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School-based technology and the shift to remote learning during COVID-19: Exploring remote learning readiness of school districts in the Philippines

White Paper

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

ABBREVIATIONS AND ACRONYMS

COVID-19	coronavirus disease 2019
DepEd	Philippines Department of Education
FIT-ED	Foundation for Information Technology Education and Development
FLO	flexible learning opportunity
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICT	information and communication technologies
OECD	Organization for Economic Cooperation in Development
PISA	Programme for International Student Assessment
RAP	Remote learning adaptive potential
RTI	RTI International
USAID	United States Agency for International Development

1 OVERVIEW

The following White Paper was prepared as a deliverable under the All Children Reading–Philippines project. It revisits data collected in the course of the ICT in Education Landscape Review, which was completed in February 2020.

2 TITLE:

SCHOOL-BASED TECHNOLOGY AND THE SHIFT TO REMOTE LEARNING DURING COVID-19: EXPLORING REMOTE LEARNING ADAPTIVE POTENTIAL OF SCHOOL DISTRICTS IN THE PHILIPPINES

2.1 Abstract

The shift from traditional teaching methods to remote learning during school closures and stay-at-home orders is a complex process requiring communication and cooperation among policymakers, administrators, teachers, parents, and others. Information and communications technology (ICT) necessarily plays an important role in facilitating communication as well as, potentially, instructional delivery, but this may be very different than the purposes that most school-based ICT in education initiatives were designed for. The requirement to shift to remote learning—at scale and with little to no time to plan—changes how one might typically think of "e-Learning readiness" or "technological readiness." What skills, infrastructure, and resources are required on the part of teachers, students, families, and education officials for such a monumental shift? What existing models can we look at to answer this question? This research dives into the results of a 2019 survey of district ICT coordinators, school ICT coordinators and teachers in the Philippines, which collected information on the use of ICT in schools before the pandemic and school closures. The authors ask the questions: "How might the investment in school-based technology have prepared teachers to transition to various forms of remote, home-based teaching and learning?", and "If experience with ICT in schools is assumed to be an asset in transitioning to remote learning, how many school districts in the Philippines were well-positioned when COVID-19 school closures hit." Grounded in literature on remote learning readiness, the study authors selected questions from the original survey that could be considered assets in the rapid pivot to remote learning (e.g., skills, resources, policies, and plans). These questions were grouped into four main themes: infrastructure, digital literacy, leadership, and digital content. These items were included in an index developed to estimate the number of districts in the Philippines that appeared to have a strong foundation for the pivot to remote learning, and the number that did not. The authors call this: "remote learning adaptive potential". The analysis found no divisions whose survey responses indicated they had all of the selected indicators of adaptive potential; only a very small number (six or 3%) even had at least 75% of the indicators. More than one-third of the divisions had fewer than half of the selected indicators, putting them in the lowest category of adaptive potential. The discussion and conclusions sections reflect on how school-based ICT investments may prepare teachers and students for self-directed and remote forms of

teaching and learning, and how this may help education officials leverage school-based technology for use in times of ongoing uncertainty.

Keywords: ICT, remote learning, distance learning,

3 INTRODUCTION

3.1 Problem Statement

With the widespread outbreak of the coronavirus disease 2019 (COVID-19) pandemic in March 2020, schools around the world have been forced to shift from classroom-based methods of instruction to some form of remote learning, or none at all.[1] Remote learning therefore has become a necessity rather than an option, as described by Doghonadze, Aliyev, Halawachy, Knodel, and Adedoyin (2020): "The whole world had to switch over for an indefinite period to distance learning because the alternative to it was stopping any education, which, of course, is unacceptable" (p. 4). The requirement to shift to remote learning—at scale and with little to no time to plan—changes how one might typically think of "e-Learning readiness" or "technological readiness." What skills, infrastructure, and resources are required on the part of teachers, students, families, and education officials for such a monumental shift? What existing models can we look at to answer this question, and to better prepare teachers for moments like this in the future?

The shift from traditional teaching methods to remote learning during school closures and stay-at-home orders is clearly a complex process requiring communication and cooperation among policymakers, administrators, teachers, parents, and others. Information and communications technology (ICT) necessarily plays an important role in facilitating communication as well as, potentially, instructional delivery, but this may be very different than the purposes that most school-based ICT in education initiatives were designed for. The nature of the COVID-19 pandemic and the need for social distancing or even strict isolation means technology-supported communication may be the only possibility for learning delivery, unlike alternative solutions during school closures resulting from other types of emergencies (e.g., conflicts or natural disasters.).

Education systems integrate technology in the curriculum for many reasons. Pouezevara, Dinçer, Kipp, and Sariişik (2013) noted that large-scale, central government purchase of school-based technology, such as one-to-one tablet initiatives, are motivated by either societal, political, economic, or educational transformation. In the areas of societal and economic transformation, ICT in education makes an important contribution because computer literacy is considered an important lifelong, or "21st Century," skill that will support transition to the workplace (Kozma, 2011). For this reason, many school-based ICT initiatives exist mainly to impart knowledge and skills *about* computers. In terms of educational transformation, some ICT in education programs are driven by hopes that personalization of learning, embedded interactivity and multimedia delivery can improve the quality of education by learning *with* technology, not just about it (Osterwiel, et al., 2018). Some will argue, particularly for secondary level or tertiary education, that technology-

[1] For our purposes, the term "remote learning" is largely synonymous with "distance learning" and covers any form of learning modality at a distance, whether online, partially online, making use of online resources, using technology for communication between teacher and student, or totally offline remote learning using printed self-learning materials. Because the term distance learning is well established in the education field to describe formal, well structured—usually tertiary—education opportunities, we choose to use "remote learning" to describe the current breadth of formal, informal, self-directed, parent-directed, online, and offline methods used to keep children and youth learning during periods of social distancing and even strict confinement.

enabled remote learning is a cost-effective, efficient alternative because it can reach learners anytime and anywhere (Lee, Yoon & Lee 2009) and that the learning experience is improved through "connectivism," or shared learning among diverse individuals (Siemens, 2005).

Based on the most recent policy statements from the Department of Education (DepEd), including the August 2019 comprehensive policy guidelines on Kindergarten through Grade 12 implementation, the situation in the Philippines could be characterized as primarily driven by the former goal—making education more relevant to 21st century skills and anticipated importance of technology to the labor market (Dunuan, 2020). Although the field of technology in education may feel pressure to integrate technology in schools in order to transform education by "learning with technology", it turn out that during COVID-19 school closures in the Philippines, the previous efforts to develop digital literacy and competency communicating using technology may serve teachers and learners more than anything else.

3.2 ICT in Schools in the Philippines

Formal educational institutions from basic to higher education in the Philippines have traditionally been classroom-based, face-to-face settings. However, the Philippines DepEd has experience with school disruptions due to natural disasters and armed conflict; as such, policies for flexible learning opportunities (FLOs) and alternative delivery modalities existed prior to the pandemic. Pre-dating the pandemic, an Alternative Learning System exists to support out-of-school learning opportunities for children, youth, and adults who, for any number of reasons, did not complete or cannot access formal education. The Alternative Learning System is modular and flexible in nature and depends on community-based arrangements between coordinators, facilitators, and learners (DepEd Order 13, 2019). It may function with the use of technology, but it is not dependent upon it.

