Explore the Impacts of Digital Technology on the Home Confined Children During COVID-19 Isolation: Is it Blessing or Curse?

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Abstract: The rate at which COVID-19 has rapidly been spreading has made every sector of human life to feel its impact immediately. Like adults, children are also suffering heavily since the outbreak of Covid-19. The education institutes in most parts of the world have been closed since last week of March, 2020. When the school break became longer, new online learning policies were taken and most of the students around the globe started to attend online classes. Children have started to use digital devices more often than usual for communication and entertainment. Recent studies have shown that the way of interaction with the technology has a significant impact on the growth and ethical impact of these children. The objective of this review study is to summarize the recent studies that have addressed the impact of technology on children during this pandemic. From an initial set of 62 articles, a total of 17 articles were finally selected through an inclusion-exclusion process. In our review, we have explored the objectives and findings of the existing studies and also compared the findings with an ethnographic study conducted over few parents and children of english medium schools of Sylhet, Bangladesh. Although most of the findings from the literature review match with the result of the field study, hence there are couple of mismatches too. In this paper, Kitchenham structure was followed and scientific papers published only in well known databases like google scholar, ACM and IEEE Xploreetc were collected and studied. The paper also includes some recommendations for the parents and school authorities so that the children can use digital technology more fruitfully.

1. Introduction

Nowsheen was a 10 year old school girl from Sylhet, Bangladesh who had great interest in outdoor sports. She loved to play in the school playground with her peers after the class hours. Even she had a good number of friends in her neighborhood with whom she loved to play long hours in the afternoon. She loved to ride bicycles and she was a champion rider. She loved outdoor sports so much that whenever she did not find any other girl of her locality to play with her, she used to play football with her cousin brothers and their friends. Although she spent a long time outside home, her parents were not unhappy. Rather they encouraged her in sports. When many children of age 10 were addicted to mobile phone games and play stations, Nowsheen was completely different. She had no experience of using mobile phones or other gazettes. She was not interested in those and her parents would not have allowed her if she even wanted. But her life took a U-turn in March, 2020. Due to the spread of Coronavirus, her school closed in mid-march and soon after, the school authority started conducting online classes. Her parents had to allow her using mobile phone and laptop. She started using digital devices even after her class time as she was not permitted to go to theplayground because of the rules of social distancing. Her parents started to observe that Nowsheen started to become addicted to digital devices. Question strongly arising in the mind of

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the parents- Digital technology is a blessing or curse of their daughter? This is the story of many school going children at present.COVID-19 is one of the most used words of the present world. From east to west, from north to south- almost every part of the world had been suffering from this disease (Singhal, 2020). Although it was first found in China, the spread of the virus rose day by day. From mid march 2020, authorities of many parts of the world closed down the academic institutions to stop the spread of the virus among the children. At that time, many people thought that the vaccine would be available soon but a proper vaccine and its distributionare still daydreams and so, most of the academic institutes are closed all over the world even after many months. During this time, many educational institutes, particularly primary and secondary schools and intermediate colleges started their education online (Basilaia & Kvavadze, 2020). The teachers started giving lectures by the use of different apps and the students got used to these. Many of the examinations were also taken online.

In developing countries like Bangladesh, not all the parents have the ability to give smartphones or laptops to their children (Cristol et al., 2019; Ahmed et al., 2017). Many of the children had to share these devices along with their parents or siblings (Ahmed et al., 2017). The cost of the internet is also an added headache for many families. The situation is quite unexpected in many families all over the world as many people who have school going children have lost their jobs or lost their earning sources (Ganong et al., 2020). Earning has dropped sharply for many parents. In this situation, they are in severe trouble of maintaining the additional internet cost of their children. In developing countries, interrupted electricity is also causing some troubles (Al-Sumaiti et al., 2017). School authorities also do not have many options except offering online education. Nobody knows how long the schools and colleges should remain closed and a long time without any academic activities would eventually hamper the future of the students.

