confident, independent, and motivated, and also concludes that a positive student attitude and high digital literacy can improve self-efficacy, which in turn contributes positively to such online behaviours as peer engagement, learning management system interaction, and convener interaction. Thus, by helping students develop digital literacy, educators can also help foster self-directed learning (Tang and Chaw, 2016). Therefore, it is evident that the incorporation of the digital competency course in students' curriculum is feasible and will raise digital competency of students through lessons, simulations, hands-on activities and exposure to educational technologies not familiar to them, and hence fully leverage on the benefits of digital technology.

The digital skills course for teachers can also enable teachers to be digitally literate which in turn can advocate for change and seek innovative solutions. Good teachers know how their students engage and learn and can use that knowledge to push for technology that will unlock new teaching potential. They will make digital choices that reflect varied cultural contexts. They would know how to inspire students to use today's technology as a powerful toolset to expand their learning opportunities. Good teachers know how their students engage and learn and can use that knowledge to push for technology that will unlock new teaching potential, making digitally literate teachers great advocates for the appropriate technologies (Levy, 2018). Teachers would be able to push students to new levels of creativity. Once students have a deeper understanding of the answers they've found, they can push for creative application of that knowledge. If there is a huge success in the courses, teachers might have the capability to offer important pedagogical and practical insights for EdTech companies developing learning technology for students. In conclusion, the course has potential to increase the digital competencies of teachers, and increase the efficacy of blended learning through leveraging the benefits of digital technologies. (Levy, 2018).

Bibliography

Cite the resources you consulted using the APA format.

List of References:

- Akgün, Ö. (2020, February 5). *Digital competence: The vital 21st-century skill for teachers and students*. Retrieved from <https://www.schooleducationgateway.eu/en/pub/resources/tutorials/digital-competence-the-vital-.htm>.
- Ayers, R. (2020, May 22). *How Effective are Monetary Incentives?* Hppy. Retrieved from <https://gethppy.com/employee-engagement/how-effective-are-monetary-incentives>.
- Caena, F., & Redecker, C. (2019, August 7). *Aligning teacher competence frameworks to 21st century challenges: The case for the European Digital Competence Framework for Educators (Digcompedu)*. Wiley Online Library. Retrieved from <https://onlinelibrary.wiley.com/doi/full/10.1111/ejed.12345>.
- Chia, O. (2020, April 30). *Home-based learning drove home difficulties of teaching remotely*. Retrieved from <https://www.tnp.sg/news/singapore/home-based-learning-drove-home-difficulties-teaching-remotely>.
- Coppola, N. W., Hiltz, S. R., & Rotter, N. (2001). *Becoming a virtual professor: Pedagogical roles and ALN*. System Sciences, 2001. Proceedings of the 34th Annual Hawaii International Conference.
- Eshet, Y. (2004). "Digital Literacy: A Conceptual Framework for Survival Skills in the Digital Era", *Journal of Educational Multimedia and Hypermedia*, Vol. 13, No. 1, pp. 93-106.
- European Commission. (2021, March 9). *Digital Agenda Scoreboard 2015: Most targets reached, time has come to lift digital borders*. Digital Agenda Scoreboard 2015: Most targets reached, time has come to lift digital borders | Shaping Europe's digital future. <https://digital-strategy.ec.europa.eu/en/news/digital-agenda-scoreboard-2015-most-targets-reached-time-has-come-lift-digital-borders>.
- Fein, A. D., & Logan, M. C. (2003). *Preparing instructors for online instruction*. *New Directions for Adult and Continuing Education*, 100, 45–55.
- Greene, J. A., Yu, S. B., & Copeland, D. Z. (2014). *Measuring critical components of digital literacy and their relationships with learning*, *Computers and Education* 76: 55-69.
- Jackman, J. A., Gentile, D. A., Cho, N.-J., & Park, Y. (2021, March 11). *Addressing the digital skills gap for future education*. Nature News. Retrieved from <https://www.nature.com/articles/s41562-021-01074-z>.
- Johnson, J. (2021, April 7). *Internet users in the world 2021*. Statista. Retrieved from <https://www.statista.com/statistics/617136/digital-population-worldwide/#:~:text=How%20many%20people%20use%20the,the%20internet%20via%20mobile%20devices>.
- Kaspersky. (2020, September 4). *Digital Education: The cyberrisks of the online classroom*. Retrieved from <https://securelist.com/digital-education-the-cyberrisks-of-the-online-classroom/98380/>.
- Kebritchi, M., Lipschuetz, A., & Santiago, L. (2017, September). *Issues and Challenges for Teaching Successful Online Courses in Higher Education: A Literature Review*. Retrieved from https://www.researchgate.net/publication/319013030_Issues_and_Challenges_for_Teaching_Successful_Online_Courses_in_Higher_Education_A_Literature_Review.
- Kember, D., & Kwan, K. (2000). *Lecturers' approaches to teaching and their relationship to conceptions of good teaching*. *Instructional Science*, 28, 469–490.