On May 11, 2020, DepEd issued the Basic Education Learning Continuity Plan under DepEd Order 12, 2020. It specifies that no face-to-face learning shall take place unless local risk severity allows for it, and as such alternative learning delivery modalities such as blended learning, distance learning, and homeschooling shall be put in place by schools according to their situation. Between May and the start of classes, on October 4, 2020,[2] DepEd at central and regional levels initiated efforts to plan and support the development of printed self-learning modules, downloadable digital resources, radio and television education, and massive teacher training and orientation efforts to prepare for this unprecedented situation. Despite careful planning and well-defined ambitions, lack of access to ICT is recognized by the authorities as a risk to effective implementation of learning continuity. Significant investment in school-based technology over the past two decades through the DepEd Computerization Program and other partnerships has made technology available in schools (Pouezevara, Arinto, Dunuan, & Sasing, 2020), but this has not entirely closed the digital divide due in part to unequal education spending by regions (World Bank and AusAID, 2016) and inconsistent connectivity, which reaches only 34% of households and 48% of schools (Southeast Asian Ministers of Education Organization Regional Center for Education Innovation and Technology [SEAMEO-INNOTECH], 2020; Pouezevara, et al., 2020). The lack of preparation and training of teachers and parents to facilitate home-based learning was also considered a major barrier to "readiness" to transition at scale to remote learning (SEAMEO-INNOTECH, 2020).

[2] For some children enrolled in private schools, the school year started earlier and does include live web-based lessons or making use of online learning management systems and content.

Surveys conducted soon after schools closed for the first time in April 2020 have helped shape the education system response for the 2020–2021 school year. Lapada, Miguel, Robledo, and Alam (2020) surveyed 2,300 teachers from schools and universities across the Philippines and found that a large majority of teachers expressed readiness to switch to distance learning education, but preparedness by type of distance learning modality varied. Sixty-nine percent of teachers felt ready to use printed modules as a tool, but only 58% felt prepared to make use of online resources and platforms such as Khan Academy, Edmodo, or Zoom to deliver distance education. Only 51% of the teacher respondents affirmed that they were well-equipped for distance learning and had gone through a series of training and workshops on distance learning education management. Though many teachers felt willing to implement distance learning, they expressed uncertainty due to lack of facilities, equipment, and capacity-building.

A survey conducted by the Asia Foundation covering 1,821 teachers from 16 regions and the Bangsamoro Autonomous Region in Muslim Mindanao aimed to understand the status of teachers in the Philippines on the use of FLOs to facilitate the continuity of education amidst the COVID-19 pandemic. The results showed that more than half of the respondents, 56%, had provisions for FLOs. The survey also found that teachers from private and public schools alike experienced various issues and challenges such as connectivity and accessibility for teachers and students; availability of learning materials, resources, and equipment (computers, tablets) for teachers and students; students' capabilities and readiness in FLOs; parent competence and time in providing support to their children in remote learning; and household resources available to support remote learning (SEAMEO-INNOTECH, 2020).

3.3 Study Purpose

This research is not another post-COVID-19 survey on distance learning readiness in Philippines schools, but instead dives into the results of a 2019 survey that collected information on the use of ICT in schools before the pandemic and school closures. This survey was originally conducted as background to development of the Philippines Education Technology Ecosystem Profile (Pouezevara et al., 2020), but most of the data were not published. While preparing to publish more results from this survey, the COVID-19 pandemic crossed the globe, and the authors decided to continue to publish the data on school-based technology availability and use in the Philippines, but also frame the research in the current context by asking the question, "How might the investment in school-based technology have prepared teachers to transition to various forms of remote, home-based teaching and learning?" Although it is too soon to answer this question definitively, the survey results are presented in a way that highlights features of school-based technology that may be an asset during the transition to remote learning. For example, in this context teachers and administrators need to communicate with each other remotely, develop new learning materials for print or online distribution, participate in teacher training, and devise methods for assessing learning. ICT skills will presumably also be useful for students and families during remote learning to communicate with each other (König, Jäger-Biela, & Glutsch, 2020), to seek information about modalities for learning and staying safe, to find additional resources for self-directed learning, and to support well-being in general. "Even where online education does not directly rely on schools, the state of technology in schools provides some indication of the readiness of the education system," note Reimers and Schleicher (2020). Experts at the World Bank (2020) also predicted that schools that are already using technology effectively would be more likely to navigate the transition to online learning effectively.

Grounded in literature on remote learning readiness, the study authors selected questions from the original survey that could be assets (skills, resources, policies, and plans) in the rapid pivot to remote learning. These items were included in an index developed to estimate the number of districts in the Philippines that appeared to have a strong foundation for the pivot to remote learning, and the number that did not. The discussion and conclusions sections reflect on how school-based ICT investments may prepare teachers and students for self-directed and remote forms of teaching and learning, and how this may help education officials leverage school-based technology for use in times of ongoing uncertainty.

4 LITERATURE REVIEW

What are the skills and resources that will support the transition to remote learning for basic education? In what ways might experience gained through school-based technology support this transition? There is not yet a field of literature uniquely suited to answer this question. However, some lessons from e-learning readiness, learning continuity in pre-COVID-19 crisis contexts, digital literacy, and leadership could be considered useful foundations to build on in dramatically changing times. In this section, we provide some background to frame the question and seek possible solutions as the education sectors all over the world face the COVID-19 pandemic.

4.1 E-Learning/Remote Learning Readiness

According to the Education Technology (EdTech) Team of the World Bank's Education Global Practice (World Bank, 2020), "transitioning to online learning at scale is a very difficult and highly complex undertaking for education systems, even in the best of circumstances." A large share of the burden falls on school administrators and teachers, who are the first-line facilitators of learning. A study by Doghonadze et al. (2020), obtained views from educators from Azerbaijan, Georgia, Iraq, Nigeria, the United Kingdom, and Ukraine on the shift to remote learning during the COVID-19 pandemic. They found that the materials, strategies, and people involved in the transition to distance education in these countries were largely insufficient or unprepared. Schools that were already applying innovative methodologies or content management systems, or already had digital curriculum and assessments in place, were *more prepared* to switch to distance learning, but only if there had been time for teachers to be oriented to the process. In most cases, teachers found they had to become digital resource developers and amateur broadcasters overnight. In this situation of 'learning by doing', clearly teachers who had prior experience 'doing' distance learning, whether during teacher training, university coursework, or even informal experience with content management systems, accessing and creating blogs, or communicating with students through messenger systems, should be somewhat more prepared to adapt their own teaching to use digital platforms for delivery. A post-COVID-19 study of teachers in Germany investigated how school computer technology, teachers' professional competence, and opportunities for developing digital competence during pre-service training affected their successful mastery of teaching remotely during school closures. The authors found that computer technology, particularly availability of tutorial programs (software for direct teaching), significantly predicted whether teachers maintained social contact, provided online lessons, and differentiated tasks for their students (König, Jäger-Biela, & Glutsch, 2020).