Students are not only using technology for education, they are using technology for many purposes for example: entertainment (music, youTube etc.), communication (email, facebook, whatsappetc) and outer knowledge (online newspaper, books etc) (Gelderblom & Kotze, 2009; Wu et al., 2014; Blackwell et al., 2014). They are using technology more often than they used to use it before (Frenette et al., 2020). Thus, technology is playing a huge part in developing their mental health too (Ye, 2020). Their behavior and attitude have started to depend on how they are using the technology (Ye, 2020; Duan et al., 2020). As there are many things on the internet which are not appropriate for the children, if they have access to those, that will cause harm to their psychology (Sharples et al., 2009; Liu et al., 2020).

We can not always detach children from technology (Gelderblom et al., 2009; Drouin et al., 2020). In this era, we have to allow children to use technology with highest care (Kumar et al., 2017). The responsibility of the parents has grown higher too (Ammari et al., 2015). In this research, a systematic literature review was conducted to see the impact of using technology on children during the COVID-19 pandemic. It is the process of identifying, evaluating and explaining all available research studies according to some pre-selected questions or topic areas. In this paper, Kitchenham Methodology was used and by using appropriate search strings, more than 62 research papers were selected and studied. The selected papers were found from reliable academic repositories such as Google Scholar, PubMed, Springer, IEEEXplore in july 2020. These databases index research articles and abstracts from most major academic publishers and repositories worldwide. Finally, an ethnographic study was conductedwith the parents and children of English medium schools of Sylhet, Bangladesh to justify the findings of our literature review. The field study was performed through semi-structured interviews where 24 parents participated along with 10 children. Among the 24 parents, 13 were male and 11 were female. For few children, we interviewed both their mother and father. Among child participants, 5 were boys and rest were girls, all of their ages were between

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12 to 16. At the end, this research shows that the outcomes of the qualitative data collected from a city of global south do not completely reflect the results of the researches based on developed world.

2. Systematic Review

The process of determining, evaluating, and explaining all available research studies according to relevant questions, topic areas, or research sectors is known as systematic literature review. By examining each particular research article, an SLR approach concludes in common phenomena. By creating questions, examining procedures, data source, searching strategy, data extraction, and data synthesis, Kitchenham's approach was followed in this study to build up the SR method. All reviewed articles in the systematic literature review were identified by searching reliable academic repositories such as PubMed, Google Scholar, Springer, IEEE Xploreetc in August 2020. Following that, a systematic review was conducted and a focus of future study on this issue was established.

2.1 Research Questions

According to Kitchenham and Charters (2007) the most crucial component of any systematic review is the definition of the research question. That is why the research questions were carefully chosen. In all, five research questions were developed to cover topics relating to the characteristics, issues, difficulties, and solutions that are currently being examined, as well as the research possibilities that exist or are emerging. The questions are as follows:

Q.1: What are the reasons of using technology by the children during COVID-19?

Q.2: What is the impact of technology on the wellbeing of children in the pandemic?

Q.3: What are the learning outcomes of children through technology during COVID-19?

Q.4: What are the obstacles of using technology faced by the children during COVID-19?

Q.5: What are the responsibilities of parents and teachers towards the children during this pandemic?

2.2 Review Protocol

According to Kitchenham and Charters (2007) the systematic literature review procedure describes how the review will be carried out. It explains how to extract and evaluate data, as well as how to find and identify relevant research. Data sources, search methodologies, research selection approach, data extraction, and data synthesis are all included in the review methodology.

Table 1 Data Sources

Digital Libraries	Website Links	No. of Papers
IEEE Xplore	www.ieeexplore.org	08
Research Gate	www.researchgate.net	24
Springer Link	www.link.springer.com	06
PubMed	Pubmed.ncbi.nlm.nih.gov	05
Science Direct	www.sciencedirect.com	10
ACM Digital Library	www.dl.acm.org	11

2.3 Data Sources

Research articles from the following electronic libraries from 2016 to 2020 are among the sources. These electronic libraries have been chosen as data sources for analysis and research. The electronic digital libraries chosen for systematic review are shown in the table above.

