Research Paper

International Trends of Remote Teaching Ordered in Light of the Coronavirus (COVID-19) and its Most Popular Video Conferencing Applications that Implement Communication

Zsolt Kristóf[1]

Abstract

The global coronavirus pandemic that emerged at the end of 2019 and will reach its peak in 2020 has affected education systems worldwide and led to widespread, complete closure of schools, universities, and colleges. UNESCO estimates that a total of nearly 1.6 billion students worldwide have been affected by the closures of educational institutions. The indicator was the highest in the period from April 1 to April 5, when exactly 1,598,099,008 students were affected by the measures. This accounted for 91.3% of the world's total learning community, with a total of 193 countries providing full nationwide remote teaching. In response to school closures, UNESCO has proposed distance learning programs as well as open educational applications and platforms that have ena-bled schools and teachers to reach their students remotely and make online education easier (UNESCO, 2020). In addition to reviewing the recent literature and monitoring lockdown measures, the study also suggests a number of specific solutions.

Keywords: coronavirus; COVID-19; remote teaching; online teaching; videoconference

Introduction

Numerous studies demonstrate that countries'education authorities need to be prepared to make radical changes in the event of a pandemic. Cakir and Savas presented a mathematical modeling approach that concluded if precautions of the right quality and quantity are not taken or if precautions are reduced, the pandemic process can show a very rapid change in the negative direction. So it is necessary to apply social isolation (Cakir & Savas, 2020). According to the results of the research, young people and children are more protected from the severe or even fatal outcome of the disease, but at the same time they can spread the disease even with or without minor symptoms. This was one of the main reasons for the closure of schools worldwide (Abdulamir & Hafidh, 2020). The above has been supported by research by Majumder and colleagues, suggesting that prolonged contact with infected individuals – even just staying in one space – may be the most likely way for the virus to spread (Majumder et al., 2020). Uscher-Pines and colleagues also agreed with this, believing that during an average flu pandemic, risk reduction strategies such as social distancing could slow the spread of viruses in schools and surrounding communities. However, they point out that, in addition to the classic remote teaching used to promote distance learning, little attention has been paid so far to alternative solutions that may be easier to sustain and more feasible. At the same time, they acknowledged that there is not enough information available to schools to reflect on different ways of keeping distance and considered further serious research on the subject to be essential (Uscher-Pines et al., 2018).

In 2019, Germann and colleagues explored the possibility of remote teaching for epidemic flu to slow the spread of the infection. The duration of the lockdown was analyzed before the presumed vaccines were applied (Germann et al., 2019). Also in 2019, Faherty and colleagues analyzed the preparedness of schools and school leaders for the special situation in the event of a possible epidemic. The awareness had to include, among other

[1] University of Debrecen, Debrecen, Hungary; zsolt.kristof@gmail.com

things, the physical rearrangement of the classes, the limitation of the group work of the students, and the expertise related to the transition to distance education. It should be noted that the study counted days missed, not weeks or even months (Faherty et al., 2019). The psychological impact of current quarantine can be widespread, significant, and lasting (Brooks et al., 2020). Various studies have shown that there are examples of the use of distance learning solutions and online learning opportunities during an epidemic. But these have focused on local cases, not on a global crisis like the one we are currently experiencing. It should also be borne in mind that schools in countries with limited technology are more likely to have problems and will obviously be ready to implement full online education at a slower pace than in more developed countries (Sintema, 2020).

Online teaching / learning rearranges the world of homeworks and exams too. Overnight, the use of methods that many educators were unfamiliar with and had not used before became almost mandatory. Further complicating the situation is the fact that different techniques may be appropriate for several subjects. The problem of classification also arises, as the teacher has to give a grade so that the student is not even in the institution. New technologies need to be implemented to avoid copying and cheating and other scams as safely as possible. Achieving quality in the topic of online education requires effective and rapid research. There was also no time to examine the methodology of online education from a quality assurance perspective, as the main goal was to save the global educational process in some form.

Currently there is an era of data collection, the educational methodology needs to be examined and further developed. We must not forget that the available tools and platforms should not be left out of the analysis (Basilaia & Kvavadze, 2020).

