The challenges to digitalization of schools in the Maldives

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Abstract

Digitalization of schools has the potential to make learning cost-effective and equitable for all children of the Maldives. It can overcome barriers to education due to resource shortages in the remote small island schools of the Maldives (Ministry of Education, 2019a). This study evaluates the effectiveness, and explores the challenges of the school digitalization program initiated by the Maldives Ministry of Education, in 1986 and expanded on ever since. A qualitative research process using document analysis and one-to-one semi-structured interviews was used. The data showed that teachers were willing to integrate ICT into their teaching since they believed that integration of ICT promotes children's interest, participation and engagement in learning. However, the slow internet speeds and exorbitant costs of internet connectivity prevented even the most competent teachers from using ICT effectively in their classrooms. Other major factors at organizational level which hinder the effort of digitalization of schools of the Maldives was found to be the lack of a digital education policy and strategy, lack of teacher training in ICT education, and limited awareness from school management regarding the process and the concept of digitalization. Limited internet access, unfamiliarity with classroom management of devices, cost of replacing damaged or old equipment; and unreliable technical support prevented teachers from relying on ICT as a teaching tool. Additionally, lack of exposure of students and parents to the use of ICT for learning contribute to the challenges of digitalization. It is recommended that awareness programs for key stakeholders including teachers, students, parents, school IT technicians, businesses, internet providers, university lecturers and public are conducted to overcome the existing challenges of digitalization, so that digitalization of schools can become a collaborative, transformative process, involving all of the stakeholders at multiple levels.

Key words: digitalization of schools; ICT in education

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Introduction

The continuing global digital revolution is highly likely to result in the development of more powerful, spontaneous, interactive, and efficient communication modes, along with increased integration of rich media (Huang & Liaw, 2018). With enhanced broadband speeds and internet access, lessons can be taught using chatbots, augmented and virtual reality, supported by artificial intelligence sources, predictive analytics and personalised learning systems. The tools students use can be desktop computers, tablet computers, smart televisions, radios, mobile phones, headsets, robots, etc. (Vuorikari, Punie, Gomez, & Van Den Brande, 2016). Digital technology can provide education in many different forms; these include virtual learning, e-learning, distance learning, and mobile learning, using relevant content and artefacts, including teacher produced content. Technology enhanced learning has the potential to enhance the students learning experience by facilitating self-paced learning, lowering inhibition thresholds for asking questions, and allowing access to learning on an as and when needed basis (Kamath, 2015).

Digitalization of schools is mostly defined in literature to mean using digital technologies in teaching and learning. These include the use of online courses, online examinations, digital textbooks, animations, presentations, informative documentaries, simulations, games and use of online platforms for synchronous and asynchronous lessons, as well as use of digital tools for assessment, feedback, and for communication with students and parents. The students are given opportunities for independent and collaborative online research as homework and class based projects with time allocated for children to share their independent and collaborative research with other children in classroom settings and elsewhere. This can generate deeper language skills and content knowledge (Sunday, Ayooluwa, Pascal, & Olaniyi, 2015).

According to social constructivist theory of learning, students need to participate actively and collaboratively in a lesson to learn something new. Digital tools which stimulate maximum engagement, motivation and collaborative learning are needed to improve quality of teaching and learning (Riehemann & Jucks, 2017). Pane, Steiner, Baird & Hamilton (2015) suggest that computer assisted learning is effective when technology is combined with pedagogy to promote student learning in groups and allows for timely and productive feedback from their peers and their teachers. Fullan and Hargreaves (2020) advise teachers to consider active inclusive involvement of parents to develop a collaborative professional environment that has greater strength and depth, while ensuring that digital learning has psychic rewards for both children and teachers.

