Exploring Full-time Online Learning of Secondary School Students in the COVID-19 Pandemic

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Abstract: - Amidst the COVID-19 pandemic, most students including those in grades K-12, have been compelled to transition to full-time online education. This research delves into the responses of secondary school students to the shift to full-time online learning necessitated by the pandemic. A comprehensive survey was conducted in Texas, specifically in Fort Bend and neighboring counties, to draw comparisons regarding students' online learning environments, their experiences, and the expectations they held. The findings of this study have implications that can offer guidance to policymakers and educational institutions on enhancing the online learning experience for secondary school students in the future.

Key-Words: - Online learning, secondary school, COVID-19 Pandemic

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1 Introduction

Over the last decade, online instructional education has experienced rapid growth, offering the advantages of flexible learning schedules and accessibility from any location, [1]. Nevertheless, a longstanding debate surrounds the suitability of online learning for K-12 students, [2]. The emergence of the COVID-19 Pandemic led to the widespread adoption of online learning across all educational levels, ensuring uninterrupted learning for students, [3]. This survey-based study delves into the responses of secondary school students toward the compulsory full-time online learning necessitated by the COVID-19 pandemic. The study focuses on students in Fort Bend and nearby counties, in Texas, examining their experiences and reactions.

2 Literature Review

Online education offers a range of multimedia resources, including texts, audio, and videos, which could enhance the learning experience, [4]. Additionally, it provides the advantage of a more adaptable and self-directed learning pace, also with reduced costs, [5]. Notably, prior to 2020, 33.5% of higher education students were engaged in various forms of distance education or online courses, [6].

In the United States, K-12 schools that exclusively offer online curricula are typically Charter schools, which provide alternative learning formats for students, [7], [8]. Prior to the onset of COVID-19, online education for K-12 students in the US primarily followed an asynchronous or hybrid model, combining online and in-person elements, [9]. Fully online or synchronous education for K-12 students was less common, with greater participation seen in Charter schools and advanced courses within public schools, [10]. Nevertheless, enrollment in online schools in the US is on the rise, with 30.6% of Charter schools offering complete online courses compared to 28.5% of traditional public schools, [11].

In contrast to online learning, a multitude of research underscores that traditional face-to-face education fosters authentic and significant interactions between students and educators, [12]. Online instruction has been accompanied by concerns and criticisms, encompassing issues like inadequate course content, limited collaborative learning, irregular instruction, lack of teacher accessibility, insufficient instructor readiness, and technical or network challenges, [13], [14].

In March 2020, all students across the United States were compelled to transition from in-person classes to online learning due to the COVID-19 pandemic. Nevertheless, this shift has been accompanied by several challenges faced by the students. According to, [3], [15], inadequacies in internet infrastructure, teachers' difficulties in adapting to online teaching methods, and a lack of parental involvement have contributed to the ineffectiveness of online learning. The study, [16], discovered that the high costs associated with acquiring appropriate tools hinder the attainment of positive outcomes in online learning. Research conducted, [17], [18], highlighted those issues related to internet access, limited interaction between teachers and students, and insufficient technological resources significantly impact the overall effectiveness of online learning.

We administered a survey targeting secondary school students in this paper, to investigate their responses to the experience of engaging in full-time online learning throughout this pandemic.

3 Survey Design

The popularity of online learning continues to soar due to its adaptable formats, cost-effectiveness, convenient accessibility, and customizable pace, [5]. However, although online learning can be a potent educational approach, its efficacy or efficiency tends to be lower for secondary school students, [19].

The studies, [20], [21], have pinpointed various challenges associated with online learning during the COVID-19 pandemic, encompassing issues such as internet connectivity, access to IT equipment, restricted collaborative learning prospects, diminished learning motivation, and amplified academic pressures. While most studies have centered around higher education settings, we intend to carry out a survey that centers predominantly on secondary school students, aiming to discern their responses to the experience of full-time online learning. The outcomes of this survey hold the potential to offer educational authorities and institutions valuable insights into the obstacles students face, with the prospect of enhancing the quality of online learning for them in the future.