Doghonadze et al., (2020) through their interviews also found that it was not only teachers who needed to be prepared but also government, educational institutions, academic staff, students, parents, and academic recognition bodies. Moreover, learners needed to have

positive attitudes and experience with technology to effectively transition to remote learning. This finding aligns with other measures of readiness for e-learning, from the student perspective. For example, studies in Iran and North Cyprus (Caliskan, Tugun, & Uzunboylu, 2017; Khalifeh, Noroozi, Farrokhnia, & Talaee, 2020) both defined "readiness" of university students to engage in online learning to mean computer, Internet, and online communication self-efficacy (ability); self-directedness and control in learning; and e-learning motivation. Geng, Law, and Niu (2019) used similar criteria of technology familiarity, self-directedness, and learning motivation to define elements of readiness for blended learning, and they were able to demonstrate that self-directed learning and technology readiness attributes have a positive impact on social presence in blended learning situations. Finally, Doe, Castillo, and Musyoka (2017) did an extensive review of e-learning readiness instruments and came up with a four-factor structure that echoes the same minimum attributes for students of higher learning to be successful in online learning: self-directedness, self-efficacy, digital engagement (technology skills), and motivation.

While it is reasonable to expect that university students may have had time to acquire self-directed learning maturity alongside basic technology skills, can this be expected for younger children who have not completed basic education? What other skills and attributes would they need to have for distance and remote learning to be successful? Looking back at elements of the Organization for Economic Cooperation in Development (OECD) Programme for International Student Assessment (PISA), Reimers and Schleicher (2020) identified questions that could be considered indicators of readiness for schools and students to learn online during the pandemic and used these data to conclude that most of the 79 education systems that participated in the survey in 2018 were not ready to offer most students opportunities to learn online. Some of the metrics included having a quiet place to study in the homes (more than 30% in the Philippines do not), access to a computer to do school work (nearly 60% in the Philippines do not), and access to the Internet (more than 50% in the Philippines do not). The Philippines consistently scored second-to-last among all participating countries in terms of readiness at home, although school administrators ranked highly the readiness of teachers.

The PISA survey also asked school principals about their school's capacity to implement digital learning, and up to 90% of Philippine principals agreed or strongly agreed that teachers had the necessary technical and pedagogical skills to integrate digital devices in instruction; that they had sufficient time to prepare lessons integrating digital devices; that effective professional resources for teachers to learn how to use digital devices were available; that teachers were provided with incentives to integrate digital devices in their teaching; and that that an effective online learning support platform was available. These numbers put the Philippines in the top five among all participating countries for these indicators but are in stark contrast to the low reported levels of infrastructure and student readiness from the same survey.

4.2 Education in Conflict and Crisis

Experience from other emergency school closures suggests readiness for home-based learning depends on existing strength of community and parent participation in education, as well as flexibility and agility of education systems to innovate (Hallgarten, Gorgen, & Sims, 2020). Technology is critical for communication with parents around enrollment and modalities, and it can be supportive for some forms of learning delivery during school closures. A 2016 review of technology and education in emergencies found that technology shows promise and is frequently used in three areas: system strengthening, teacher training, and student learning (Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ],

2016). However, the use of technology for delivery of basic education to children most often involves bespoke technology packages designed for short-term use (e.g., tablets and solar power) or designing entirely new education technology products like television or radio episodes (Creed & Morpeth, 2014). Both are dependent upon existing technology infrastructure—especially electricity—and existing technology literacy. Moreover, either a high degree of self-regulation or adult supervision is required for young students to make use of these alternatives. The emphasis many school systems placed at the start of the pandemic on basic ICT skills training and developing curriculum-aligned content suggests that school systems that had made progress in these two areas prior to school closures would be at an advantage (Alam & Tiwari, 2020). Similarly, given the need for teacher training and support during a period of rapid educational shift, if teachers had experience using technology for teacher training before the crisis set in, it follows that they would be more likely to make use of technology during the crisis—for their own professional development, but potentially also to deliver student learning based on instructional models they had experienced themselves. The more teachers become adept at using digital tools to manage routine communication with the government, parents, and students, the better equipped they will be for future shocks (Beteille et al., 2020).

4.3 ICT Policies and Leadership

The shift to remote learning across the entire public school system requires considerable policy leadership, from articulating policies to support distance learning; providing financial assistance to educational institutions and students coming from low-income families; establishing accessible blended learning environments and content management systems; creating or curating the curriculum-aligned content that will be delivered through these platforms; conducting training for teachers and students to use these systems; and determining acceptable guidelines on assessment and quality assurance in the new environment (Doghonadze et al., 2020; SEAMEO-INNOTECH, 2020; Commonwealth of Learning, 2020; UNESCO, 2020). Involvement by school administrators and ICT coordinators has been found in the Philippines to be influential in promoting teachers' use of tablets and other technologies (Lumagbas et al., 2019).

If we assume that the same leadership skills that enable ICT integration in schools will be those that also enable remote learning to be successful, then we would look for evidence of positive attitudes and a shared vision among staff and teachers on how technology is to be used in the classroom and the institution itself (Albugami & Ahmed, 2015; Kennewell, Parkinson & Tanner, 2002; Lumagbas et al., 2019; OECD, 2001); a distributed leadership style that allows teachers to take initiative, rather than an authoritarian one (Yuen, Law, & Wong, 2003; Ghamrawi, 2013); and a dual role as pedagogical and administrative leader (Kirkland & Sutch, 2007). School leaders must also provide teachers with sound and meaningful ICT integration training for them to be able to function confidently with remote learning.

5 METHODS

5.1 Data Collection

In 2019, RTI International and FIT-ED, under a contract from the United States Agency for International Development (USAID), conducted a national survey of ICT in public primary schools. The self-administered, web-based survey was designed to capture the state of ICT use for teaching and learning in Philippine public schools from three perspectives: (1) the

school division, (2) the elementary school, and (3) the elementary school teacher. The survey covered all 223 school divisions, with a response rate of 91.9% (or 205 out of 223 divisions). To establish the sample, first, all Division ICT Coordinators were contacted to participate. Division ICT Coordinators were instructed to select two elementary schools from their respective divisions to take the survey. There were no specific conditions for selection. School ICT Coordinators from each selected school completed the survey and were then asked to identify one teacher of any subject except ICT to participate in the survey.

Three survey questionnaires were constructed, one for each type of respondent:

- **A Division ICT Coordinator Survey Questionnaire** consisting of 37 items divided into seven sections: division profile; ICT plans and policies; ICT resources; ICT training; ICT partnerships; evaluation of ICT use; and ICT goals, needs, and barriers;
- **An Elementary School ICT Coordinator Survey Questionnaire** consisting of 31 items divided into seven sections: school profile; ICT plans and policies; ICT resources; ICT use; ICT training; ICT funding; and ICT goals, needs, and barriers; and
- **An Elementary School Teacher Survey Questionnaire** consisting of 23 items divided into four sections: teacher profile; ICT access and use; ICT training; and ICT goals, needs, and barriers.

No personal information was collected other than for gender and division. School names were not included, and therefore teacher responses could not be matched to School ICT Coordinator responses for the same school. The three surveys were administered online using SurveyMonkey in three phases by geographical cluster: Visayas, July 29 to August 1, 2019; Luzon, August 12 to 15, 2019; and Mindanao, August 26 to 29, 2019.

Of the original sample of 446 elementary schools (two per division) and 446 elementary school teachers, 405 (90.8%) and 388 (87%), respectively, completed the survey.