2.4 Data Strategy

To find out proper research papers of a particular topic, defining a proper search strategy is very important. In the case of literature review, few keywords were supposed to be chosen to find out the best possible outcome. To build an optimal search string, it is suggested to break down the research question into individual facts, namely research units, where their synonyms, acronyms, abbreviations and alternative spellings are all

included and combined using Boolean operators (Kitchenham & Charters, 2007). The final search string is obtained by the following three steps:

- Identification of synonyms, acronyms and related words
- Identification of terms and related words in the abstracts of the articles that were identified in the first search
- Construction of the search string using AND and during operators.

Finally, the following search strings were obtained:

- Child computer interaction and COVID-19'
- Impact of technology on children during COVID-19'
- Education, entertainment and communication of children in COVID-19'

For studying research paper related to child-computer interaction before the COVID-19 pandemic, more searching were done based on the following search strings:
'Child computer interaction' and 'Impact of technology on children'.

2.5 Data Extraction

For the discussion of the issue, the stored data are retrieved from the selected publications. The data are included in the systematic review paper. Initially 64 papers were extracted and after three step exclusion process, 10 papers were used finally to conduct this review.

2.6 Data Synthesis

The paperswere selected by studying abstract, introduction and conclusion. All of them were related to the systematic review area.

Table 2 Data Synthesis

Stage	Selection Criteria	Num. of Papers
1	Extracting all papers based on search string	64
2	Exclusion based on title	07
3	Exclusion based on abstract and conclusion	32
4	Exclusion based on full paper	15

2.7 Result of Systematic Review

In this section, the result of the systematic review has been populated. After completing the exclusion from the extracted papers, 10 finally selected papers were explored thoroughly from results on the basis of the questions that have been formulated in the 'Research question' section. The questions are answered by analyzing the papers from top to bottom manner as per the aim of this research work.

Q 1: What are the reasons for using technology by the children during COVID-19?

Since the outbreak of COVID-19, as with adults, children have been suggested to stay at home. This was expected to be the best way of not getting affected (Ye, 2020). A study on the children of different age groups in the USA, Drouin et al. (2020) found that, 100 percent children of the age group from 13-18 have used technology during this pandemic, where the percentage was above 97 percent in the age group of 6-12 years and among the children age group of 0-5, the percentage was just below 85 percent. Many children used technology for educational purposes. To reduce the impact on schoolchildren, online education policies were taken in most of the parts of the world and new online materials were developed for the betterment of the school going children (Frenette et al., 2020). Through remote teaching approaches, children used technology to study online. Online learning was defined as an approach that typically provides anytime, anywhere access to resources, and remote teaching was defined as an approach that acts as a direct replacement for face-to-face teaching in the Ministerial briefing paper on evidence of the likely impact on education outcomes on children learning at home during COVID-19 submitted to the Australian Government Department of Education, Skills and Employment. Teachers utilize video technology or something similar to engage with students in real time, and they rely on pupils adhering to a set of timetables (Masters et al., 2020).

Apart from educational requirements, children

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also have used technology for accessing social media. Drouin et al. (2020) said that, during the COVID-19 pandemic, both the parents and their children had increased the use of technology and social media. Children used social media for various reasons, for example to communicate with their peers during the social distancing period, to collect critical information related to the corona virus and also for social support during crisis period (Drouin et al., 2020) Children also have used technology for entertainment, for example playing computer games, listening to music etc. (Goldschmidt, 2020).

Q 2: What are the impacts of technology on the well-being of children in the pandemic?

According to Goldschmidt et al. (2020), the well being of children can be divided into 5 parts: social, physical, emotional, intellectual and spiritual. The authors say that during this pandemic, the well-being of the children is closely associated with their use of technology. As they were unable to go to the school or even to the playground due to the rules of social distancing, children used technology to be connected socially. They used phones to call their peers and also they did video calling and chatting through different apps. Children were not in the high-risk group of COVID-19 for severe illness or hospitalization. Though many parents used tele health services during the pandemic whenever they wanted to (Wosik et al., 2020). A survey conducted by Pammer et al. (2001) in Florida, USA revealed that the frequency of use of tele-health services varies across the state as a result of several factors including space limitations and staff training.