The survey was conducted primarily within the Fort Bend Independent School District (ISD), which is a school district system located in Sugar Land, Texas. For the 2021-2022 school year, the district received a B accountability rating. The ethnic distribution within the district comprises 27.5% African American, 27.3% Asian, 26.4% Hispanic, 14.8% White, and 4% from other ethnic backgrounds. Like numerous schools across the United States, Fort Bend initiated its online learning program in March 2020, later introducing a hybrid approach with both face-to-face and online instructional methods in October 2020. Eventually, the online program was concluded in December 2021. Depending on their chosen learning method, students had a mandatory online learning experience spanning between 7 to 21 months. The primary goal of the survey and subsequent study was to explore the perspectives of secondary school students on online learning and to propose potential actions for enhancing future online education. Specifically, three research questions were formulated to compare online learning with traditional face-to-face education:

1. What were the learning conditions encountered by students during online learning?
2. What advantages and challenges did students face during online learning?
3. What are the expectations of students regarding future online learning experiences?

4 Survey Results

The survey was undertaken between September 2022 and December 2022, with a focus on secondary school students spanning from 9th to 12th grade. A comprehensive total of 180 students actively participated in the survey, and the distribution of students across various grade levels is visually depicted in Figure 1.

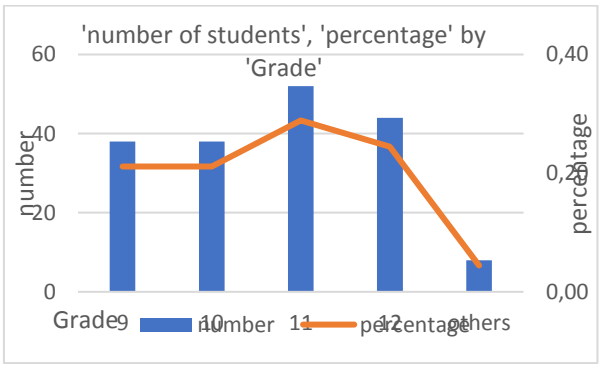

Fig. 1: The number of students in each grade

Within this cohort, approximately 74 students identify as female (accounting for 41.1% of the total), while 102 students identify as male (constituting 56.7% of the total). Additionally, 4 respondents (2.2%) opted not to provide an answer to this question.

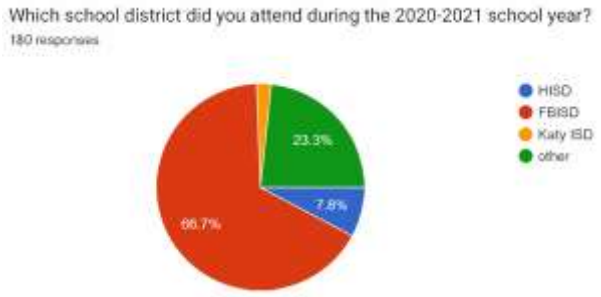

Fig. 2: The percentage of students in the school district

Likewise, we inquired about the school district attended by students during the academic year 2020-2021. The distribution of responses is depicted in Figure 2, revealing that 66.7% of students were enrolled in Fort Bend ISD, 7.8% in Houston ISD, and 2.2% in Katy ISD, while the remaining students hailed from various other ISDs.

4.1 Learning Methodology and Tools

Within this section, we commence by presenting the outcomes derived from the survey's inquiries about teaching methods employed by teachers, the tools used for teaching, and the learning platforms utilized by students. For each question, respondents had the option to select one or more answers from the provided choices.

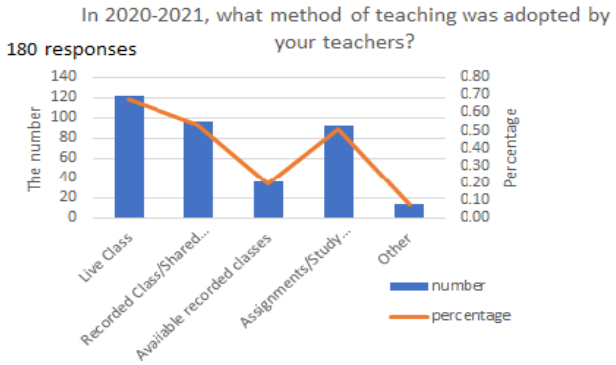

Fig. 3: The teaching method

In the era of digital advancement, the incorporation of information and communications technology into online learning equips students with the necessary skills they require, [22]. As evident in Figure 3, during the transition from traditional classroom settings to online environments, approximately 68% of teachers opted for live/synchronous classes, mirroring the experience of face-to-face instruction. This synchronous approach not only emulates direct interaction, akin to traditional learning, but also addresses concerns about the absence of in-person contact for online students, which has been linked to negative experiences, [23]. Moreover, over half of the teachers also employed recorded classes/shared videos and asynchronous assignments/study materials in their teaching strategies.