Internationally, virtual personalised learning is becoming the new norm in education with platforms such as Khan Academy, StraighterLine, Udemy, EdX, and Coursera offering a plethora of courses at affordable prices, including courses on how to integrate ICT into school education. Moodle, Tencent Education, Edmodo, Schoology, Blackboard, and Google Classroom are some of the cloud based platforms used by schools to offer blended learning to school age children. Digital expertise of teachers need to not only include knowledge of apps, tabs, platforms and other resources but to have the capacity to decide if the digital resource adds value to enhance learning, compared to other cheaper resources. They also need to identify, minimise and manage risks that children may be exposed to while engaging in digital teaching and learning.

The Maldives' Ministry of Education (2019a) described the digitalization of Maldivian schools as on the emerging-applying phase on the Morel's Matrix for ICT integration in schools which has four phases (1) emerging, (2) applying, (3) integrating, and (4) transforming. On the Morel's Matrix, emerging/applying means the ICT provision is teacher-centred, and driven by a few interested individuals. For provision to be transformative, it will have to be learner-centred and promote collaborative experiential learning, critical thinking, creativity and innovation. In transformation of ICT, entire learning community of teachers, students, parents and support staff will be involved and lessons will cater to different learning styles, interests and goals of achievement for children. With this vision of transforming learning through ICT, Ministry of Education's digital school project aims to make the schools more technology-friendly and meet the rising standards of the modernising world, by ensuring collaboration between schools, businesses, industries, internet service providers, teacher training colleges, families and communities to achieve this objective.

Since the digitalization process is at its infancy, it is necessary to conduct relevant studies to determine the advantages and disadvantages as well as the effectiveness of this process in the Maldives. Therefore, a thorough analysis of the digitalisation program was conducted to analyse the effectiveness of the program and the obstacles faced at policy and planning level and at school level. Recommendations are made for solutions that would overcome some of the major challenges, by considering the conditions that could enhance the digitalization process.

Methodology

In order to achieve the objective, a qualitative research process using one-to-one semi-structured interviews and secondary document analysis were used. Documents reviewed include Ministry of Education policy and planning documents, circulars, news reports, internet provider websites, non-governmental organizations' documentation and academic research literature.

Nine teachers and one principal from three different public schools in Male' were interviewed using a semi-structured interview format, in August 2019. The schools were chosen based on a high level of digital technology use.

Consent was obtained from the school management and Ministry of Education to conduct the study. Participants were selected by the researchers depending on their knowledge and experience with use of digital tools in teaching. The questions used in the interviews focussed on generating information regarding the effectiveness of the school digitalizing program and barriers to success.

The interview questions were on planning and implementing digital technology, challenges, effectiveness, and recommendations. Prior to the interviews, the questions used were pilot tested to see the sufficiency of the questions to generate the required data. The questions were asked in English, for ease of transcription. The participants were given the option to answer in English or Dhivehi. The questions were provided prior to the interview, for the participants to become familiar with the questions, so that they can give thought out responses. The interviews were audio recorded with the participants' permission. Each interview lasted for 20 to 35 minutes. Interviews were conducted at a location quiet and free from distraction (meeting room or a vacant classroom) provided by the research school upon request. The data collected was analysed using content analysis (Patton, 1990).

Findings from the document analysis

This section includes analysis of demographics, internet connectivity and access to broadband and artefacts, curriculum, teacher training, virtual learning and other policy developments.

Demographics

According to the latest educational statistics, Maldivian school system currently has approximately 89,000 children (25 percent of the Maldivian national population), in 348 schools, taught by 10,424 teachers of whom, 7458 are women. 22 percent of teachers are expatriates, and 13 percent are untrained, temporary teachers (Ministry of Education, 2019b).

Majority of Maldivian parents use smart mobile phones, the internet and instant messaging apps to access information and advice provided by their children's schools about their children, at times with the assistance of their children to access these services (Zahir, et al., 2020).