Ye (2020) focuses on the mental health of children during this period. The long stay at home had quite an adverse effect on the mental health of the children. Children who maintained long quarantine faced many issues like depression and stress symptoms (Wiederhold, 2020). Longer duration of home confinement also resulted with poor mental health and avoidance behavior for many children (Pammer et al., 2001). Levels of anxiety in children and adolescents were much higher during the epidemic (Duan et al., 2020). Many of these mental health problems are closely related with the social media use of these children (Drouin et al., 2020). A research conducted by Drouin et al. (2020) shows that the anxiety of the children during COVID-19 pandemic increases proportionally with their use of social media or technology. It was found that the children who used social media or social technology to be connected with others and who used video or phone calls were more likely to face higher anxiety. The study also found that higher age group children use social media more than the lower age group children (Drouin et al., 2020)

Q 3: What are the learning outcomes of children through technology during COVID-19?

Frenette et al. (2020) found that as schools had been closed for a long time during the COVID-19 pandemic, this could negatively affect the academic performance of the children who are in home quarantine. Students' academic activities were shifted through online resources and millions of students attended online classes all over the world during this pandemic period (Frenette et al., 2020). Sintema (2020) conducted a research on the performance of the grade 12 students of Zambia during this time. He has found that students suffered mostly in Mathematics, Science, design and Technology subjects. The author conducted semi structured interviews with the teachers of a public secondary school. The result shows that there will be a likely drop in the performance levels of both G.C.E candidates and Grade 12 internal candidates in this year's examinations. The teachers explained that the capacity of all the students are not the same. The students who have better learning ability may gather enough knowledge through the online education system but those students who are usually slow learners may face a lot of difficulties to understand the subjects clearly as these slow learners were in need of close care from the class teachers which was not possible through online. The results also suggested that teachers are stepping up their preparedness in containing the negative effects of the epidemic by bringing in

pedagogical strategies aimed at ensuring that students in examination classes are adequately prepared for the examinations (Sintema, 2020). A ministerial briefing paper of Australia on educational outcomes of children learning at home during COVID-19 (Masters et al., 2020) mentioned that, students working at Level 4 and above are capable of making independent decisions while learning online. These students can relatively work with little support from others but the others can not use the online resources properly.

Q 4: What are the obstacles of using technology faced by the children during COVID-19?

Access to the internet is one of the key necessities of online education. A study in Canada shows that about 1 in 20 households with children under age 18 do not have internet access at home (Frenette et al., 2020). In these families, the students are unable to participate in the online classes. Moreover, the number of internet enabled devices per household member is also crucial. It was found that, in lower income households, students do not have their own internet enabled devices and they have to share these devices with others and this affects their academic performance negatively. The quality of students' learning activities at home may also be affected by the type of devices available to them. It was found that, in lower income families, children rely usually on mobile devices where in higher income families children have laptops and personal computers (Frenette et al., 2020). Mobile devices are not suitable for academic activities as devices like mobile phones and tablets are designed for retrieving information, not for producing information (Wiederhold, 2020). Mobile devices also have additional technological restrictions than personal computers, such as limited memory and storage (Napoli & Obar, 2014). Some educational tasks, such as reading and writing large amounts of text, are more difficult to execute on mobile devices than on personal computers owing to variations in screen size and ease of use of the keyboard (Wiederhold, 2020; Dias & Victor, 2017).

Q 5: What are the responsibilities of parents and teachers towards the children during this pandemic?