Fig. 4: The teaching platform

Illustrated in Figure 4, the data highlights that approximately 72% of teachers leverage Microsoft Teams, while 38% opt for Zoom. Microsoft Teams is predominantly employed for synchronized classes, whereas Zoom is commonly utilized for office hours or teacher-parent conferences, typically overseen by the ISD IT department. Notably, YouTube also serves as an instructional tool, with research indicating that the younger generation displays significant interest in games and videos as part of their online education experience, [16].

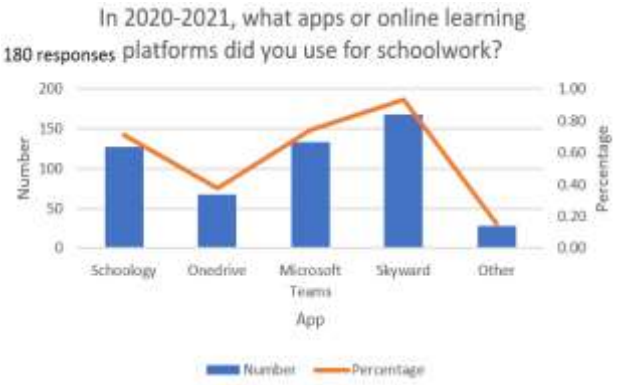

Fig. 5: The learning platform

Concluding with Figure 5, the survey sheds light on the applications employed by students for their online learning experience. Schoology serves as a platform for instructional delivery, communication, and progress tracking. Onedrive facilitates access to cloud-based documents. Skyward is harnessed for tasks such as class scheduling, maintaining the gradebook, and recording attendance. Microsoft Teams assumes a role in facilitating synchronous classes.

4.2 Learning Environment

As outlined in, [24], the widespread adoption of online learning is influenced significantly by factors such as internet availability, the cost of equipment and network services, and the emergence of new technologies. In our survey, which garnered 180 responses, it was revealed that 81.1% of participants utilized devices they already possessed, 6.7% acquired new devices, and 12.2% borrowed devices from their educational institutions.

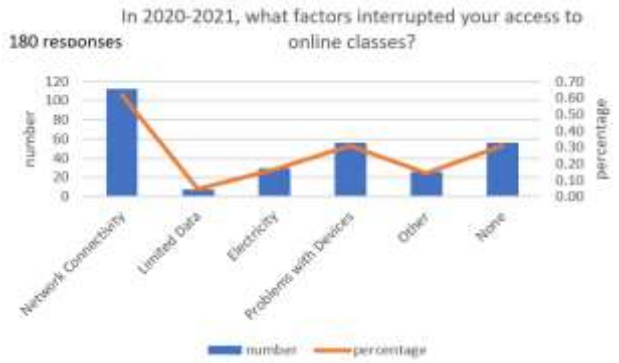

Fig. 6: The factors that interrupted online classes.

As depicted in Figure 6, the foremost factors that interrupt online learning are network connectivity, hardware accessibility, and a stable supply of electricity. Notably, around 31% of respondents encountered no difficulties throughout their learning experience.

The correlation between parental engagement and student performance has been well-documented in traditional face-to-face courses. Consequently, parental support holds the potential to positively impact student performance in online courses as well. However, given that our respondents primarily comprise secondary school students aged 14 to 18, the data reveals that 43.3% of participants indicated that parents are minimally involved in their online learning endeavors. Furthermore, responses indicated that 26.7%, 14.4%, 13.3%, and 2.2% reported increasing levels of parental involvement ranging from moderate to heavy engagement.