- Kintu, M. J., Zhu, C., & Kagambe, E. (2017, February 6). *Blended learning effectiveness: the relationship between student characteristics, design features and outcomes*. International Journal of Educational Technology in Higher Education. Retrieved from <https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-017-0043-4>.
- Levy, L. A. (2018, July 25). *7 Reasons Why Digital Literacy is Important for Teachers*. USC Rossier. Retrieved from <https://rossieronline.usc.edu/blog/teacher-digital-literacy/>.
- Lim, F. V. (2020, June 3). *Digital Learning in the Time of a Pandemic*. SingTeach Education Research for Teachers Research within Reach. Retrieved from <https://singteach.nie.edu.sg/2020/06/03/vsl-digital-learning/>.
- Luterbach, K. J., & Brown, C. (2006). Education for the 21st century. *International Journal of Applied Educational Studies*, 11(1), 14-32.
- Mohammadyari, S. and Singh, H. (2015) "Understanding the Effect of E-Learning on Individual Performance: The Role of Digital Literacy", *Computers & Education*, Vol. 82, pp. 11-25.
- Ng, I. Y. H., & Lim, S. S. (2021, February 2). *Commentary: The case for universal digital access, as home-based computing becomes a post-pandemic norm*. CNA. Retrieved from <https://www.channelnewsasia.com/news/commentary/universal-free-internet-access-remote-working-online-learning-12766858>.
- Ng, I. Y. H., Lim, S. S., Pang, N., Lim, D., Soh, G., Pakianathan, P. V. S., & Ang, B. (2021, January). *FROM DIGITAL EXCLUSION TO UNIVERSAL DIGITAL ACCESS IN SINGAPORE*. Retrieved from <https://fass.nus.edu.sg/ssr/wp-content/uploads/sites/8/2021/01/Digital-Access-20210118.pdf>.
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers and Education*, 59(3):1065-1078.
- O'Sullivan, M. K., & Dallas, K. B. 2010. A collaborative approach to implementing 21st century skills in high school senior research class. *Education Libraries* 33(1): 3-9.
- Noviaristanti, S., Hanafi, H. M., & Trihanondo, D. (2020, March 17). *Understanding Digital Industry: Proceedings of the Conference on Managing Digital Industry, Technology and Entrepreneurship (CoMDITE 2019), July 10-11, 2019, Bandung, Indonesia*. Google Books. Retrieved from <https://books.google.com.sg/books?id=f6PSDwAAQBAJ&lpg=PA133&ots=02cbr2N4Kk&dq=digital+literacy+of+students&lr&pg=PA133#v=onepage&q=digital%20literacy%20of%20students&f=false>.
- Ong, A. (2021, February 2). *Commentary: COVID-19 has revealed a new disadvantaged group among us – digital outcasts*. CNA. Retrieved from <https://www.channelnewsasia.com/news/commentary/covid-19-has-revealed-digital-divide-literacy-singapore-12783252>.
- Perera, M. U. Gardner, L. A., & Peiris, A (2016). Investigating the Interrelationship between Under- graduates Digital Literacy and Self-Regulated Learning Skills, *Proceedings of the Thirty Seventh International Conference Information Systems*: 1-13.
- Prior D. D., Mazanov, J., Meacheam, D., Heaslip, G. and Hanson J. (2016) "Attitude, Digital Literacy and Self Efficacy: Flow- On Effects for Online Learning Behavior", *Internet and Higher Education*, Vol. 29, pp. 91-97.
- Purdue University Global. (2020, June 30). *4 Common Challenges Facing Online Learners*. Purdue Global. Retrieved from <https://www.purdueglobal.edu/blog/online-learning/4-challenges-facing-online-learners/>.
- Shenglin, B., Simonelli, F., Bosc, R., Zhang, R., & Li, W. (2020, December 10). *Digital infrastructure: Overcoming Digital Divide in Emerging Economies*. G20 Insights. Retrieved from https://www.g20-insights.org/policy_briefs/digital-infrastructure-overcoming-digital-divide-emerging-economies/.

- Shopova, T. (2014, July 31). *DIGITAL LITERACY OF STUDENTS AND ITS IMPROVEMENT AT THE UNIVERSITY*. Retrieved from <https://pdfs.semanticscholar.org/3dad/1638029c45e3338b94958040b6ffbf5692af.pdf>.
- Tang, C. M., & Chaw, L. Y. (2016). *Digital Literacy: A Prerequisite for Effective Learning in a Blended Learning Environment?* The Electronic Journal of e-Learning Volume 14 Issue 1 2016. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1099109.pdf>.
- Techataweewan, W., & Prasertsin, U. (2017). Development of digital literacy indicators for Thai under- graduate students using mixed method research. *Kasetsart Journal of Social Sciences*: 1-7.
- Tenku Shariman, T. P. N., Talib, O., & Ibrahim, N. (2012). The Relevancy of Digital Literacy for Malay- sian Students for Learning With WEB 2.0 Technology. *Proceedings of the European Conference on E-Learning*:536-545.
- The Nation. (2020, September 1). *Lack of digital infrastructure affects girls' education in remote areas*. The Nation. Retrieved from <https://nation.com.pk/02-Sep-2020/lack-of-digital-infrastructure-affects-girls-education-in-remote-areas>.
- UNICEF. (2020, April 15). *Children at increased risk of harm online during global COVID-19 pandemic*. UNICEF. Retrieved from <https://www.unicef.org/romania/press-releases/children-increased-risk-harm-online-during-global-covid-19-pandemic-unicef>.
- Vissers, D., Rowe, M., Islam, M. S., & Taeymans, J. (2017, December 19). Ownership and Attitudes towards Technology Use in Physiotherapy Students from Seven Countries. *Health Professions Education*. <https://www.sciencedirect.com/science/article/pii/S2452301117300895>.
- Yue, C. L., Bjork, E. L., & Bjork, R. A. (2013). Reducing verbal redundancy in multimedia learning: An undesired desirable difficulty? *Journal of Educational Psychology*, 105, 266–277.