Parental participation has been shown to have a favorable impact on students' academic results (Frenette et al., 2020). In the case of online education, parents should encourage their children more than normal, as the children may require a higher level of motivation in their studies, since teachers are not always present in physical education (Waters et al., 2014). Parents from lower-income households are less interested in their children's educational activities than parents from middle- and upper-income families (Smith, 2006). Usually lower income parents have long working hours, do more heavy physical work, have less flexible working hours and also sometimes multiple jobs and that is why they cannot give high attention to their children's education (O'Sullivan et al., 2014). According to Frenette (2020), higher educated professionals are more likely to work from home, have higher educational expectations for their children, and may be in a better position to help their children understand more difficult content, especially in high school (2020). Higher educated workers are more likely to work at home, have higher educational expectations for their children, and may be in a better position to help their children understand more advanced material, particularly at the high school level, which benefits students who are engaged in online learning at home. (Jackson et al., 2012; Drouin et al., 2020)

Sintema (2020) explained that the teachers should also play a vital role to make online education successful. He suggested that the teachers should bring in pedagogical strategies aimed at ensuring students in the classroom are adequately prepared. The ministerial briefing paper of Masters et al. (2020) raises the questions about the role of a teacher's professional learning to support the use of ICT in teaching. Online teaching is different from face to face teaching and the research suggestedthat the teachers need to upgrade their skills in both online teaching and online learning design to make themselves effective in online educational environments. It also says that the

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teachers should provide a special learning management system for online education. The teachers should take extra care for the vulnerable children and their families as they are at a risk of not getting the benefits of online learning (Sintema, 2020; Masters et al., 2020).

3. Discussion

It was found that children use technology at a very high rate (Jackson et al., 2012). The rate has increased sharply during the COVID-19 pandemic, mostly due to the distance learning policy adopted by many educational institutes all over the world (Ye, 2020). Even at the age group of 0-5 years, the percentage of children using technology is nearly 85 percent (Drouin et al., 2020). The rate increased in the age group of 6-12 years and finally it has touched almost 100 percent in the age group 13-18 years. This rate confirms that children and technology are closely related. Children use technology for online learning, for contacting their friends and for entertainment. They also use social media at a large rate. Instant chatting, video calling etc are quite popular among the children. And technology plays a vital role in the well being of children particularly during the pandemic situation. Most importantly, the mental health of the children are closely associated with their use pattern of social media. It was found that children are suffering from stress, anxiety and even depression after using social media (Drouin et al., 2020).

Although technology has some adverse effects on the children's mind, it has come up with wonderful benefits in the field of education particularly during the COVID-19 social distancing period. The educational institutes in most parts of the world have been closed since March 2020 but children have been able to continue their learning through the online platform. If the online platform was not used, the long gap of more than six month in education could have a severe effect on their overall academic performance. The teachers trained themselves quickly in online systems and the students as well adopted this in a meaningful manner. As such, the students were in touch of learning in spite of the pandemic. Students usually face some difficulties to use technology properly, even for educational purposes. The Internet is still not fully available all over the world and many students have to share their devices with other members of the family. Students of comparatively lower earning families can not afford laptops or computers and they have to rely mostly on mobile devices which is not the best option for online education.

To develop a clear understanding about the positive and negative impacts of online education on home confined children and to examine the obstacles faced by the children and their parents in distant learning, we conducted a qualitative field study in Sylhet, Bangladesh with families who are associated with online education and where only the students of English medium schools and their parents were targeted. Our data collection consisted of semi structured interviews with 34 participants. We have conducted semi-structured interviews with participants during August and September 2020. The interviews targeted understanding participants' views about online education. All the authors were born and brought up in Bangladesh and they all spoke the local Bengali language and were familiar with the local culture and customs. During the COVID-19 pandemic, it was very common for families with children to be familiar with the online education system, we began by recruiting participants through convenience sampling. As the first author was born in sylhet and fluently can speak the local sylheti language, he first approached 6 parents for the interview. These 6 parents eventually helped us to recruit a total of 24 parents and 10 children through snowball sampling, until we reached the theoretical sampling. The authors have chosen semi structured interviews (face to face and over phone) to collect data. The age of the parents were between 38 to 52 where the children's ages were 12 to 16. The authors avoided their own family members and direct relatives for the interviews. Among the 24 parents, 13 were male and 11 were female. Among the children 5 were boys and 5 were girls. The interviews were conducted with