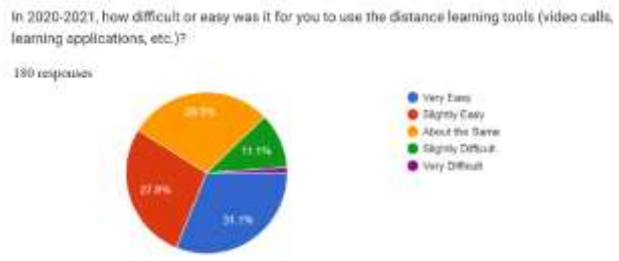

Fig. 7: The learning tool difficulty

Amid the pandemic, as educational institutions transitioned from traditional face-to-face to online learning, our survey findings, as illustrated in Figure 7, indicate that a mere 1.1% of participants perceived the adoption of new modern technologies as "very difficult." Only 11.1% considered it to be "slightly difficult," while 28.9% found it to be on par with the familiarity of face-to-face learning. On the other hand, 27.8% regarded the transition as "slightly easy," and a significant 31.1% characterized it as "very easy." In light of these findings, it can be inferred that, at least within the context of our survey, the introduction of new technologies and tools does not appear to significantly hinder online learning for high-school students.

4.3 Learning Benefits and Obstacles

Despite online learning being the sole feasible method of education during the pandemic, we were curious to gauge the proportion of students who perceived benefits from this virtual learning environment as opposed to the traditional classroom setting. Additionally, we aimed to uncover the aspects of online learning that students found enjoyable or unappealing. The inquiries we posed in the survey during the 2020-2021 online learning phase are as follows:

1. Did you find it easier to access teaching materials provided by your teachers in the online environment?
2. Did you invest more time and effort in your online learning compared to face-to-face classes?
3. Did you find the course content presented by your teachers easier to understand in the online setting compared to face-to-face classes?
4. Were you able to communicate effectively with your teachers/lecturers during online learning, as compared to face-to-face classes?
5. Did you feel more enthusiastic about participating in class activities during online learning, in contrast to face-to-face classes?
6. Did you typically receive quick responses from your teachers in the online learning environment compared to face-to-face classes?
7. Did you believe that you had sufficient support and resources to study effectively from home during online learning?
8. Did you establish stronger connections with your friends and classmates in the online

learning environment compared to face-to-face learning?
9. Did you feel more at ease taking online exams or tests in comparison to face-to-face assessments?
10. Did you perceive the workload to be heavier throughout the school year in the online learning environment, as opposed to face-to-face classes?

Table 1. Survey Results for Online vs. Face-to-Face

QUESTIONS	STROGNLY AGREE	AGREE	ABOUT THE SAME	DISAGREE	STRONGLY DISAGREE
Q1	11.1%	24.4%	28.9%	27.8%	7.8%
Q2	6.7%	17.8%	24.4%	36.7%	14.4%
Q3	6.7%	12.2%	23.3%	38.9%	18.9%
Q4	2.2%	5.6%	21.3%	51.7%	19.1%
Q5	1.1%	6.7%	18%	41.6%	32.6%
Q6	1.1%	6.8%	46.6%	34.1%	11.4%
Q7	5.7%	31.8%	36.4%	19.3%	6.8%
Q8	1.1%	4.5%	5.7%	36.4%	52.3%
Q9	13.6%	22.7%	45.5%	15.9%	2.3%
Q10	2.3%	3.4%	46.6%	40.9%	6.8%

The comprehensive survey outcomes have been compiled in Table 1. For Q1, an almost equivalent percentage of 35.6% of students found it harder compared to 35.5% who found it easier to acquire online teaching materials. Moving on to Q2, a significant majority (75.5%) of students did not perceive themselves as spending more time on online learning. Moreover, in Q7, a substantial 73.9% of students believed they possessed adequate support and resources for effective online studying. Likewise, Q9 reveals that a larger contingent of students (36.3%) expressed a preference for online exams, as opposed to the 18.2% who did not. Finally, in Q10, a mere 5.7% of students perceived the workload in online learning to be more burdensome than that in face-to-face classes.

Nevertheless, a significant 57.8% of students perceived online learning to be more challenging in Q3. Additionally, approximately 70.8% of students found it more difficult to effectively communicate with their teachers (Q4), while 45.5% indicated they did not consistently receive prompt responses from their teachers (Q6). Moreover, a notable 88.7% of students expressed missing the interpersonal interaction and bonding inherent to face-to-face classroom experiences in Q8. Lastly, a substantial 74.2% of students displayed a preference for the face-to-face mode of learning, as revealed in Q5.