Availability of ICT equipment in schools

In the Maldives, in general, parent teacher associations and individual community members provide ICT equipment to schools while the Ministry of Education provides internet connectivity costs. A rapid baseline review of technology infrastructure and ICT integration conducted by Ministry of Education in February 2018 showed that out of 172 schools that participated in the survey, ICT related gadgets available to use in the classrooms included a total of 809 smart TVs, 415 Projectors, 90 smartboards, and 277 computer/ laptops/iPads. The model of provision is for each school to have a computer lab with about 15 desktop computers for a whole class of thirty children to join in at the same time (Ministry of Education, 2019a).

Tablet computers had been given to all of the school children from Grade 3 and above, across the Maldives in 2018, by the Ministry of Education. These tablets can be taken home by children. However, there is a gross shortage of ICT equipment in Maldivian schools, especially for teaching purposes, including modelling to the whole class, and for children to investigate using a range of ICT equipment. Equipment is mainly available only in schools in Male' and in other larger schools in the atolls, causing huge inequity issues for those children from smaller schools. Children who are marginalised, in underserved communities can be the most vulnerable children in the Maldives, who can benefit the most from digitally competent teachers and well resourced schools.

Access to digital equipment

According to the Ministry of Education survey of February 2018; 156 (90.7 percent) of the responding schools stated they provide access to computers to their teachers. This meant that 5,932 teachers accessed a total of 1,018 computers provided by the schools. 160 (93.0 percent) of the schools stated they provide internet access to their teachers and 133 (71.5 percent) of the schools stated they provide computer access to students. However, this limited access is problematic because of damage to equipment and the necessity to upgrade them on a regular basis (Ministry of Education, 2019a).

The 2018 survey by Ministry of Education (2019a) showed that Information Technology (IT) technical staffs were employed only in 57 of the responding schools with altogether 64 staff. Most of the other schools stated that the principal or teachers took the responsibility of technical troubleshooting. A few schools stated that the technical support services were outsourced. Additional to minor repair and maintenance services, prevention of breaches to internet safety, will require a full time trained staff member to be available at each school who can respond appropriately and provide support to the teachers.

Internet connectivity

The Maldives has two fibre-optic submarine cable networks of over 1200kms each, running across the length of the country, which support provision of fixed broadband and mobile broadband services. 3G to 4G mobile internet connections are available in all of the inhabited islands. The two major networks are owned by the two international telecommunication providers operating in the Maldives, Dhiraagu and Ooredhoo. Focus Infocom Private Limited is a local service provider who offers the highest internet speeds in the Maldives, but currently provides their services mostly for commercial use.

Most of the islands in the Maldives have an optical fibre internet connection. The speeds served to schools range from 4-5Mbps to 25Mbps in island schools, with up to 30Mbps in Male' schools. Internet providers currently have the capacity to provide up to 100Mbps in the islands and 1Gbps in Male'. Of the 213 schools connected via Digital School Network, Ministry of Education described the bandwidth as follows: 4 Mbps in 74 schools, 8 Mbps in 75 schools, 12 Mbps in 24 schools, 16 Mbps in 15 schools, 20 Mbps in 6 schools, 24 Mbps in 12 schools, 28 Mbps in 6 schools (a total of 2 Gbps). (Ministry of Education, 2019a)

These bandwidths are shared by the students and as well as the school office and teachers. “Current minimum of 4 Mbps is not enough even for 2 classes to connect concurrently” (Ministry of Education, 2019a).

According to the Ministry of Education, 6 Gbps total speed would barely suffice, but costs would be prohibitive for higher bandwidths since internet prices are very high in the Maldives. “The network is designed in such a way that the service provider cannot be changed from Dhiraagu to another. With such high internet prices, sustainability of the digitalisation project is questionable” (Ministry of Education, 2019a). However, Government of the Maldives holds 42 percent of shares in Dhiraagu with the Maldivian public holding 6 percent additional shares, and the company has the capacity to provide the services to the Ministry of Education requirements.

The most underserved and marginalised communities in the Maldives do not have broadband internet, preventing digital technology users from living in these communities. This limits any window of opportunity to digital teaching and learning for the poorest children and families of the Maldives.

