Sindh Education Foundation
Government of Sindh

Research on Exploring Models of Digital Learning Programs under Public-Private Partnerships

Research and Publication Unit (RPU)
Sindh Education Foundation

Empowering Through Education

Acronyms

AKU-IED	Aga Khan University-Institute for Educational Development
ASER	Annual Status of Education Report
DIL	Developments in Literacy
DL	Digital Learning
DLPS	Digital Learning Programs
GCU-Hyderabad	Government College University, Hyderabad
ICTS	Information and Communication Technologies
IOBM	Institute of Business Management
INSTAL	Introducing Smart Teaching and Learning
JICA	Japan International Cooperation Agency
LOU	Letter of Understanding
NGOs	Non-governmental organizations
PSDU	Program Support and Development Unit
RPU	Research and Publication Unit
SEF	Sindh Education Foundation
TAM	Technology Acceptance Model
TPACK	Technological, Pedagogical and Content Knowledge
TTWF	Teach the World Foundation
UNESCO	United Nations Educational, Scientific and Cultural Organization

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ABSTRACT

This research was conducted to understand how research participants perceived the effectiveness of Digital Learning programs, what has been the impact of digital learning programs that have been thus far offered, which elements are mostly taken into consideration while, designing a digital learning program and what should be the framework and foundation of an effective digital learning program. For this purpose, RPU undertook in-house qualitative research design, where 19 respondents (2 Key informants, 6 experts and 11 SEF middle tier management personnel) were interviewed. The analysis of the data revealed four themes: Perceptions and Usage of the Digital Learning, Models of Digital Learning, Impact of Digital Learning Programs and Elements of a Digital Learning Program. It was also concluded that the *SEF Digital Learning Framework* must be used for an effect digital learning program which has been formed by amalgamation of TPACK-X by Mishra (2019), elements of DL and TAM by Davis (1985).

Keywords: *Digital Learning; TAM; TPACK-X; Qualitative design; elements of digital learning*

INTRODUCTION AND BACKGROUND

Various Information and Communication Technologies (ICTs) are used by education systems for the purpose of Digital Learning (DL). The integration of ICT into the education is considered to be a practical tool for the attainment of educational goals; making ICT a mandatory tool to support teaching and learning methodologies (Gil-Flores et al., 2017). Digital Learning has broken the barriers of time and space making learning possible anywhere and at any time. DL has also proven to bring teaching learning success for both students and teachers due to student's interest in technology. Digital learning has led to better results and lesser absenteeism (Tondeur et al., 2008). DL can help students learn various concepts in lesser time and is not limited to only certain subjects; but in fact, entertains an array of subjects (Lawrence & Tar, 2018). Dl can also help bridge learning gaps that may arise due to any unforeseen circumstances (Munyengabe et al., 2017).

But in order to obtain best results of DL, there needs to be a change in teaching pedagogy and the learning environment (Nur et al., 2023). Where most developing countries are applying the latest technologies in teaching and learning, in Pakistan, and particularly in the rural Sindh, the situation is dismal and the teaching methodologies as well as the learning environments remain static and unchanged (Asad et al., 2020; Rind et al., 2022). For the DL to truly become a part of the teaching and learning process, Pakistan needs to take some serious steps for the improvement of school infrastructure, improved teaching and learning resources and professional capacity building of teachers (Rind et al., 2022).

In spite of government institutions and private non-profit organizations working to promote education, the province of Sindh is rife with illiteracy and poverty, with the number of out of school children in the province being as high as 44%. A low literacy rate and a large number of out of school children contributes to unemployment, slower economic growth and decreased standards of living (ASER, 2023). The Sindh Education Foundation (SEF) has developed an educational model that helps in addressing challenges of delivering quality education to underprivileged communities in the Sindh province (Tariq & Farooq, 2023). The vision of SEF is to promote inclusive and equitable education by establishing SEF-supported educational institutions through partnerships with individuals. SEF also partnerning with non-governmental organizations (NGOs), private sector and community-based organizations, (Tariq & Farooq, 2023). These collaborative efforts enable the foundation to leverage local expertise and resources, resulting in the creation of sustainable educational institutions (The Sindh Government Gazette, 1992).