5.2 Data Analysis

Based on the literature review and expectations for how remote learning is expected to unfold in the Philippines over the 2020–2021 school year, the authors of the present study selected survey questions that, if answered in a particular way, would indicate a pre-existing asset that could make adapting to remote learning easier or more effective. From this list, questions where there was very little variation (for example, almost all teachers have access to a computer, so it was not considered a relative asset) were eliminated. Next, a remote learning adaptive potential (RAP) score for each division was created by assigning a point value to each selected survey item and summing the values based on the participant responses to those survey items. Certain survey questions were duplicated between teachers and School ICT Coordinators, for example teachers were asked “What training on ICT have you received?” and School ICT Coordinators were asked “How many of your teachers have received the following training?” with identical lists of available trainings. To prevent overlap within the scores, teacher survey responses were removed, since School ICT Coordinators were guided to provide responses based on their observation of what most teachers in their schools do, whereas teachers were only responding for themselves. If any division was missing a response from a survey, that missing score was replaced with the average score for that region. If more than one of the two surveys were missing from the district, that district was excluded from analysis.

Table 1 shows that there is variation among districts based on this “Overall” RAP score and a normal distribution (mean and median are almost the same). The two School ICT

Coordinator responses were averaged, then added to the District ICT Coordinator score from that district to create an "Overall District" score. The highest possible score would have been 56 points—indicating that all positive indicators are present; "Overall" scores ranged from 12.5 to 46.0 points. Average district scores and range are shown in the table below.

Table 1: Summary of RAP Scores

Index Score (highest possible score)	Mean	Range	Number of Districts
District ICT Coordinator RAP Score (Maximum Score of 22)	12.1	[2, 21.5]	209
School ICT Coordinator RAP Score (Maximum Score of 34)	18.6	[4, 28.3]	207
Overall District RAP Score (Maximum Score of 56)	30.7	[12.5, 46.0]	207

Before describing further the RAP scores and possible implications, we present some basic descriptive analysis of the survey responses according to the themes identified above.

6 FINDINGS

The presentation of results is naturally dependent on and limited to the survey data available to us as a result of the questions asked, but it is organized based on themes from the literature review above that suggest the following features of school-based ICT may prove to be assets when switching to remote learning:

- Infrastructure (availability of hardware and connectivity);
- Digital literacy (through experience using the infrastructure or training);
- Leadership (including partnerships or experience with resource mobilization); and
- Existing educational content, software or learning delivery platforms at the school.

Since the survey was not originally constructed for this purpose, there are no data available about other potentially important features like teacher and student attitudes toward technology, self-directedness, or infrastructure and resources at home, despite those being important for this shift in teaching and learning methods.

6.1 Infrastructure

Access to school-based ICT is high in the Philippines, as is personal communications technology. Across divisions in the Philippines, Division ICT Coordinators almost all report having Internet access at the division office (97%), and for most of them, it is somewhat reliable and of sufficient speed (see **Table 2**). This situation is less the case at the school level, with only half of Division ICT Coordinators reporting that 75%–100% of elementary schools have functional computers. It is more likely that high schools have computing equipment, in line with the government's strategy under the DepEd Computerization Program (DepEd Order 78, 2010). The proportion of schools with Internet access is even lower, which may explain why only one-third of Division ICT Coordinators report that their division uses any kind of learning management system or online platform to connect schools.

Among the 388 elementary school teachers who answered the survey, 97% said that they had access to a computer at school and at home; 94% had a smartphone, and all but 1% of

those who did, used it every day.[3] On the other hand, smartphone use remains limited to personal reasons with the large majority (95% or more) reporting that they did not use their phones for instructional tasks such as tracking and analyzing their student's performance, creating lesson plans, developing assessments (e.g., quizzes, exams), tracking and analyzing student performance, classroom management, or other administrative tasks. Similarly, smartphones were not used for professional development, whether in formal online courses or informal self-study.

All three categories of respondents agreed that the top three barriers to effective ICT use in schools were:

- Not enough computers and other ICT equipment;
- Not enough software and digital learning resources that could be used for different subjects in the curriculum; and
- No Internet access, or the Internet connection was too slow and unreliable (e.g., always down).

Table 2: ICT Infrastructure Indicators

Question and Response Option	Percentage
Division ICT Coordinator Responses	
Do you have Internet access at your division office? YES	97%
Is your Internet connection at the division office reliable? * : We sometimes lose our Internet service during office hours	64%
Is your Internet speed at the division office sufficient? : Our Internet becomes too slow when many people are using it at the same time	57%
What percentage of your elementary schools have functional computers (desktops, laptops, or tablets) that can be used for teaching and learning? * : 76%–100%	50%
What percentage of your high schools have functional computers (desktops, laptops, or tablets) that can be used for teaching and learning? : 76%–100%	68%
What percentage of your elementary schools have at least one computer connected to the Internet? * : 76%–100% : 26%–50%	 25% 25%
What percentage of your high schools have at least one computer connected to the Internet? : 76%–100%	37%
What percentage of your schools with Internet access have a reliable Internet connection? * : 51% - 75%	27%
What percentage of your schools with Internet access have a connection speed that is sufficient for their needs? * : 26%–50%	26%
Does your division have an ICT plan: YES Does it include: Plans for technical support and maintenance Plans for hardware and software acquisition, replacement, upgrading	88% 72% 55%
Teacher Survey Responses	
Do you have access to a computer (desktop, laptop, or tablet) at school?: YES	97%
How often do you use the computer at school? : DAILY	77%
Do you have access to a computer (desktop, laptop, or tablet) at home? : YES	97%
How often do you use your computer at home? : DAILY	85%

[3] As a reminder, these teachers were not selected randomly but were chosen by the Division ICT Coordinator, so the sample may be biased toward teachers who were known to be technology users.

Question and Response Option	Percentage
Does your school have Internet access? : My school has Internet and all teachers are allowed to use it.	68%
School ICT Coordinator Responses	
Does your school have functional computers (desktops, laptops, or tablets) for teacher and student use? : YES	91%
Does your school have Internet access?*: YES	80%
Is the Internet service at your school reliable?*: We sometimes lose our Internet service during the school week	64%
Is the Internet speed at your school sufficient?*: Our Internet becomes too slow when many people are using it at the same time	66%

Note: Most frequent response option reported unless otherwise indicated; items with * were used to construct the RAP Index.

Even if the remote learning modality in the Philippines is mainly based on printed self-learning modules, prior access to technology for communication or instructional delivery is still considered an asset because it could improve communication with students, families, and the school community or help teachers communicate with school leaders, access training, and peer support networks.

Based on the degree of variation in responses, and considering the degree of alignment with the literature review and theory of remote learning adaptive potential described earlier, the infrastructure indicators chosen for the RAP index include:

- Whether the division has an ICT plan that includes plans for hardware and software acquisition, replacement, and upgrading and plans for technical support, maintenance, and repair (reported by the District ICT Coordinator);
- Whether the division office has reliable Internet service and whether division personnel can access the Internet (reported by the District ICT Coordinator);
- The percentage of elementary schools that have computers, Internet connectivity, and sufficient speed of connectivity (reported by the District ICT Coordinator); and
- Whether the sampled school has reliable Internet access and sufficient Internet speed (reported by the School ICT Coordinator).