Curriculum adaptation

Information and Communication Technology was introduced to Maldivian secondary school students as early as 1986, when the first computers were brought to the country by Ministry of Planning and Development. Soon after, the larger secondary schools in Male’ had computer laboratories. By 2004, computer science was included in the national curriculum and every child was mandated to be computer literate before leaving secondary school. The current National curriculum framework introduced in January 2015 and the Inclusive Education Policy implemented in January 2013 strongly emphasizes the use of information technology in teaching and learning.

The most significant change in the new curriculum is the eight key competencies through which students are prepared for lifelong learning. Each key competency is built on a combination of cognitive and practical skills, knowledge, values, attitudes, and other social and behavioural components. One of the eight key competencies is on ‘using Technology and the media’. According to the national curriculum, usage of technology and media enhances the ability to use a variety of technologies as a tool for learning, communication, and entertainment. Thus, the school management are accountable to include ICT in teaching and learning starting from early childhood stage. The inclusive education policy

implemented in the Maldives (Ministry of Education, 2013), contains guidelines principles, roles, and responsibilities necessary for the implementation of inclusive education in Maldives. This policy outlines modifications that need to be made to teaching methods, equipment and materials required, roles and responsibilities of stakeholders that are required to make this policy feasible (Ministry of Education, 2019a)

In the Ministry of Education survey of 2018, only 87 out of the 172 schools offered computer related subjects including Computer Science for Grade 8-10; Business Studies for Grade 7-10, BTEC/Dhasvaaru vocational subjects; ICT foundation to Key Stage 1-3; and a very few schools offered coding as an extracurricular activity called the Coding Club. Women in Tech Maldives, a civil society organisation in the Maldives collaborates with the Ministry of Education to promote coding as an extracurricular activity for girls.

Out of the 127 schools who participated in the rapid review of ICT in schools by the Ministry of Education, 75 schools listed 131 teachers assigned to computer-related subjects, 91 percent of them were expatriate teachers and 64 percent of all ICT related teachers were male. This indicates that unless there is a drive to train teachers, especially local women teachers, specialising in computer science and providing a salary incentive to remain a computer science teacher, there will be inequity in access to computer science education by Maldivian children.

Teacher Training

A majority of international funding received following the Tsunami of 2004 was utilised to streamline and optimize teaching, learning and school management using information technology. A major achievement of the funding was the establishment of 20 teacher resource centres (TRCs) in 20 atolls, with desktop computers, smart white boards, and internet access for virtual learning by teachers. Staff who led continuous professional development of teachers were trained on how to do online teaching using Moodle. The Ministry of Education, in collaboration with UNICEF, used the facilities to begin training school management professionals on virtual learning platforms. By 2018 there were 23 TRCs that were strategically located throughout the country. The TRC functions as the central resource hub for the islands in each atoll and is connected with the National Institute of Education (NIE) as the oversight body. The teacher educators in these training hubs have been trained on virtual learning (Saeed & Moreira, 2010; Ministry of Education, 2019a),

The Ministry of Education's 3 year Master Plan of 2015 -2018 identified 10 deliverables on ICT, including training all of the teachers in ICT-literacy and ICT integration, allowing for distance education courses to be accredited as continuous professional development of all teachers. When children were given tablet computers, teachers were offered a mandatory course to develop familiarity with use of Google Classroom.

UNICEF supported the widening of this training during the Covid-19 pandemic. 3,885 teachers in government schools including 2,641 female teachers were trained on the use of Google's G Suite from July to November 2020. This represents 42.5 per cent of the teaching workforce in government schools (UNICEF, 2021). This training covered the theory and delivery of content, and the creation, editing and posting of content on various media outlets to support online teaching and distance learning (Nishan & Mohamed, 2021).

In-house training was conducted by school staff members who were more familiar with the Google Classroom Application, with 100 percent of staff in some schools completing the Google Certified Educator Level 1 training, while others achieved Level 2, and the Trainer levels.