highest ethical standards and interviewees participated voluntarily. They were ensured that the identification would be confidential. 24 out of 24 parents said that the use of technology by their children increased during the COVID-19 pandemic mostly because of the online education adopted by their schools. They have said that their children use the technology mostly for learning. They also use technology for using social media, listening to music, playing video games etc. Only 6 parents (25%) said that their children also use the internet to gather news of home and abroad. 22 parents (91.67%) said they did not notice any stress and depression among their children for using social media. This finding is completely opposite to the finding of our literature review. None of the parents who were interviewed have even taken any telehealth service for their children. 14 parents (58.33%) were very satisfied or satisfied with the learning outcome of their children from online education and they want the schools to continue online learning for students on a marginal scale even after the pandemic is over. 2 parents (8.33%) were not at all satisfied with this system and both of their children are below 6 years of age. 5 parents (20.83%) said their children have their own internet enabled laptop, computer or mobile phone. All these parents were parents of boys and interesting is the parents allow their sons to have their own device for education but do not allow their daughters to have personal internet enabled devices for online education. 15 parents (62.5%) said that they have increased their involvement in the education of their children during COVID-19. 21 parents (87.5%) do not have any idea about internet security and they have not taken any step to protect their children from accessing unwanted materials on the internet.

10 school going children were interviewed in front of their parents. All of them (100%) agreed that their use of technology is at the peak during the home isolation and social distancing period. They have said that they use technology for online classes, for communicating with their teachers, relatives and friends and for entertainment purposes. All of them love to spend time on YouTube. Among these 10, 8 children (80%) have Facebook accounts and they love to spend time on Facebook. None of them were stressed or depressed during the pandemic and surprisingly none of them were seriously afraid of corona virus. 6 children (60%) said they were mostly satisfied or very satisfied with the learning outcome of homeschooling. All the 5 boys have their own digital device with internet connectivity and do not need to share that with anyone. For 5 girls, the situation is completely opposite. None of them have their own internet enabled device and they have to share a laptop, computer or mobile phone with their parents or with siblings. All the 10 children confirmed that they are getting maximum help and support in education from their parents and teachers during this pandemic.

From the above discussion it can be observed that the outcomes of the literature review match with the findings of the ethnographic study in majority cases but the findings differ in couple of aspects. The research paper studied were mostly based on the western world where the field study was conducted in a city of global south, probably the socioeconomic differences between the developed and developing societies are the main reasons behind this mismatch. In the research papers, it was observed that the children are encountering stress and depression where these were not at all encountered by the children we interviewed. Most of the parents think their children are not attached with social media but the children we interviewed were using social media in a good number. Moreover the gender discrimination of using digital devices were quite common among the parents and children we interviewed but this was not the findings from the research papers we studied. These issues probably need furtherresearch.

4. Conclusion

It is to be noted that not too many research works have been published regarding the child-computer interaction since the outbreak of COVID-19 which was the major challenge. The systematic review was done based on the limited papers

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whichhave been published in this field. Digital technology is a blessing for children if it is used under the supervision of the parents. They can achieve academic advancement, can connect with their peers and can get some entertainment during the pandemic situation. However, the answer of 'whether technology is a blessing or curse for children?' lies in the way technology is used by them and how the parents and teachers are handling the situation. The children should be encouraged to use technology with care so that they do not get anything bad from the social media or internet. Proper security systems may be installed to make distance between children and unwanted materials on the internet. If the parents become more involved with the children in their educational environment and if the teachers get their proper training from the authorities to make the online learning more interesting in this pandemic, then technology would remain as a blessing. Otherwise, if the children become addicted to it and if parents do not observe what the children are doing by the use of digital devices, then there is every opportunity for technology to become a curse for the children.

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