6.2 Digital Literacy

Despite high levels of access reported above, teachers did not appear to be using school-based technology in ways that might be advantageous to supporting remote learning. **Table 3**, below, summarizes survey responses related to digital literacy. For example, 98% of the teachers said they did not utilize these computers to track and analyze their students' performance. In addition to this, 96% did not use computers in communicating with their students, parents, and their co-teachers; 99% of the respondents also said that they did not use computers to take formal online courses or even self-study using video tutorials and digital learning materials. On the other hand, a majority of teachers (74%) did regularly use their personal technology to communicate with parents, and some teachers (56%) were using school computers to create learning materials. The two teachers per division in our sample did not necessarily represent all teachers in the Philippines, since they were not selected randomly (the School ICT Coordinator selected two teachers). However, for 388 teachers across 217 divisions of the Philippines to have such high agreement indicates that this may have been a widespread trend.

School ICT Coordinators also agreed that the available infrastructure was not widely used in ways that might support remote teaching and learning. Use of productivity tools like word processing software for writing reports or slide presentation software for class lectures was the most common use of ICT by teachers (96%) and students (93%), according to ICT coordinators. School ICT Coordinators also agreed that school ICT resources were not regularly used by teachers for instructional transformation like to show simulations (91%), design and maintain websites (99%), use online quizzes (91%), create digital portfolios (97%), or do collaborative writing (95%) or collaborative projects (95%). They were also not regularly used by students to do data collection or data manipulation (91%), design or maintain websites (100%), keep an online journal or learning log (98%), maintain a digital portfolio (92%), or do collaborative writing exercises (91%).

Table 3: Digital Literacy Indicators

Question and Response Option	Percentage
Division ICT Coordinator Responses	
The division ICT plan (if there is one) includes:	
Plans for teacher and staff training on basic ICT literacy skills*: YES	73%
Plans for teacher training on using ICT for teaching and learning*: YES	67%
How often does the division superintendent use [item below]: DAILY	
Computer*	81%
Smartphone	99%
Division superintendent can do the following:	
Communicate (email, chat)	96%
Do Internet research	93%
Write documents	85%
Take online courses	32%
Update information systems or databases	26%
Does your division provide training on ICT for school heads? : YES*	72%
Does your division provide training on ICT for teachers? : YES*	89%
Teacher Survey Responses	
How often do you use the computer at school? : DAILY	79%
How often do you use your computer at home? : DAILY	88%
Do you ever use school computers for: Creating instructional materials and student support materials : YES	56%
Do you ever use your smartphone for: Communicating with students, parents, other teachers, etc., through email, chat, discussion forums, social media, SMS, voice calls : YES	74%
Do you ever use your home computer for: Communicating with students, parents, other teachers, etc., through email, chat, discussion forums, social media, SMS, voice calls : YES	13%
School ICT Coordinator Responses	
Do you allow your teachers to use school Internet *: YES	99%
Do you allow your students to use school Internet *: YES	49%
In a typical school year, what percentage of the teacher population uses your school's ICT resources in some way: 76%–100%	41%
How have ICT resources been used most by teachers (multiple responses possible):	
Using productivity tools (word processing, spreadsheets, presentations) *	19%
Using spreadsheet software for data manipulation or statistical analysis *	15%

Question and Response Option	Percentage
Doing research on the Internet *	14%
In a typical school year, what percentage of students use your ICT resources in some way: 51%–75%	30%
What proportion of teachers (all, some, or none) have been trained on the following:	
Basic Internet use (browsing, searching, email): SOME	44%
Advanced Internet tools and platforms (blogs, wikis, social media, etc.): SOME	74%
General course about using ICT for teaching and learning: SOME	66%

Note: Most frequent response option reported unless otherwise indicated; items with * were used to construct the RAP Index.

Access to technology is an asset, but knowing already how to use it, and how to use it for instructional purposes, would allow for more rapid start-up of remote learning and potentially more innovative or efficient ways to deliver instruction, administer assessments, or track student progress. As shown in the table above, digital literacy is considered both practical experience using technology as well as specific training in aspects of ICT in education use.

Based on a combination of variation in responses and the hypothesized importance of these digital literacy indicators in the current context, the items included in the index are as follows:

- Do the division and school ICT plans include plans for teacher and staff training on basic ICT and on use of ICT for teaching and learning (as reported by the School and District ICT Coordinators)?
- Does the school head use the school computer or personal smartphone for tasks like communicating (email, chat, text), doing Internet research, taking online courses, or updating information systems (as reported by the School ICT Coordinator)?
- Are teachers and students allowed to access school Internet (as reported by the School ICT Coordinator)?
- If the division superintendent uses computers daily (As reported by the Division ICT Coordinator).
- If the division provides training on ICT for school heads and training on ICT for teachers.

6.3 Leadership

School leaders were not surveyed directly, but School ICT Coordinators were asked to rate certain skills and behaviors of the school head. This request was made based on the belief that strong school leaders, who were themselves users of technology, would be more likely to encourage teachers to use technology as well. This leadership dimension is one of the components of the Scaling Equitable Education Technology (EdTech) Ecosystem Model (Omidyar Network, 2019), and the authors of the Philippines EdTech ecosystem profile found that influence of local leaders was strong (Pouezevara et al., 2020). In the context of remote learning, in which teachers, school administrators, parents, and learners are mostly confined to their homes, it seems critical that school heads be proficient with basic communication devices and methods. **Table 4** summarizes leadership indicators drawn from the survey responses. Across districts in the Philippines, School ICT Coordinators agreed that their school head used a smartphone every day (96%) and used a computer (desktop, laptop, or tablet) daily (87%) or weekly (9%). They agreed (95%) that school heads were proficient in using computers or smartphones to communicate by email and chat. Many

agreed that the school head also used the technology to do Internet research (86%) and other general productivity tasks in word processing, spreadsheet, or presentation software (89%).

Ninety-eight percent of the teacher respondents also disagreed with the statement, "We don't have enough support from the school administration to use ICT for teaching," which means that they did feel supported by their school leaders. The survey data showed that many districts and schools had an ICT plan, but whether this plan was sufficiently detailed varied, and in only about 10% of cases at district and school level did the plans articulate goals and objectives of the technology.

Table 4: Leadership Indicators

Question and Response Option	Percentage
Division ICT Coordinator Responses	
How many years have you been the ICT coordinator of your division? : 3 to 5 years	67%
Does your division have an ICT plan?* : YES	88%
The ICT plan includes: ICT goals and objectives Use of ICT resources	 10% 11%
The division ICT plan is aligned with national plans and policies* : SOMEWHAT (We also have some plans and policies that are specific to our context and needs)	59%
The division does NOT require schools to have an ICT plan.*	54%
How often do you conduct impact evaluation? * NEVER	41%
School ICT Coordinator Responses	
Does your school have a written ICT plan?* : YES, our ICT plan is incorporated into our general school improvement plan YES, our ICT plan is separate	 56% 20%
The ICT plan includes: ICT goals and objectives Use of ICT resources	 10% 10%
How does your school pay for ICT-related expenses? : School's maintenance and other operational expenses budget (MOOE)	41%

Note: Most frequent response option reported unless otherwise indicated; items with * were used to construct the RAP Index.