With the emergence of Covid-19, digital learning has been on full display, changing the future of education. Throughout the world many educational institutions have implemented digital learning in their practices. The adoption and implementation of an effective digital learning program which can integrate the Sindh Education Foundation's existing digital learning initiatives under a single umbrella can help stimulate students' education and raise the literacy rate in Sindh. If successful, other organizations can follow in the footsteps of SEF and expand digital learning programs throughout Pakistan. This research has attempted to answer the following research questions:

1. How does the stakeholders perceive the effectiveness of Digital Learning programs that have been offered thus far?

2. What has been the impact of the digital learning programs offered by SEF?

3. What elements of a digital learning program considered while designing a digital learning program?

4. What could be the framework and foundation of an effective digital learning program at SEF?

LITERATURE REVIEW

SEF has been working towards providing digital learning to students through the Letters of Understanding (LOU) and Memorandum of Understanding (MoU) with the digital learning providers such as the Microsoft, the Noon Academy, Edkasa, Development in Learning (DIL), Taleem Foundation and Teach the World Foundation (TTWF). Edkasa provided an education app for 9-12 grade students; whereas Development in Learning (DIL) collaborated with SEF-GoS District/Region Offices and introduced technology-enabled teaching and learning. Similarly, Taleem Foundation's LOU targeted the provision of uninterrupted digital educational facilities and the establishment of a low-cost and effective technology setup offering academic support through teachers' capacity building. The Teach the World Foundation initiative centered towards accelerated digital learning program and initiated Micro Schools and InSchool support aimed at reaching out-of-school children across the region.

Sindh Education Foundation is currently working with a total of 2,950 schools (formal and non-formal) across the province of Sindh. According to the SEF annual report 2020-2021, SEF has integrated Information and Communication Technology (ICT) into learning culture of Foundation Assisted Schools. The report further explains the steps taken by SEF to digitize teaching and learning through Introducing Smart Teaching and Learning (INSTAL) project which was initiated in 2017-18 by selecting 600 schools for this project. Through this project, blended learning was introduced using tablet for children in urban slums to remote areas of rural Sindh. SEF was also able to obtain A1 package for education from Microsoft.

According to the SEF reports, the INSTAL project promised provision of E-Learning Software, tablet computers (30 per school), and an LED TV per school along with a grant of Rs. 200,000 (For Solar Panels and/or Comp Lab) Training and development On-going technical Support. It was estimated that around 135,000 to 150,000 students benefitted through this project; where 18,000 tablet and 600 LED TV sets provided to the schools. The project also required hiring of 600 teachers by the school operators to teach and supplement teaching-learning at selected SEF Supported Schools. These stats tell that SEF has taken digital learning very seriously and has tried its level best to implement in teaching and learning.

Rind et al., (2022) evaluated the impact of INSTAL project in the science teaching and learning at the SEF-supported schools in the rural district of Khairpur. They reported an overall positive impact of INSTAL program reducing student absenteeism and increasing their interest in their studies. Nevertheless, the teachers reported that it had no impact on students' listening and writing skills.

Elements of Learning

According to the Government of Pakistan (2021), the households with the Internet facility are 33%, which shows that students from far flung areas may not have the Internet access required

for any digital learning to happen. The report mentions that computers are owned by 12% households, over 45% of the households own mobile phones which includes basic phones (53%), feature phone (23%), and smartphones (22%) whereas relatively more people own televisions (63%). Even when people do own a smartphone, they do not necessarily have the data required to access the Internet which means that only 4% of the poorest can access the Internet.
According to Ahmed et al., (2018), 85.2% of their 252 respondents identified electricity as the most critical issue which hinders the implementation of DL program. Other that the, teachers training and appropriate content development were also some of the aspects that cause difficulty in running DL in schools. In order to run any successful program, all of the above issues must be catered to create the space of DL effectively in schools (Zuberi et al., 2022).

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Fred Davis which is an information system model, the purpose of which is to show the acceptance of technology by its users to achieve their objectives (Davis, 1989). This model postulates that external variables are responsible for the perceived usefulness and perceived ease of use of a technology, which creates a peculiar attitude towards technology usage that gives rise to behavioural intentions to use technology which then translates into actual system usage (Davis, 1989) as shown in figure 1.