A study done by Shibana in 2013 in 5 Maldivian schools highlighted that 9 percent of teachers surveyed identified their computer usage as "not very friendly" with only 25 percent self-identifying themselves as "advanced users". Hoque, Samad, Siraj, and Ziyadh (2012), found that though digital tools are made available in schools of the Maldives, they are not used effectively for learning, rather used merely for administrative purposes.

In general, even though a few digital tools are available, due to low competency and technical knowledge, teachers only use these tools to deliver content to make it interesting for learners, rather than because of the impact on students' ICT skills or knowledge (Adam, 2015). Muhaimin (2019) stated that science teachers' low technological knowledge was the main reason for the insufficient use of technology by science teachers. Teacher's pedagogical habits rely on cultural practices relating to learning norms and institutional context (Adam, 2014), indicating that a paradigm shift in how teachers and school managers perceive ICT may be necessary for effective digitalisation of schools.

Virtual learning

By the end of 2018, there were 9 schools from the outer islands/atolls that were connected to Iskandhar School in Malé so that students can join lessons virtually if they did not have the subject teacher in their own school (Ministry of Education, 2019a).

The virtual learning program expanded dramatically during the corona virus pandemic of 2019, with extensive collaboration between Ministry of Education and internet service providers. The post-pandemic impact of the exposure to virtual learning and internet access for all of the children to continue with remote learning is yet to be seen.

Policy level developments

Maldives Education Management Information System (MEMIS) is an open source software system adapted to the Maldivian context and introduced to Maldivian schools in 2017, which is used for monitoring students' enrolment, attendance and their academic progress. Additional features in MEMIS include students' health screening data, data on children with learning disabilities, teacher qualifications and continuous professional development, allowing for efficiency in identifying gaps in provision. There are plans to also monitor availability of physical resources through the MEMIS (Ministry of Education, 2019a). Herodotou, et al. (2019) suggests that analytical data should not only identify students at risk, but also identify contextual factors involved in poor performance of individual students.

There is a national policy to ensure all schools had ICT equipment to a nationally acceptable standard, and to have an education portal providing access to quality teaching and learning resources. The Ministry of Education's online platform, Fila, is a resource repository that includes videos of previously televised lessons, and digital resources produced by National Institute of Education. Schools can also share their resources with other teachers through this platform. However, long term sustainability of the platform will require higher levels of organisation, storage and control of access to archived resources. The national policy also expects schools to draw up their own ICT in education and development plans (Ministry of Education, 2019). However, it is unclear, how the equipment and training will be funded and made sustainable, since most of the previous funding have been funding provided through non-governmental organizations, and the resourcing has not been specifically targeted to develop children's digital competence in security, integrity, information and knowledge

searching, critical engagement in digital content evaluation and production.

Findings from the interviews

The effectiveness of technology in the classroom depends on the teacher's ability to use it appropriately in the teaching and learning process. From the finding of the research it is evident that teachers have a positive perception towards integrating technology in teaching and learning. Participants noted that current digitalization program conducted by the Ministry of Education has faced a lot of challenges to fulfil the requirements of digitalization. The most significant challenges highlighted by teachers include insufficient teacher training and support from school management, inadequate technical support, improper management practices, imperfect policy and strategic planning, as well as lack of awareness programs to parents and students.

Effectiveness

One of the key factors that contribute to the effectiveness of digitalization of education is the usability of various tools in classroom deliveries. Nonetheless this depends on other key factors such as teacher competency, availability of tools and support service. Overall there is a positive perception towards the use of digital technology and tablet computers from all of the participants. Participants highlighted that, in general, using technology in teaching and learning was found to be beneficial. Regarding implementation of digital tools one participant quoted;

> *"I am positive about it; I think it is a good thing. Even though we have not incorporated ICT in mainstream teaching and learning I believe that most of the students understand lessons much better while teaching with digitalised tools than normal classroom teaching without ICT."*