Sangra and Gonzalez-Samamed (2010) summarize literature supporting the notion that "a favourable school culture and the support from staff make the development of innovative practices with ICT easier" (p. 216). A study of the role of school-based ICT coordinators in Spain found that ICT coordinators with more experience will spend less time on managing school resources and more time on exchange of experiences with other schools (Rodríguez-Miranda, Pozuelos-Estrada, & León-Jariego, 2014). It is intuitive that an ICT coordinator with more experience would likely be more efficient with technical support and have a wider knowledge of tools and processes to share with teachers. Therefore, years of experience as a School ICT Coordinator was included in the index.

Leadership also means planning for the future, building partnerships, mobilizing resources, and ensuring continuous improvement through evaluation. These are elements that may be present in an ICT plan.

Based on variation and alignment with the themes of the literature review, these leadership indicators were also included in the index:

- The ICT plan (district or school) included rewards and incentives for teachers and staff to use ICT, a resource mobilization plan, and a monitoring and evaluation plan (as reported by the School and District ICT Coordinators).
- The school ICT plan includes child safety online policy and data usage, privacy, and security guidelines (as reported by the School ICT Coordinator).
- All schools are required to have an ICT plan (as reported by the District ICT Coordinator).
- The school has been successful sourcing ICT resources from partners in the private sector or community (as reported by District ICT Coordinators).
- The division conducts impact evaluations of ICT programs once a year or more often.

6.4 Content

When the original survey was developed and administered, one goal was to find innovative practices that could be explored further in the form of a case study. In an open-ended question, teachers were asked to list the software programs most commonly used with the school computers in an open-ended response. Pouezevara et al. (2020) summarized the results of the survey of 366 people, who answered the question as follows:

> 202 named only Microsoft products, 59 listed generic productivity tools (spreadsheet, word processing) without naming Microsoft, and 45 named Microsoft products along with other products. Tools apart from productivity tools that were cited include Kahoot, Plickers, and Wondershare Quiz Creator for quizzing and assessment; crossword puzzle generator; 4-D/ augmented reality for science; Google Classroom and Google Drive for managing access to locally curated or locally developed resources; ZipGrade and the Geometer's Sketchpad. Ten respondents in six different regions mentioned Quipper, a commercial content management system popular elsewhere in Asia. (p. 12).

This present study has also noted already that the survey results show schools are using basic productivity tools—possibly transforming them into interactive lessons, such as slide presentations with media—but not software or methods designed specifically to enhance the pedagogical experience through the features of technology. As König, Jäger-Biela, and Glutsch (2020) noted in the case of Germany's pivot to remote learning, "teachers who had already software resources at their disposal and were familiar with their use in teaching were clearly advantaged when school closures began" (p. 617).

In the current context of remote learning, where many Filipino children do not have access to technology at home anyway, would having existing content make a difference? Our study cannot answer that question, but since previous studies noted a more rapid transition to remote learning where digital content—and especially use of learning management systems—was already available, we included a few indicators of content in the index. **Table 5** presents survey responses to indicators of educational content.

Table 5: Content Indicators

Question and Response Option	Percentage
Division ICT Coordinator Responses	

Question and Response Option	Percentage
Does your division use a learning management system or any online platform to connect at least some of your schools to each other?* : NO	67%
How does your division choose what ICT products or services to buy for your schools and teachers?	
We follow DepEd Central Office guidelines on what to buy	72%
We ask schools and teachers what they want	38%
How does your division get information on what ICT products and services are available in the market? (More than one response possible)	
We are informed by the DepEd Central Office	65%
We get promotional materials from suppliers	51%
We get information informally through conversations with colleagues, family, and friends	51%

Note: Most frequent response option reported unless otherwise indicated; items with * were used to construct the RAP Index.

The items related to content included in the index were:

- If the district ICT plan includes plans for developing ICT-enhanced instructional materials (as reported by the District ICT Coordinator).
- If the division uses a learning management system (as reported by the District ICT Coordinator).
- A selection of responses to the question "How have your ICT resources been used most by teachers" that indicate use of instructional technology (as reported by the School ICT Coordinator).

7 DISCUSSION

7.1 Index and Number of Districts That Are 'Ready'

A Remote Learning Adaptive Potential (RAP) Score established from the sum of positive responses given to the selected survey items is informative, but it does not provide a straightforward measurement of remote learning adaptive potential. However, using the index values, we provide a proxy measure for potential by creating cut-points in the range of possible scores. If a division has an Overall RAP Score in the top 25% of possible scores (42 to 56), that division has more assets at their disposal to draw on for remote learning and is classified in the table below as "High Adaptive Potential." Those divisions scoring in the 50th–75th percentile in the Overall RAP Score would be classified as "Medium Adaptive Potential" and would need only some support for remote learning. Those divisions scoring 50% or less of the total possible Overall RAP Score would be classified as "Low Adaptive Potential" and would likely need more attention before being able to successfully adapt to remote learning. Only one division scored less than 25% of the possible total Overall RAP Score, so the bottom two quartiles were combined for the Low Adaptive Potential category.

Table 6, below, shows the percentage of divisions falling into each of the three adaptive potential categories.

Table 6: Percent of Divisions Identified in Each Category of Adaptive Potential

Division Readiness	Percentage *n* 205
Low Adaptive Potential (bottom 50% of possible score)	36% (72)

Medium Adaptive Potential (50%–75% of possible score)	62% (125)
High Adaptive Potential (75%–100% of possible score)	3% (6)

According to this classification, the majority of divisions in the Philippines (62%) would require some support to be able to adapt to remote learning. Over one-third (36%) of divisions would require more intensive support to be adaptive, while a small percentage (3%) of divisions may be well prepared for remote learning now. **Table 7** provides characteristics of schools by their division's adaptive potential category.

Table 7: Characteristics of Schools by Division Adaptive Potential

	Low Adaptive Potential	Medium Adaptive Potential	High Adaptive Potential
Counts	*n*= 147	*n*= 246	*n*= 12
Location			
Urban	56% (82)	39% (97)	33% (4)
Rural	44% (65)	61% (149)	67% (8)
Population			
Fewer than 500 students	46% (67)	31% (75)	33% (4)
Between 501 and 1,000 students	25% (37)	23% (57)	17% (2)
Between 1,001 and 2,500 students	18% (27)	28% (69)	33% (4)
More than 2,500 students	11% (16)	18% (45)	17% (2)

Somewhat surprisingly, most schools in divisions classified as High and Medium are in rural areas (67% and 61%), and the majority of schools in divisions classified as Low are in urban areas (56%). While these High Adaptive Potential rural schools have higher instances of teachers being trained on various ICT subjects and a higher percentage of experienced School ICT Coordinators (3 or more years of experience) than the High Adaptive Potential urban schools, there is no evidence in the data that this is a larger pattern among rural schools overall in the Philippines. It is possible this difference has to do with selection bias of the schools in question, as schools were selected for this study by Division ICT Coordinators. Schools in divisions classified as Low are more likely to be smaller schools, with less than 500 students (46%), while schools in other divisions have a more even spread of population size.

While all items included in the RAP scores contributed to the adaptive potential category of each division, some items were more often found in the highest potential divisions than others. This is apparent when we look at the survey response rates by question and assigned division potential category. **Table 8** below shows the percent of School ICT Coordinator responses to items by their division's adaptive potential categories.