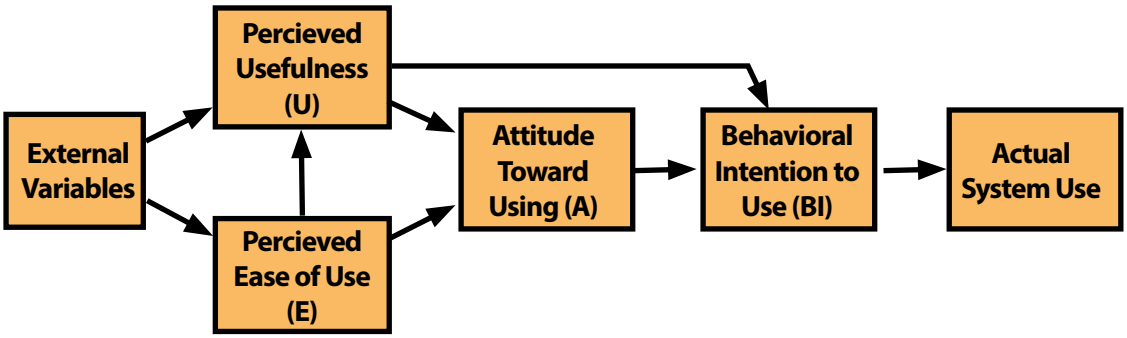

Figure 1. Technology Acceptance Model (TAM) (Davis, 1989)

By external variables, Davis (1989) means the Information System interface (Marikyan & Papagiannidis, 2023); whereas, perceived usefulness is the extent to which a one believes that a particular system will enhance one's job performance (Davis, 1989). Perceived ease of use is the degree to which a one believes that usage of a particular system will be effortless (Davis, 1989). Thus, positive attitude towards technology depends upon how much easy it is to use the interface. In case the interface is complicated to use, the positive attitude is diminished. Simply put, whether or not one will perform a certain behaviours depends on two factors: First, the benefit that one will receive from the said behaviour and the effort or costs that one puts in to perform the behaviour (Johnson & Payne, 1985; Payne, 1982). It can be safely stipulated that the use of a digital platform is directly related to the trade-off between the perceived usefulness of the system and the perceived difficulty of using it (Davis, 1989).

Perceived usefulness and perceived ease of use collectively play a positive role in enhancing the attitude of users towards the use of technology, and attitude directly influences one's behavioral

intentions, which ultimately leads one to use technology. Apart from that, there may be some other external factors which influence users to accept or reject the use of technology. There have been many studies that have added various external factors in various contexts to TAMS model to explore technology usage by individuals (Park & Park, 2020). These factors may be perceived self-efficacy, facilitating conditions and systems quality (Male et al., 2020).

An attitude can be called a set of emotions, beliefs, feelings or ways of thinking towards someone, something or a particular situation. It results from an experience that has a powerful influence over behaviour (Fishbein & Ajzen, 1975). It comes from our beliefs, intentions and actions, and is a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour (Eagly & Chaiken, 1989). According to Eagly and Chaiken (1989) attitude has three components:

- a cognitive component which deals with beliefs, thinking or knowledge
- an affective component, which may encompass feelings or emotions
- a behavioural component, which reflects how attitude affects the way someone acts or behaves.

The concept of behavioral intention may be defined as "the degree to which a person has formulated conscious plans to perform or not perform some specified future behaviour" (Warshaw & Davis, 1985, p. 214).

Digital learning is an excellent opportunity for those who cannot continue their studies through traditional classroom courses as well as for those who use it as a support to traditional classrooms. In the 21st century, technology in education has already been used tremendously in various forms. However, COVID-19 further increased the demand and importance of online education as the entire world transformed the traditional mode of education to online because of the suspension of face-to-face learning during the corona-virus pandemic. There are many factors which make online education successful or fruitless, and the command of teachers on content and pedagogy are also two very crucial factors.

TPACK-X Model

Even though there are huge benefits of technology, nevertheless, it must be accompanied by content knowledge and pedagogical knowledge in order to be effectively and efficiently be used (Cullen & Guo, 2020; Ghayyur & Mirza, 2021). In a 21st century classroom that meets students' needs, a teacher is required to have practical technological expertise and the ability to relate that technological proficiency to content as well as the latest pedagogical skills (Craig et al., 2020; Tseng et al., 2022).

Technological knowledge (TK) of teachers refers to their knowledge of various ICT and digital learning tools; whereas, Content Knowledge (CK) refers to them having knowledge of the curriculum of a subject. CK involves knowledge regarding theories, ideas, facts, principles and vocabulary about a particular subject, which teachers must master in order to become an effective

facilitators. This allows teachers to select content of a subject, organize it, administer assessments, and provide feedback (UNESCO, 2022). It is also crucial that teachers must possess Pedagogical Knowledge (PK) for learners' academic achievement because it ensures teacher's competencies in delivering content.