Adam (2015), in her study on enhancing technology-integrated pedagogical practices in Maldives stated that the enthusiasm of teachers for learning new technology related ideas is high, however teachers require institutional support in learning complicated tools and their usability in delivering lessons. These tools promote student's attention, interest and minimise boredom during the lessons. According to the findings, the teachers believed that the students were more attentive and were more involved and engaged in learning when lessons were conducted using tablet computers. Regarding the participation of students during classrooms with technological tools, one participant noted as

follows;

> *"Students are more interested in lessons when these tools are utilized. They understand more; also they concentrate more when tablets are used. I feel that I have done less work when tablets are used to get students attention in the lesson. They are very attentive, when a work is assigned, they try to complete it. Students are more competitive to finish the work as soon as possible, and they try to do it better than the other students. Rather than giving work on the books, they are more into the lesson when work is assigned through the tablet computers. And it is helpful for me as a teacher too."*

Cassidy (2016) also suggested that motivation gives way to active learning which is student centred. Motivalla (2007) highlighted in her research, that when technology is used along with learner centred instruction, it improves learning, promoting cognitive development.

Challenges

Participants showed a positive attitude towards incorporating technology in teaching and learning, however most of the participants were shy of using the tablet computers, due to insufficient knowledge on how to use Google Classroom and other digital tools. Participants also found it difficult to identify and choose technological tools which match the learning objectives for the lessons.

Participants believed that effective training plays a significant role in implementing this program successfully; however the training conducted by Ministry of Education had no practical sessions. Although all of the participants had participated in the G-Suite training programme, most of the participants agreed that the training received was not sufficient to practically use relevant tools in teaching. Participants also highlighted that the training received was not adequate enough, to give them confidence to continuously conduct lessons in a virtual classroom. One participant commented on the efficiency of training as follows;

> *"The training was not sufficient. Ministry conducted a swift training session for the teachers regarding Google Classroom which was not much of a help to the teachers to fully understand the concept and use it. Not many practical sessions were conducted."*

According to the participants, the training was conducted at a fast pace, and only at a superficial level, that most participants failed to understand what was taught in the program. This reflected that a much better planned training including more technological pedagogies are needed in a sustainable manner. Shibana (2016), indicates in her study regarding challenges in transforming education in the Maldives, that digitalization requires continuous tuning of the system, with inclusion of ICT in education in preservice teacher training programs as well as in in-service teacher training programs. Jones (2017) stated that teachers were unable to use technology in the classroom in transformative ways not because of lack of technological knowledge but lack of knowledge about technological tools that are more interactive. Teachers need to see other teachers using digital tools effectively and collaborate with other teachers in team teaching, to gain confidence to use digital tools in their own classrooms. Adam (2015) found that many teachers raised concern regarding the formally designed workshop style professional development mechanism in schools as they were not organised well enough to enhance teachers' pedagogical practices. Most participants highlighted that this knowledge could be acquired best through hands-on practical sessions and observation of classrooms where digital tools are used efficiently and effectively. Due to lack of proper training, knowledge and required technical skills, the participants in this study found it difficult to apply different pedagogical approaches to achieve the range of learning outcomes identified in the National Curriculum.

Connectivity issues

In order to use digital tools and ICT in education, schools must be equipped with proper technical support and maintenance mechanisms. Technical issues are a major concern for the teachers while implementing digital tools in classrooms.

Inadequate internet access was indicated as a major challenge by all of the participants. Due to slow internet connection, students found it difficult to use the tablets during the class hours, thus lessons conducted even by competent teachers were not satisfactory. Although smart TVs and projectors were available, usually teachers downloaded the material and brought it to the class as internet access may not be available during class hours. Limited accessibility and networking connection are the biggest challenges in digitalization of the schools in the Maldives.

Lack of technical support

Some participants highlighted that managements of some schools show positive attitude towards technology and encourage use of digital technology in the classes, and ensure that computers, digital projectors, and smart TVs are available for all of the teachers to use. Unfortunately lack of technical support during lesson time and length of time taken to repair equipment were a major hindrance to integrating ICT in classroom teaching in Male' schools. Participants highlighted that technical support provided in almost all of the schools were not enough as most of the schools had one technician, who attends to all the technical problems within the school and that technicians were most of the time unavailable. Either the technician was too busy, or absent due to low motivation caused by higher workload and insufficient salary. This resulted in unattended technical issues.