Fig. 8: The grade for online vs. face-to-face

Furthermore, we inquired about students' perceptions of their grades in online learning compared to face-to-face classes, as illustrated in Figure 8. Remarkably, around 26% of students believed their performance to be worse than that in face-to-face classes, while an equal 26% felt their performance was enhanced compared to face-to-face. Notably, the remaining 48% of students indicated that their performance remained consistent across both learning modalities.

Finally, at the end of the survey, two open-ended questions were posed without pre-defined responses:

1. Which course or subject did you find the most challenging to learn in an online environment during the 2020-2021 academic year?
2. Throughout 2020-2021, what aspect of physically attending classes did you miss the most?

In response to Q1, the three most frequently mentioned challenging subjects were Math (38 responses), Science (34 responses), and English or ELA (28 responses). Math and ELA were identified as difficult to learn online due to the complexity of certain topics, which can be challenging to grasp without direct teacher explanations and the opportunity to hear questions from fellow students. Science emerged as a challenging subject due to its experimental nature, particularly the difficulty in conducting hands-on labs in an online setting.

Regarding Q2, nearly 95% of the 176 responses highlighted the absence of friends, classmates, teachers, and peers as the aspect they missed the most about physically attending classes. This aligns with the recognized challenges of online education, particularly the lack of *social interaction*, as highlighted by, [23], [25]. Some respondents also mentioned elements such as school, classroom, and organization. The isolation brought about by online learning has taken a toll on the mental well-being of both children and adults, leading to negative emotions like frustration, anxiety, depression, and boredom, [26], [27]. In fact in, [28], data from early 2021 indicates a 51% increase in emergency department visits for suspected suicide attempts among adolescent girls compared to the same period in early 2019.

4.4 Suggestions for Future Online Learning

In summary, the examination of online learning benefits and challenges reveals that most students acknowledge its convenience, appreciating the flexibility of learning anytime and anywhere. The majority of students find using tools, accessing materials, and participating in exams relatively straightforward. However, a predominant obstacle identified in online learning is the deficiency of communication with peers and the delay or absence of responses from teachers, [29]. Furthermore, the perception that online learning is more demanding is widespread among students. Consequently, high school students require additional guidance to effectively navigate their learning endeavors. By addressing these challenges and providing targeted support, students can optimize their online learning experiences.

The survey outcomes underscore that enhancing the effectiveness of online learning necessitates collaborative efforts not only from students, but also from policymakers, educators, and parents. Several actionable recommendations can be drawn from these findings:

- **Educational Authorities and Schools**: Educational institutions need to offer comprehensive guidance and technical support to students encountering technical challenges during online learning. Providing resources for troubleshooting technical issues can mitigate barriers to effective online education.
- **Group Learning and Peer Interaction**: Recognizing the significance of group learning and peer interactions, online learning platforms should be strategically structured to facilitate communication and collaborative learning among secondary school students. Incorporating methods for fostering peer engagement can enhance the overall learning experience.
- **Diverse Assessment Methods**: To cater to students' preferences and strengths, schools should offer various assessment options, including paper-based exams. This approach acknowledges the diverse learning styles and examination preferences of students.

- **Mental Health Support**: In acknowledgment of the potential mental health impacts of prolonged online learning, administrators and educational leaders should consider providing access to licensed mental health professionals. These professionals can offer necessary support to address mental health challenges that students may experience due to the transition to online learning.

By addressing these recommendations, educational stakeholders can work collectively to optimize the online learning experience for secondary school students, ensuring that both the benefits and challenges are effectively addressed.

The findings outlined above are based on the specific survey conducted for online learning during the COVID-19 pandemic. However, it's important to acknowledge certain limitations in the generalizability of these findings:

- **Limited Population Representativeness**: The survey's participant pool is derived from a single city, which may not reflect the broader diversity of experiences across different regions, demographics, and educational settings. The unique circumstances of this city could influence the responses in ways that might not apply universally.
- **Context-Specific Factors**: The quality of online learning platforms, teaching materials, and instructional methods can vary significantly between educational institutions. The findings might be influenced by the unique characteristics and strategies employed by the specific institutions involved in the survey.