Additionally, Technological Content Knowledge (TCK) is the understanding of teachers the use of technology for teaching a particular content (Lai et al., 2022). It highlights how technology be used to illustrate specific content (Koehler & Mishra, 2009). On the other hand, Technological Pedagogical knowledge (TPK) is helps teachers integrate technology in their teaching (Mishra, 2019). Pedagogical Content Knowledge (PCK) is the understanding of pedagogical skills needed for teaching specific content (Ali et al., 2020). In order to effectively integrate technology in teaching, teachers must have content and pedagogical knowledge (Ardiç, 2021; Smith & Zelkowski, 2022).

In order to measure the technological, content and pedagogical knowledge of teachers, Koehler and Mishra (2009) developed a framework of Technological, Pedagogical and Content Knowledge (TPACK) which was further modified and a component of context was added to it (Mishra, 2019). According to Mishra (2019), context is an important component as it highlights the organizational and situational advantages and disadvantages in which teachers are working; therefore an element of context (X) was added to the model, making it TPACK-X. Figure 2 shows the TPACK-X model extracted from Lavidas et al., (2021). the organizational and situational advantages and disadvantages in which teachers are working; therefore an element of context (X) was added to the model, making it TPACK-X. Figure 2 shows the TPACK-X model extracted from Lavidas et al., (2021).

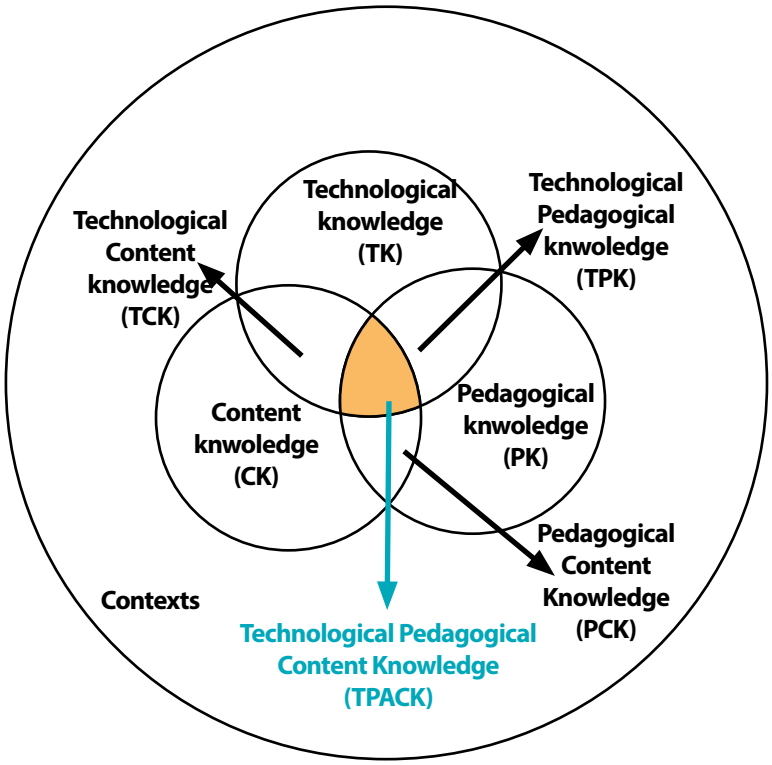

Figure 2. TPACK-X Model (Lavidas et al., 2021)

Conceptual Framework

The conceptual framework for this study is an amalgamation of the Technology Assistance Model (TAM) and the Technological, Pedagogical and Content Knowledge (TPACK) model. The TPACK model is needed to understand the knowledge of the participants regarding how technology can be integrated in the content and pedagogy in the context (X) of Sindh; whereas, TAM is required to see what their perceptions are regarding digital learning which will help to perceive actual usage of digital platforms. Figure 3 shows the conceptual framework for this study.