According to Lewis (2003), without support in the classroom and respective to whole school resources, teachers cannot be expected to deliver a good lesson using technological tools. Rapid technical support would build a positive perception in using the technology by teachers. Participants noted that if a tool gets misplaced or damaged it takes a while to repair. According to Kozma (2008), a teacher has no interest in using technology if they face technical problems that require a long time to resolve. Shibana (2016) suggested that implementation of technological infrastructure must address all of the issues regarding tools, content development, networks, and technological support. However, it is worth to note that all of the research schools possessed modern technological tools, but the challenge was lack of proper maintenance.

Policy and Strategic Planning

Policy and strategic planning is a vital component in implementing digital education. Maldives does not have a policy on digitalization. Although many initiatives have been implemented in order to improve digital education, education sector of Maldives requires urgent national policy and strategy direction regarding digitalization of schools (Shibana, 2016). Lack of clear policies led to issues in implementation at school level. There is no timeline in achieving digital goals, thus the successful rate of progressive implementation cannot be weighed. This closes the doors for further improvements. Lack of formulated policies, strategic direction and timelines for implementation fuels contradiction among stakeholders regarding their roles and responsibilities.

Absence of specific performance indicators and monitoring frameworks was

highlighted in the education sector analytical report of Ministry of Education (2019a). Likewise, the findings in this research revealed that participants from some schools didn't give much consideration to integrate technology in their lessons as they did not get enough support from the management. Participants highlighted that there is no mechanism established in the school to monitor technological lessons conducted or to understand teacher's regular incorporation of technology in lessons. Additionally there is no established mechanism to give and receive feedback regarding the difficulties teachers face while using digital tools in classrooms. They also highlighted that when tools get damaged, the time taken to repair or replace also reflects low support from the management. This finding is supported by Phoele, Moakofhi, Phiri, & Leteane (2017) in their study that one of the hindrances to integrate technology in class was lack of support at leadership level. Amanuel (2019) also highlighted that lack of support from top management was one of the challenges to integrate ICT in teaching and learning.

Another issue according to the participants was awareness of students and parents towards digital platforms and tools. Participants noted that parents and students were not much aware of how to use mobile phones for enhancing learning, and to improve commitment to better understand subject content. Also students in Key Stage One had little or no understanding on how to use the given tablet computers. Further study needs to be carried out to determine level of awareness of students and parents towards digitalization of education and level of use of digital tools for learning purposes, whilst identifying strategies to increase collaborative practice inclusive of parents (Fullan & Hargreaves, 2021).

In summary, it is evident that the participants believed that using digital technology has relative advantage, however proper utilization of digital tools in the classroom was considered complex. At its initial stage of digitalization, there has not been any observable difference in student performance due to limited classes with technological practice. Participants suggested that providing good internet access with respective to strength and speed, providing effective teacher training, providing technical support, providing good technical facilities and carrying out effective awareness programs to parents and students, reducing teachers' workload, providing guidance and monitoring digital lesson more closely would make this program a much better one. Thus, it could be argued that digitalisation of teaching and learning in Maldivian schools needs concerted effort and collaboration among all of the stakeholders in attaining long term goals.

Conclusions

This study determined factors that promote digital teaching and learning and barriers that need to be addressed in order to successfully implement digital teaching and learning in Maldivian school system. It is evident that, stakeholders of this sector especially teachers believe incorporating technology in teaching and learning is beneficial in delivering lessons. The involvement and contribution by the students are high during classes taught using digital tools. However, individual teachers lack pedagogical knowledge, technical skill and know-how to confidently prepare personalised digital content, and to select an appropriate tool to effectively deliver the content which is the only proper way to trigger student's cognitive development. Several additional challenges hinder the effort of digitalization of schools of Maldives. Major findings include internet inequality of access, despite availability of the physical infrastructure; insufficient teacher training and support from management, inadequate technical support, improper management practices, lack of evidence based policy, strategy, training, and monitoring as well as lack of awareness programs for parents and students.