Given these limitations, while the insights from this survey are valuable for understanding the experiences of students in a specific context, caution should be exercised in generalizing these findings to broader educational landscapes. A more comprehensive and diverse set of data from various regions and contexts would be necessary to draw more universally applicable conclusions about online learning during the pandemic.

5 Conclusions

Online instruction has experienced rapid growth, particularly with the onset of the COVID-19 pandemic in 2020. The global education landscape saw a swift shift toward online learning, affecting students of all levels, including secondary education, for more than a year. It's crucial to recognize that the primary aim of this transition was not to recreate a perfect educational environment, but rather to swiftly provide virtual access to students during the crisis.

This paper presents a survey conducted in Fort Bend and neighboring counties in Texas. The survey aims to compare secondary school students' experiences, conditions, and expectations in online learning versus traditional face-to-face instruction. The study provides insightful implications to guide policymakers and educational institutions in enhancing future online learning experiences for secondary school students.

Furthermore, it's imperative to acknowledge the adverse effects that online learning during the pandemic has had, particularly on mental health. Educational leaders and administrators must make informed decisions on how to best support online education moving forward. Balancing the benefits and challenges of online learning will be key to shaping its role in future education.

References:

[1] Norman, S. Traditional Education and Advantages of Online Learning, *Education, Global Themes and Feature Topics, Industries*, 2016.

[2] Zheng, B., Lin, C.-H., and Kwon, J. B. The impact of learner-, instructor-, and course-level factors on online learning. Computers & Education https://doi.org/10.1016/j.compedu.2020.103851, 2020.

[3] Hong, J. et. al. High School Students' Online Learning Ineffectiveness in Experimental Courses During the COVID-19 Pandemic, *Frontiers in Psychology*, 12, pp.1-9, 2021.

[4] Clark, T. and Barbour, M.K. *Online, Blended, and Distance Education in Schools: Building Successful Program*. Stylus Publishing, USA, 2015.

[5] Sun, A.Q., Chen, X. Online Education and Its Effective Practice: A Research Review, *Journal of Information Technology Education: Research*, vol. 15, pp. 157-190, 2016.

[6] Education Data, Education Data Organization, 2021, https://educationdata.org/online-education-statistics (Accessed Date: 12/2/2022)

[7] Anthony, E. (Blended) learning: How traditional best teaching practices impact

blended elementary classrooms. *Journal of Online Learning Research*, 5(1), 25–48, 2019.

[8] Barbour, M. K. The landscape of K-12 online learning: Examining what is known. In M. G. Moore & W. C. Diehl (Eds.), *Handbook of Distance Education*, 4th ed., pp.521-542. Routledge, 2019.

[9] Molnar, A. (Ed.), Miron, G., Barbour, M. K., Huerta, L., Shafer, S. R., Rice, J. K., Glover, A., Browning, N., Hagle, S., & Boninger, F. Virtual schools in the U.S. 2021. Boulder, CO: National Education Policy Center. http://nepc.colorado.edu/publication/virtual-schools-annual-2021 (Accessed Date: 12/2/2022)

[10] Arnesen, K. T., Hveem, J., Short, C. R., West, R. E., & Barbour, M. K. K-12 online learning journal articles: Trends from two decades of scholarship. *Distance Education*, 40(1), 32–53, 2019.

[11] NCES, Characteristics of 2020-21 Public and Private K-12 Schools in the United States. 2021. National Center for Education Statistics, 2021. https://nces.ed.gov/pubs2022/2022111.pdf (Accessed Date: 12/2/2022)

[12] Major, W. Contagion in the Classroom Or, What Empathy Can Teach Us about the Importance of Face-to-Face Learning, *Journal of Liberal Education Fall*, pp 67, 2014.

[13] Kumari, T. A., Hemalatha, C., Ali, M. S., and Naresh, R. Survey on impact and learning's of the online courses on the present era. *Procedia Comput. Sci*. 172, pp.82-91. DOI: 10.1016/j.procs.2020.05.167, 2020.