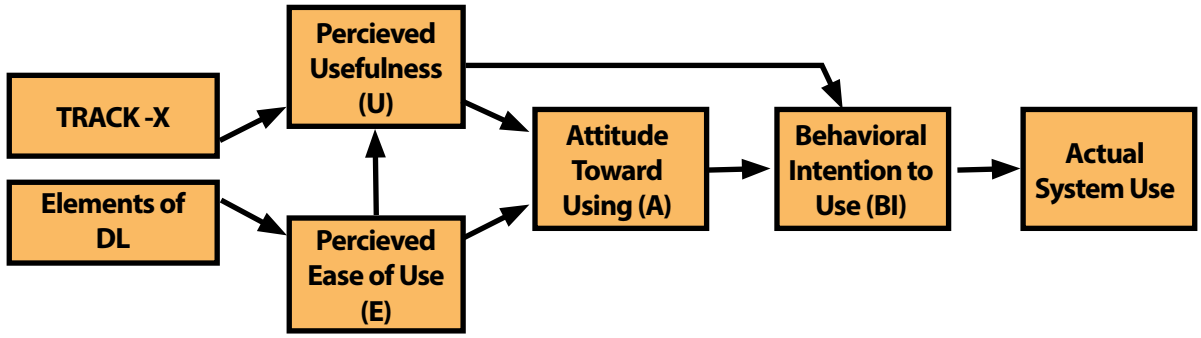

Figure 3. Amalgamation of TPACK-X by Mishra (2019), elements of DL and TAM by Davis (1985)

METHODOLOGY

This study delved into crucial research questions concerning the implementation of digital learning, the specific models of digital learning in use, and the potential framework for SEF-run schools in Sindh. As Merriam (2009) asserts, the research methodology should effectively address the research question(s) at hand, underscoring the significance of our study. The qualitative research methodology of interviews was employed to gather data for this research, as interviews offer insights into individuals' lived experiences, beliefs, and perceptions (Creswell, 2007). Thus, semi-structured interviews helped the researcher to discover and understand the perceptions and viewpoints of the interviewee while being mindful of the experiences of the interviewee with the topic at hand (Hollway & Jefferson, 2000; Ritchie & Lewis, 2003). Moreover, many untapped areas of investigation emerge from semi-structured interviews (Bryman, 2012). Keeping the benefits of semi-structured interviews in mind, a semi-structured interview guide was prepared with six open-ended questions.

Sample

Since the sampling method in qualitative research is primarily purposive (Creswell, 2007; Yin, 2011), the purposive sampling method was conducted. Purposive sampling requires the researcher to locate people who can give him/her the required information in order to fulfil the research purpose and to address the phenomenon that the researcher is looking into (Frost, 2011; Johnson & Christensen, 2004; Tongco, 2007). To understand the landscape of DL offered by SEF, this study took into account the point of views of the stakeholders such as key informants, experts in DL, and the middle management at SEF. Therefore, the interviews were conducted from 19 respondents (2 Key informants, 6 experts and and 11 SEF middle tier management personnel).

The key informants were directly linked with policy making, the experts could connect theory with practice, helped in providing the required DL and the middle tier management is the connection between the SEF schools and the SEF head office. The middle management makes sure that the policies and funds are passed down to schools and are used there in their true spirits.

Data Analysis

Face-to-face semi-structured interviews from a total of 1 respondents were conducted, and the data were collected using audio recordings, which were transcribed and manually coded to generate themes (Hammond & Wellington, 2013). Since respect for participants' rights is important, not only was consent obtained from them, but their anonymity and confidentiality were also maintained (Braun & Clarke, 2005). The transcribed data were coded, and the researcher used the originated codes to make connections and develop certain patterns (Smith & Osborn, 2015). The corresponding codes derived were then placed under their theme statements (Saldana, 2013). The analysis of the data revealed four themes: Perceptions and Usage of the Digital Learning, Models of Digital Learning, Impact of Digital Learning Programs and Elements of a Digital Learning Program.

FINDINGS

Perceptions and Usage of the Digital Learning

The middle and senior management as well as experts interviewed had positive perception regarding the digital learning platforms. They all believed that digital learning had a great potential for Pakistani school and they gave credit to Covid-19 that expedited the concept of digital learning in Pakistan. There seemed to be a common theme running through all interviews that pointed out towards digital learning being synonymous with development, for example according to a respondent,

> *"Developed countries had integrated DL in their curriculum and syllabus. But we were far behind."*

Even when the overall perception is positive, there are issues with digital learning that need to be addressed.

The positive aspects of digital learning were that it developed independent learning capacity in children. According to the respondents, one of the important aspect of digital learning is self-paced learning. So when the learning for students became self-paced, confidence in their own capabilities developed and they became independent learners. It was thought that the since students being digital natives had no problem navigating the digital landscape; nevertheless, it came as a surprise when teachers also became at home with it. Thus, digital learning also helped teachers to become independent learners. Basic training was given to them by Microsoft, upon which the teachers themselves built their capacity to teach, run various digital tools and apps and to assess students.