Table 8: School ICT Coordinator Responses by Division Adaptive Potential Category

	Low Adaptive Potential	Medium Adaptive Potential	High Adaptive Potential
Counts	***n*= 147**	***n*= 246**	***n*= 12**
Leadership Dimensions			

	Low Adaptive Potential	Medium Adaptive Potential	High Adaptive Potential
3+ Years as ICT coordinator of their school	61% (89)	64% (157)	42% (5)
School has an ICT plan	59% (87)	88% (216)	100% (12)
ICT plan includes: Plans for rewards and incentives for teachers and staff to use ICT	5% (7)	18% (44)	67% (8)
ICT plan includes: Resource mobilization plan	8% (11)	22% (54)	67% (8)
ICT plan includes: Child safety online policy	14% (20)	39% (97)	83% (10)
ICT plan includes: Data usage, privacy, and security guidelines	9% (13)	31% (76)	67% (8)
Digital Literacy Dimensions			
ICT plan includes: Plans for teacher and staff training on basic ICT literacy skills	48% (71)	75% (184)	83% (10)
ICT plan includes: Plans for teacher training on using ICT for teaching and learning	51% (75)	76% (186)	83% (10)
School head can use computer to: Communicate (via email, chat)	94% (138)	96% (235)	92% (11)
School head can use computer to: Do Internet research	82% (120)	89% (220)	67% (8)
School head can use computer to: Take online courses	15% (22)	28% (68)	50% (6)
School head can use computer to: Update information systems or databases (EMIS, LIS, etc.)	58% (85)	72% (176)	92% (11)
School allows teachers to access school's Internet	99% (99)	99% (210)	100% (12)
School allows students to access school's Internet	37% (37)	53% (112)	92% (11)
All teachers have received training on: Basic Internet tools	31% (45)	50% (124)	75% (9)
All teachers have received training on: Advanced Internet tools and platforms	8% (12)	13% (33)	33% (4)
All teachers have received training on: General course about using ICT for teaching and learning	14% (21)	22% (55)	33% (4)
Infrastructure Dimensions			
School has Internet access	68% (100)	87% (213)	100% (12)
School has reliable Internet service (uninterrupted Internet service during the school week)	18% (18)	29% (62)	42% (5)
School has sufficient Internet speeds (Internet is fast enough for our needs no matter how many are using it at the same time)	14% (14)	12% (26)	25% (3)

While it may stand out that all schools in the High divisions had ICT plans (100%), it is important to note that the majority of schools in other divisions did as well (88% in Medium and 59% in Low divisions). What goes into an ICT plan is what makes the difference in terms of the Adaptive Potential score. The majority of schools in the High divisions include plans for rewards and incentives for teachers and staff to use ICT (67%); a resource mobilization plan (67%); child safety online policies (83%); and data usage, privacy, and security guidelines (67%). Many fewer schools in divisions classified as Medium had these elements in their ICT plan, and only a handful of schools in Low divisions did. School head computer use was mostly equal across readiness categories, but the High divisions were characterized by a higher percentage of school heads who used the computer to update information systems or databases (92%) than did school heads in Medium (72%) or Low (58%) divisions. Reliable Internet access and sufficient Internet speeds have already been discussed as important for schools to be well suited to remote learning or greater use of ICT resources. While the percentage of schools reporting having reliable Internet access (42%)

and sufficient Internet speeds (25%) was highest in the High divisions, this was still quite a low percentage of schools and may have caused issues for teachers trying to effectively use ICT resources in teaching or in remote learning.

Table 9, below, shows the percentage of Division ICT Coordinators responding to certain items by their division's adaptive potential for remote learning.

Table 9: Division ICT Coordinator Responses by Division Adaptive Potential Category

	Low Adaptive Potential	Medium Adaptive Potential	High Adaptive Potential
Counts	**n= 72**	**n= 125**	**n= 6**
75%–100% of division personnel can access Internet	71% (48)	74% (90)	83% (5)
75%–100% of schools have at least one computer connected to the Internet	18% (13)	28% (35)	67% (4)
75%–100% of schools have reliable Internet connections	9% (6)	7% (9)	17% (1)
75%–100% of schools have reliable Internet speeds	6% (4)	2% (3)	17% (1)
Division has uninterrupted Internet service during office hours	24% (16)	32% (39)	50% (3)
Division provides training on ICT for school heads	60% (43)	78% (97)	83% (5)
Division provides training on ICT for teachers	76% (55)	95% (119)	100% (6)
Division requires all or some schools to have an ICT plan	31% (22)	53% (66)	100% (6)
Division superintendent uses computer daily	82% (59)	79% (99)	100% (6)
Division uses a learning management system or any online platform to connect at least some of your schools to each other	22% (16)	39% (49)	17% (1)
Educational software is donated by partners (private sector, non-governmental, and other civil society organizations)	36% (26)	40% (50)	33% (2)
Division has ICT plan	75% (54)	95% (119)	100% (6)
ICT plan Includes: Plans for hardware and software acquisition, replacement, and upgrading	36% (26)	63% (79)	100% (6)
ICT plan Includes: Plans for teacher and staff training on basic ICT literacy skills	49% (35)	86% (107)	100% (6)
ICT plan Includes: Plans for teacher training on using ICT for teaching and learning	42% (30)	80% (100)	100% (6)
ICT plan Includes: Plans for technical support, maintenance, and repair	51% (37)	82% (102)	100% (6)
ICT plan Includes: Monitoring and evaluation plan	33% (24)	73% (91)	100% (6)
ICT plan Includes: Plans for developing, compiling, adapting ICT-enhanced instructional materials	13% (9)	54% (68)	100% (6)
ICT plan Includes: Plans for rewards and incentives for teachers and staff to use ICT	7% (5)	20% (25)	100% (6)
ICT plan Includes: Resource mobilization plan	7% (5)	33% (41)	100% (6)
ICT plan is aligned	92% (66)	97% (121)	100% (6)
Division conducts an impact evaluation of the ICT programs once a year or more often	26% (19)	54% (67)	83% (5)

The majority of divisions across readiness categories have ICT plans and have them aligned with the national ICT plans and policies from DepEd Central Office, but the High divisions are set apart because of leadership demonstrated by what is included in that plan. One

hundred percent of divisions categorized as having High Adaptive Potential require all or some of the schools to also have an ICT plan, and the division plans all include rewards and incentives for teachers and staff to use ICT; resource mobilization plans; monitoring and evaluation plans; plans for technical support, maintenance, and repair; and plans for hardware and software acquisition, replacement, and upgrading. All of the divisions classified as having High potential have ICT plans that include guidance for developing, compiling, and adapting ICT-enhanced instructional materials and for training for teachers and staff on basic ICT literacy skills as well as training for teachers on using ICT for teaching and learning.