Currently, there is no conceptualization of what digitalisation of schools means, and what are the processes through which this would be achieved. A shared collaborative envisioning process is needed where students, teachers, parents, librarians, school principals, school health workers, counsellors, community health workers, curriculum developers, in-service teacher educators, policy makers, technologists, internet service providers, charitable organisations, and parent teacher associations come together, to explore what is needed in terms of transformation of learning through digitalization. Furthermore, awareness programs for key stakeholders and public are advised to overcome the existing challenges of digitalization.

Recommendations

Since digitalization is a key component of modern education, Maldivian government needs to do much more to support digitalisation of Maldivian schools. The following recommendations are derived from the findings of this study, to improve the digitalization of education sector in Maldives.

Absence of a digitalization policy undermines the current digitalization practices. It was observed that the program launched in the Maldives does not follow an evidence based approach to development, and does not reflect or address the challenges faced by the schools. An evidence based approach could help to

draw up policy, strategies, guidelines and monitoring mechanisms that should be followed by stakeholders operating at different levels of the school system. If issues arise due to negligence of any stakeholder, it would be easy to solve when clear roles, duties and tasks are allocated. It will also make it easier for school management teams, parents, teachers, school ICT technicians, training institutions, internet service providers, equipment suppliers, funding agencies and the Ministry of Education to work collaboratively to make the digitalisation program more successful and innovative.

Another recommendation is to enhance teacher competence by means of both pre-service and in-service teacher training. It is important to formulate a training policy that concentrates on all facets of digitalisation including fundamental proficiency training in computer science teaching in all of the schools of the Maldives, and methods of application of technology in teaching all of the subjects, along with a solid technological pedagogy with practical sessions, including international visits to schools abroad to observe how digital technology can be used in classroom settings.

Along with teacher training, it's also important to formulate a monitoring mechanism. Through such a mechanism, the school management can support integration of digital technology across all of the subjects, as well as ensure national policy is followed. Formulation of an effective monitoring framework is mandatory to ensure teachers use technology regularly and effectively during lessons. This could be carried out through lesson plan checks, coordination meetings and lesson observations.

For collaborative online learning to happen, parents need to be trained on how to use online digital tools and to support their children's home-based learning in a safe manner. Parents need to be taught how to follow the online safety guidelines developed for parents, by the Ministry of Education recently. If trained, parents can be a valuable asset in improving children's learning through use of digital technology.

The internet connections available in most schools were upgraded recently. Although internet is available in most of the schools, it is merely sufficient for communication and administrative purposes. The low speed and lack of capacity for multi device usage hinders the usability of digital tools in a class room and is not sufficient for more than two classrooms to use internet simultaneously. Therefore, it is vital that Maldivian government speeds up policy interventions to upgrade and enhance internet connections, ensure continuous upgrades to equipment required, and to maintain the quality of broadband services

provided.

A much stronger firewall and security is also required to block the unwanted popups and prohibit students in exploring other irrelevant content during class hours. Additionally, technicians and technical assistants with proper technological knowledge should be employed in schools to address the issues raised by the participants. It's important that teachers receive full technical support to aid the process of incorporation of technology in the classroom in a continuous manner. Unless technicians have a salary which can support a family life, have regular training opportunities to continuously learn to maintain and repair equipment, retention of IT technicians will continue to be an ongoing concern.

This research explored the challenges generally faced by the teachers in implementing digitalization in classrooms; further research needs to be done from students, parents and other stakeholders' perspective too. Sustained action research by teachers on digital teaching, learning and assessment exploring how to design collaborative interventions can not only benefit the students but motivate the teachers to engage in digital pedagogies.

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