It was discussed that digital learning helped in clarifying various concepts and ideas for students and teachers both. As one of the respondents pointed out that teachers sitting in remote areas of Sindh can be trained in pedagogy and content by someone sitting in Islamabad. The ideas that were abstract when read from the book became more clear when videos were shown to them. As one of the participants from the middle management said,

> *"When conceptual clarity occurs so creativity and critical thinking are developed. Creative and critical thinking have a deep connection with curiosity. So cognitive growth of child is healthy. Involvement in lessons is more."*

On the other hand, the downside of digital learning for SEF run schools comes in form of poor infrastructure, availability of gadgets and some training for the teachers to operate those gadgets and apps. Due to poverty, nonavailability of proper gadgets is an issue that cannot be addressed in the coming future. Secondly, the cost of technology is immense as the school needs labs and gadgets to run digital pedagogies and these computers have a limited lifespan and need to be upgraded or changed and this requires continuous inflow of money.

One of the stake holders also pointed out that whenever a new technology is introduced, there's always hinderance from some people on ground to use it. He was of the opinion that the attitude should be a positive one and everyone should work like a team.

Models of Digital Learning

Even when teachers incorporated DL or were forced to incorporate DL due to Covid-19 in their teaching, they were not properly trained to integrate content pedagogy and technology which resulted in using the substitution model. As an expert pointed out:

> *"If we look at Sindh, or overall Pakistan, it's a model that we typically call a substitution model. So, basically, the work that you used to do with a paper pencil, or with a blackboard, you brought that technology, and substituted it. You didn't bring any other change in it. So, for example, you used to write on a chart paper or blackboard, now you have PowerPoint."*

The above statement can be vouched on through the following quotes by the managers:

> *"..... content which you learn or someone teaches you, that content is memorized."*

> *"In online communication is you tell about one thing and other person listens. In the process of learning understanding of somethings have a gap. Are not focused and do not give required attention."*

> *"Teacher who is teaching there you are saying that she cannot understand and needs support you have given support that is also one way learning not two-way learning. Child listens for five minutes after that child have ."*

It was pointed out by the expert that when anything that is new is introduced, in a system, the whole system or the environment needs to be changed. She gave an example of the banking system, that when digital banking was introduced all aspects of banking became digitized. She raised a question by saying, "Are we doing the same?" This question was answered by one of the respondents when he said,

> *"A lot of things have been initiated with the training unit. But they stay for a certain period of time and then they go away. For example, recently we had E-Office training. That was a part of the interaction. We are doing it on a document-based. We thought we would take it to an electronic way. I think that training took 1.5-2 months. Our head office took it. It was materialized and people got their IDs and logins. But I haven't seen a worksheet till yet."*

These words show that even when the organization is spending its money and resources on digitizing the whole organization and training the staff, yet, the willingness to change and go paper free seems to be missing. Therefore, a holistic change in the organizational culture seems to be missing as proposed by the subject expert.

On the other hand, cascade model is being used to train the teachers so that they can successfully implement this model. As described by the key informant:

> *"if our batch is 60 if we are doing 3 sessions daily and 60 students are studying daily, in the next 6 years Sorry, in a year when these children will be qualified then with more grooming maybe from these 60"*

One of the stakeholders was of the view that such a model should be implemented which combines content, pedagogy and technology. It can be concluded that even when the cascade model was being used for teacher's training and technology was being made available to the teachers, the substitution model was being used in the classrooms.

Another stakeholder added that DL is ideal for informal education pathways as well because of the following reasons,

> *"So, these all 4 elements flexibility, ease of access, relevance and quality, these actually make it alternate pathway than the formal schooling which is kind of a structure."*

Impact of Digital Learning Programs

All participants believed that the digital learning programs had a positive affect. They all confirmed that digital learning programs became more acceptable after Covid-19. Talking about the INSTAL project, the members said,

> *"Definitely it was successful because learning through technology, when the child saw audio visual at least his understanding got clear."*

> *"We got good results and significant improvements in learning outcomes of children through assessment. Content was developed from Katchi to Grade 5. (Because of the success of INSTAL) We plan to go to post primary gradually."*

It was also note that the absenteeism decreased in laces where digital learning was introduced. As was put by one of the respondents into the following words:

> *"I am talking about Dadu, in a school, where it was difficult to go so we had to leave cars and go by foot. Over there the building was good, classroom was good with good environment, with solar and LED. In that school 40 min classes used to be there (conducted via digital platforms mainly LED). That class was filled with children because DL was the attraction. Children started coming to the school."*

The above words also indicate that digital learning takes place in certain environment and all the fundamentals should be catered to before learning actually begins to happen. Nevertheless, one of the most important aspect of DL was the conceptual understanding of students. It was noted that DL helps build conceptual understanding of students and helps them understand the given content, as can be seen from the following statements of the respondents,

"And they could see what they were learning. Concepts became clear. Because of this, children started questioning. It was due to digital learning."