[14] Raheim, M.D.H. Indonesian University Students' Likes and Dislikes about Emergency Remote Learning during the COVID-19 Pandemic. *Asian Journal of University Education*, 17(1), pp. 1-18, 2020.

[15] Salzano G., Passanisi S., Pira F., Sorrenti L., La Monica G., Pajno G. B., Pecoraro M., Lombardo F. Quarantine due to the COVID-19 pandemic from the perspective of adolescents: The crucial role of technology. *Italian Journal of Pediatrics*, 47(40), 1–5, 2021.

[16] Basar, Z.M. Mansor, A. N. Jamaludin, K.A. Alias, B.S. The Effectiveness and Challenges of Online Learning for Secondary School Students – A Case Study. Asian Journal of University Education, 17(3), pp.119-129, 2021.

[17] De Leon, J 7 Things we learned about Covid's Impact on Education from Survey of 800 Schools, 2022, https://www.the74million.org/article/7-things-we-learned-about-covids-impact-on-education-from-survey-of-800-schools/ (Accessed Date: 11/2/2022).

[18] Muhammad, A. & Kainat, A. Learning Amid The COVID-19 Pandemic: Students' Perspectives. Pakistan. *Journal of Pedagogical Sociology and Psychology*, 2020.

[19] Jung, Y., and Lee, J. Learning engagement and persistence in massive open online courses (MOOCS). *Comput. Educ*. 122, 9–22, 2018.

[20] Agung, A.S.N., Surtikanti, M. W., & Quinones, C. A. Students' perception of online learning during COVID-19 pandemic: A case study on the English students of STKIP Pamane Talino. SOSHUM: *Jurnal Sosial Dan Humaniora*, 10(2), 225–235, 2020.

[21] Yan L, Whitelock-Wainwright A, Guan Q, Wen G, Gašević D, Chen G. Students' Experience of Online Learning during the COVID-19 pandemic: A province-wide survey study. *British Journal of Education Technology*, 52(5): 2038–2057, 2021.

[22] Ratheeswari, K. Information Communication Technology in Education. Journal of Applied and Advanced Research, 3(S1): 45., 2018.

[23] Johnson, C.C, Walton, J.B, Strickler, L., Elliot, J.B. Online Teaching in K-12 Education in the United Sates: A Systematic Review, *Review of Educational Research*, 20(10), pp. 1-59, 2022.

[24] Wildana, W., Iffat, M., Dewi, E., Zainur, R., Student's Responses on Learning in the Early COVID-19 Pandemic. Malang, Indonesia. *Journal of Education and Teacher Training*, 2020.

[25] Magson N. R., Freeman J. Y., Rapee R. M., Richardson C. E., Oar E. L., Fardouly J. Risk and protective factors for prospective changes in adolescent mental health during the COVID-19 pandemic. *Journal of Youth and Adolescence*, 50(1), 44–57, 2021. -->25

[26] Browne D. T., Wade M., May S. S., Maguire N., Wise D., Estey K., Frampton P. Children's mental health problems during the initial emergence of COVID-19. *Canadian Psychology/Psychologie Canadienne*, 62(1), 65–72, 2021.

[27] Naff, D., Williams, S., Furman-Darby, J., & Yeung, M. The Mental Health Impacts of COVID-19 on PK–12 Students: A Systematic Review of Emerging Literature. *AERA*

Open, 8. https://doi.org/10.1177/23328584221084722 , 2022.

[28] Yard E., Radhakrishnan L., Ballesteros M.F., Sheppard M., Gates A., Stein Z., Hartnett K., Kite-Powell A., Rodgers L., Adjemian J., Ehlman D.C., Holland K., Idaikkadar N., Ivey-Stephenson A., Martinez P., Law R., Stone D.M.. Emergency Department Visits for Suspected Suicide Attempts Among Persons Aged 12-25 Years Before and During the COVID-19 Pandemic - United States, January 2019-May 2021. MMWR Morb Mortal Wkly Rep. 2021 Jun 18;70(24):888-894. DOI: 10.15585/mmwr.mm7024e1.

[29] Yates, A., Starkey, L. Egerton, B., and Flueggen, F. High school students' experience of online learning during Covid-19: The influence of technology and pedagogy. Technology, Pedagogy and Education, 9, 1-15, 2020.

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