Interestingly, Division ICT Coordinators report instances of learning management platforms across all categories, and so this asset alone was not enough to distinguish a division as having more or less adaptive potential. In fact, a slightly higher percentage of divisions classified as Medium and Low used a learning management system or an online platform to connect at least some of their schools to each other (39% and 22%) than did divisions that were classified as High (17%). This result may be associated with the apparent lack of sufficient connection for all schools and divisions surveyed. Very few divisions in each of the adaptive potential categories reported that 75% to 100% of their schools had reliable Internet connections or speeds. While a majority of the High divisions (67%) reported that 75%–100% of their schools had a least one computer connected to the Internet, only 28% of the Medium divisions and 18% of the Low divisions reported this. Lack of access for all schools in each division to fast and reliable Internet is an obstacle for all divisions wanting to improve their use of ICT for teaching and learning or for using ICT for remote learning needs.

8 CONCLUSION AND RECOMMENDATIONS

8.1 Study Limitations

The main limitations of this study had to do with the survey methodology and response bias. While the study had a high response rate for school divisions of 91.9%, this does leave a non-response rate of 8.1%, so not every school division in the Philippines is represented. Also, schools were selected to complete the survey by Division ICT Coordinators who were initially surveyed. Their methodology for choosing schools was most likely not uniform and could be biased toward their own convenience. Similarly, teachers were chosen to be surveyed at the discretion of the School ICT Coordinators. It is a possibility that these selection methods biased the survey sample, and the School ICT Coordinators and teachers surveyed were not representative of the divisions in which they worked.

Another limitation of this study is that the current research question of this paper was not the primary driving force in the creation of the surveys. The arrival of the COVID-19 pandemic brought greater focus on the readiness of schools globally for remote learning and gave a different importance to the state of ICT for teaching and learning in the Philippines. This study was not able to explicitly ask participants their thoughts on their division's or school's adaptive potential for remote learning using their ICT resources and had to rely more on previous literature to identify important characteristics of potential. At this stage, this is an exploratory classification system that does not imply any causation or predictive validity. Future research may attempt to revisit schools in each category to determine if there was any correlation between the assigned adaptive potential category and the ease with which remote learning was carried out and the observable outcomes.

8.2 Conclusions and Implications

This study examined a previous survey data set inquiring about availability and use of school-based technology, and then asked to what extent those investments might be an asset during a time when schools are closed and basic education has shifted to remote delivery. This is largely a theoretical exercise that provided an opportunity to review the literature around the link between school-based technology and remote learning during emergency closures. This is an area with very little empirical research behind it, but the study uncovered four likely areas where knowledge and skills gained from school-based ICT initiatives may lay the foundation for radical shifts in educational delivery:

- Availability of infrastructure in schools, communities, and homes;
- Established digital literacy among school leaders, teachers, and community;
- Strong school leadership that includes community partnerships, forward-thinking planning, and resource mobilization; and
- Pre-existing digital content and platforms for remote education delivery.

These four areas overlap to some extent with survey responses gathered prior to the pandemic school closures. By selecting survey questions that are related to these four areas of preparedness, we made a simple calculation of "adaptive potential" based on the sum of the presence of these indicators by division. There were no divisions whose survey responses indicated they had all of the selected indicators of remote learning potential; only a very small number (six or 3%) even had at least 75% of the indicators. More than one-third of the divisions had fewer than half of the selected indicators.

This approach implies that the presence of more indicators is necessarily better, and having a combination of assets will help a division be more prepared for shifting to remote learning. This could be an oversimplification, but there is not yet enough experience from the current global remote learning experience to know for sure whether this is the case. It could be that there are one or two critical "non-negotiable" factors that, if present, compensate for the absence of other factors. On the other hand, the classification system emphasizes the interdependent nature of technology assets, training, and use. For example, presence of an ICT plan alone is unlikely to have an impact unless it specifically articulates goals, strategies, and resources for training and instructional use of technology. Similarly, investment in a learning management system or platform for communication will be of limited impact if Internet connectivity is unreliable or insufficient. Additional assets of importance found in the literature, but without overlap in the existing data sample, are those of teacher and student self-efficacy, acceptance of remote learning, and self-directedness.

Furthermore, the presence of an indicator alone does not tell us anything about *intention* to apply this to transforming teaching and learning. It is well documented that the presence of technology alone does not result in positive learning outcomes; rather it is how this technology is used, i.e., the intent and acting on that intent. When diving deeper into the question of why High Adaptive Potential schools are more often rural (see Table 7, above) we found that the things that the High urban and rural schools divided on tended to be more purposeful. For example, an urban school can score highly on the RAP index just because they are well-resourced but not necessarily with a specific intention towards ICT in education. The items where rural schools have higher frequencies than the urban schools are things that one might be sure to include if there was strong pedagogical intent for the technology, for example, having a learning management platform, teachers who report using technology for giving quizzes and communicating with parents, or having all teachers trained on basic *and* advanced internet tools. This is purely speculative at this point, since there

were only 12 schools in this subset of the sample, but it highlights the importance of coupling access to technology with transformative use (Omidyar Network, 2019). Future research of this type might consider weighting the items in the index differently, after further validation of the link between the indicators and adaptive potential.

Despite these limitations, the data present a picture of ICT in Philippines schools as largely driven by basic technology access, use of common productivity tools for teaching and learning, and relatively low level of EdTech maturity, characterized by appropriate of technology but without yet widespread, impactful pedagogical use.[4] Out of the 223 divisions responding to the survey, only 72 District ICT Coordinators listed among the top three goals for ICT both "To improve the quality of our instructional materials, learning resources, and assessments" and "To make the learning process more engaging for our students," as opposed to 205 who chose "To make the work of our teachers and staff easier and more efficient" along with "To improve the quality of our instructional materials, learning resources, and assessments" or 201 who prioritized "To make the work of our teachers and staff easier and more efficient" along with "To make the learning process more engaging for our students."

On the other hand, across the divisions in the Philippines, school administrators and teachers had widespread access to personal communications technology and were adept at leveraging that technology to communicate with one another. Soon after school closures, the government was able to disseminate information through social media, and deliver training via Facebook livestreaming, and teachers connected to collaborate and share experiences using messaging platforms. This capacity alone may be sufficient for many schools to deliver learning remotely. Follow-up research will attempt to uncover the relative influence of different factors. One thing in certain, however; remote learning is increasingly dependent upon affordable, reliable and sufficient Internet access. The widespread use of social media in the Philippines using mobile data is in apparent contradiction to the low reported levels of school and home connectivity. Either way, increasing efforts to ensure universal access to the Internet, whether wired, wireless or mobile, in homes and in schools will go along way towards leveling the adaptive potential of all schools to learn about technology, to learn with technology and to continue learning thanks to technology in times of crisis.

Given the large investments in school-based technology by the Philippine government to date, it would be unfortunate—if not surprising—to learn that this investment did little to prepare schools and school districts to shift to remote learning during an emergency. To prepare for future shocks, school-based ICT in education policies and vision need to emphasize the importance of new forms of digitally-enabled learning, including capacity for self-directedness. In addition, teacher training when school is in session or closed should also build self-efficacy and self-directedness as a core competency. Finally, universal access to affordable, reliable, and sufficient Internet will enable a range of possibilities, from communication and coordination among education stakeholders, to accessing additional content and maintaining connection among learners.

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[4] See the EdTech Ecosystem Framework "Ecosystem Change Model" (Omidyar Network, 2019) for an example of how to plot progress of technology appropriation against impactful use and Solar, Sabattin, and Parada (2013) for one example of an education technology maturity model.

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