This questioning and understanding became the cornerstone of critical thinking. This concept was very well explained by a respondent in the following words,

"Conceptual understanding is developed. When conceptual clarity occurs so creativity and critical thinking are developed. Creative and critical thinking have a deep connection so growth of child is healthy. Curiosity gets a bump. Involvement is more. More involvement more productivity."

The concept of developing critical thinking skills through digital learning was even though heralded by most of the respondents, nevertheless, two respondents refuted this claim. The same thought can be seen being used in the following words,

"My point of view is different. DL enhances skills but slows growth of cognitive and critical thinking. Child becomes dependent on what is being given to him. Does not have own input learning understanding."

The Key Informant also explained,

"We saw that the enrollment of children also increased. The interest in the classroom increased. Children were quick at learning. Otherwise, they could learn from the class, they were quick at learning. The reflexes of the children increased. Children could practically read in the book. They could also see how it is happening. To develop cognitive skills, there are three things. Reading. Practical, seeing and then doing it yourself. Two things were resolved by this, they read the book and saw how it was happening."

Another downside of digital learning that came out again and again was the financial aspect of having a digital learning. The financial aspect is highlighted once again in the following words by a respondent,

"If there is no provision for budget we can have a wish but (a wish) cannot materialize without budget."

Also it was highlighted by a participant that sometimes decisions are taken at the higher level without the planning that is needed for a successful project. These sentiments are shown in the following words,

"They will find out where there is a need. There should be a plan with impact and outcome. We need expansion. We have to see if there is a gap between decision and planning. When there is a gap in planning and decision. When we make decision due to pressure like DL from the whole world we hear DL. DL so there is a pressure we will

take a wrong decision. Output will not be good."

The above statement also depicts that some decisions at the higher level are taken under pressure and are not well planned or well thought of and it was the understanding of the participant that implementing digital learning was one such decision. The quote also suggests that SEF delved into digital learning because the whole world was moving towards it, but SEF actually never took into account its own strengths and weaknesses.

Elements of a Digital Learning Program

There are ten important elements of digital learning that include content, assessment, pedagogy, personalized learning, feedback, learning technology, collaboration, accessibility, customer and customer services.

The interviews showed that the first and the foremost issue is to provide learning technologies to the users.

First, I will say that they should have gadget. SEF should first have a provision for those gadgets like tablets, laptops, smart phones.

INSTAL program already tablets are there. It is needed to enhance features. Over there we can have online meetings. We can have lectures of experts and given to school then see impact.

Similarly, the issues of the Internet and accessibility also persist and must be taken care of, as was pointed out by one of the respondent.

Internet facility should be proper. Make a centralized system all material audio video resource material is accessible, and that should be 24/7. So, if anyone wants they can access after work.

There was a question of disparity between students of urban Sindh and rural Sindh. As one of the SEF manager pointed out that students from rural areas of Sindh don't even have the Internet facility therefore they can never be at par with the students of urban Sindh. Similarly, it was noted that the tablets or the resources in some case are not taken care of properly, "there is no ownership as when someone gets something free of cost it is not given importance."

One of the SEF manager pointed out that in some of the localities, SEF has placed solar panels for unlimited supply of electricity and for the Internet supply, Internet providers have been asked to give schools concessional packages.

Teacher's training seemed to be an issue and it was noted that the teachers who were recruited were not trained in digital learning and even if they were trained the retention rate was low due to low salary package. The Key Informant was of the opinion that a lot was being invested in training the teachers, as she said,

"Basic trainings have been conducted in-person now at start of academic session they will keep on following the teachers and guide and support them throughout the year."

It was also pointed out that the assessments to gauge the effectiveness of DL was not diligently implemented, so real and complete data with regards to the effectiveness of DL was missing. An issue that emerged with reference to content of DL was that teachers are not sometimes well versed in the language of the content. So the content should be in English, Urdu and Sindhi.

DISCUSSION

This study explored about the perception, the models being used, the impact and the elements of DL from the middle management and SEF, the key experts and it was revealed that they had a positive attitude towards it. They were of the view that it increased student learning and reduced absenteeism. According to Vlachogianni and Tselios (2023) Educational technology may be used throughout the learning process and in its every aspect because it is more welcoming to students and teachers alike as compared to the traditional mode of teaching and learning. One of the main positive attribute of the digital learning was that the learners and the teachers both became independent learners, where they gained knowledge at their own pace and in their own time. Thus, DL being an interactive tool, it influences student satisfaction, their academic achievement and makes them lifelong learners (Craig et al., 2020). Asad et al., (2020) added that one of the reason for student engagement was the curiosity that was brought in by technology. According to the results, digital learning also helped learners clarify their concepts. Alneyadi et al., (2023) through their research proved that DL helped clear many scientific and mathematical concepts. They recommended that for the teaching of mathematics and science the government should make DL compulsory.

The respondents were satisfied from the results of their previous ventures in DL as was discussed that the results of the INSTAL project were very encouraging. Same results were given by Rind et al., (2022), they claimed that projects like INSTAL can positively contribute to uplift the educational standards in Sindh. It was due to the success in the first round of INSTAL that the key persons decided to take the project at a larger level. One reason for the success of the INSTAL project is the fact that SEF provides schools with equipment required to implement the INSTAL project in the partner schools. SEF also trains teachers to use the technology provided to them . As was also discussed in the interviews that the cascade model was used to train teachers. According to the interviewees, the partner schools need to set up an ICT room and then another grant is provided to them with a fifty-two-inch television for the visualization of the videos on the selected topics to be taught. Other than that, SEF also equips the schools with a hard drive that has relevant videos and 30 tablets per school (Rind et al., 2022). It was also revealed that in some rural places, SEF has also installed solar panels to deal with the electricity issues. Since all this support is provided to the partner schools by SEF, therefore it can be said that SEF has tried to mitigate all issues related to the elements of DL that were discussed by Zuberi at al., (2022). The Effectiveness of Introducing Smart Teaching and Learning (INSTAL) Project in Foundation Assisted Schools (2022) which is a SEF's own evaluation report on the INSTAL project revealed that majority of the students enjoyed learning digitally; they felt more confident towards the knowledge gained as their concepts were clarified in a better way; it helped all four of their language skills and their comprehension skills. The report further explained that there was found to be low absenteeism in INSTAL project schools; the students took charge of their learning and became autonomous learners; the teachers became facilitators and eventually, learning became fun.

The Proposed Framework

On the whole, DL is playing a positive role in Sindh's landscape. The framework designed using the TPACK-X by Mishra (2019), elements of DL and TAM by Davis (1985) should be used as a framework for any digital intervention that takes place in SEF. This framework in figure 3 can be called the 'SEF Digital Learning Framework' which covers the elements of digital learning, the content, the pedagogy, the perception and finally the usage of any ICT tool.

The INSTAL project used a framework similar to the one proposed in the conceptual framework of this study. It can be concluded that the TPACK and the TAM models are very much into play through the digital learning initiatives such as INSTAL taken by SEF. Most of the issues that emerge with regards to digital learning have been catered by SEF, therefore, there was seen a positive perceptions of the respondents with regards to DL. The elements of DL were taken care of through the provision of solar panels, that helped to resolve the electricity problem whereas, the tablets were provided by SEF to schools for digital learning. The contents played in the tablets were specially designed to cater the needs of the students. Each lesson is well presented to the students. The IT teachers are also hired to look after the IT labs and to assist teachers to run videos on the related topics, that are discussed later by the teachers. Then students are given various exercises which show benefit of DL on student learning and understanding (Kanwal & Ahmed, 2021). A cascade training model was being used to train teachers for using the digital learning platforms which is the best model to train a large number of teachers in a short span of time. To manage digital learning endeavours , it is permitive to introduce a comprehensive policy and design a framework. For this a dedicated setup shall be framed while considering its demand and viable execution at the grassroot level.

CONCLUSION

Through this research it was concluded that DL has a great potential in Pakistan if challenges that come with DL are appropriately addressed. There is a positive perception of DL among the SEF team members and they are looking forward to adopt modern means of teaching and learning. On the other hand the SEF management is playing a positive role in providing the SEF run schools with the infrastructure required to run DL. All respondents were of the view that there was a positive and significant improvement is students' learning and their scores. It also reduced absenteeism and improved students interest in learning.

Thus it is recommended that the SEF Digital Learning Framework that amalgamates TPACK model and the TAM model for a better delivery in DL should be used in their future DL initiatives. INSTAL has provided SEF with a very good grounding and the same experience must be used for other digital initiates. Also, the digitization should not be limited to the partner schools, which means that SEF must look to digitize itself as an organization, as was suggested by one of the experts. Hence, it is also recommended to introduce a comprehensive policy and framework.

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