An unavoidable factor is the fact that it is not at all essential for a student to have wide or even limited access to the tools which online education demands. As a result of Hungarian research, a study was published in April 2020 examining sixth, eighth and tenth graders in terms of the percentage that digital education cannot reach, mainly due to lack of resources. The results showed that a very significant proportion of pupils – about one-fifth of them in primary schools, for example – had only limited or no access to the necessary resources. The problem is further exacerbated by the fact that a large percentage of them have already had troubles with learning, and their possible absence from online-type education obviously worsens their chances. It is an international experience that social disparities increase when distance education is introduced. For students who do not have access to education, this situation can open up a very serious and quite long-term set of problems. The chances of meeting the year-end requirements can be drastically reduced without the help of an instructor or even a parent. Unfulfilled tasks can have a long-term negative impact on students' school careers, and the chances of dropping out can be greatly increased. Permanent disadvantage can not only be caused by failure, the grades of better learners can also deteriorate, so further learning can be jeopardized (Hermann, 2020).

International measures about distance education

The process of school closure has shown a strong correlation with the spread of the virus. UNESCO data includes country-level and local ordinances, as well as tracking countries that have not responded to the emergence of the virus in education. Belarus, which is relatively close to Hungary, has not made any changes to the opening hours of its schools and, although it is quite rare, there are areas in the world similar to the above. Figure 1 shows the conditions experienced on the 7th of May 2020. Countries marked in light purple responded incompletely, only with local distance education at the time of the above date. There can be several reasons for this. There are countries that have simply not followed the standard of completeness as an international standard, others have had to do so because of their territorial size, and there are some that have already abolished the nationwide lockdown. In the vast majority of countries, complete country-wide distance education are active in early May, which can be seen in dark purple.

Figure 1. The international status of distance education on May 7, 2020.
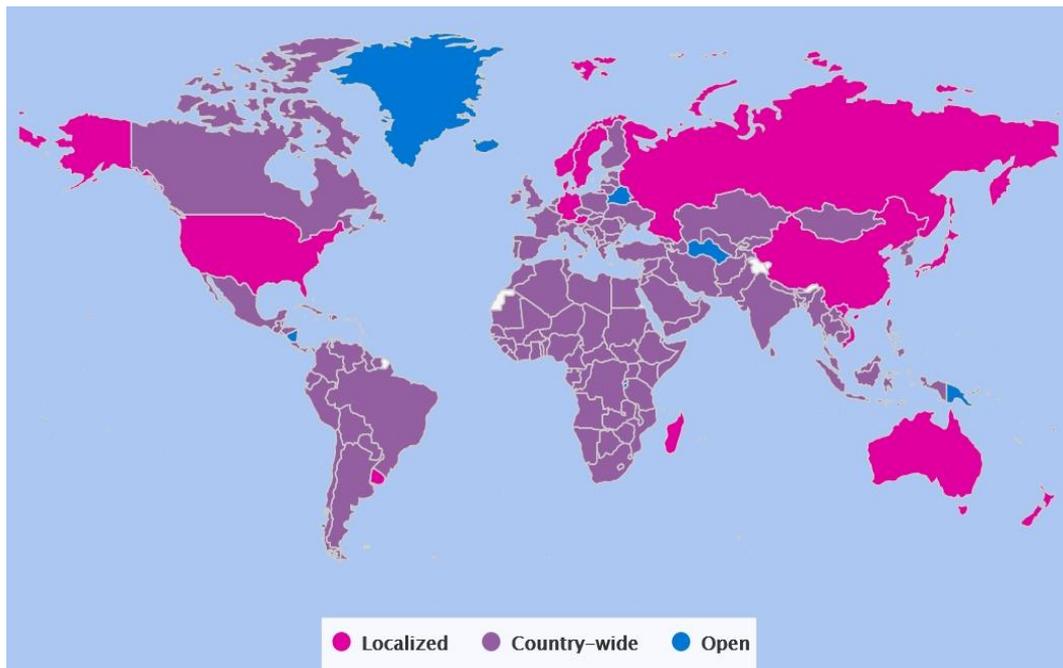
(edited by the author based of en.unesco.org)

Figure 1 shows, among many other things, that China, where the first outbreaks of the virus were reported and where, by definition, the earliest action was taken, is already beyond full lockdown. In some cases, their size, structure, and even location may play a significant role in countries' education policy decisions. For example United States, Russia, and Australia have been in the group indicating only local action since the outbreak of the virus, with no complete lockdown. In Europe, Iceland and Sweden, which is responding in a special way to the epidemic, have remained in favor of local lockdowns throughout. Belarus, with a population of nine and a half million people, is carrying out a kind of experiment, as it has not responded substantially to the pandemic, not only in the field of education, but in virtually any field.

Figure 1 shows a snapshot of the current states. However, it is also worth examining how international trends have changed over time since the first measures were introduced. In Figure 2, I focused only on those countries that ordered country-wide distance education. I examined a number of how many states decided to close at the national level for a given date. The data can be seen from the 19th of February. This was the date when the first provisions took place.

Figure 2. Number of countries in the world using distance education at country-wide level
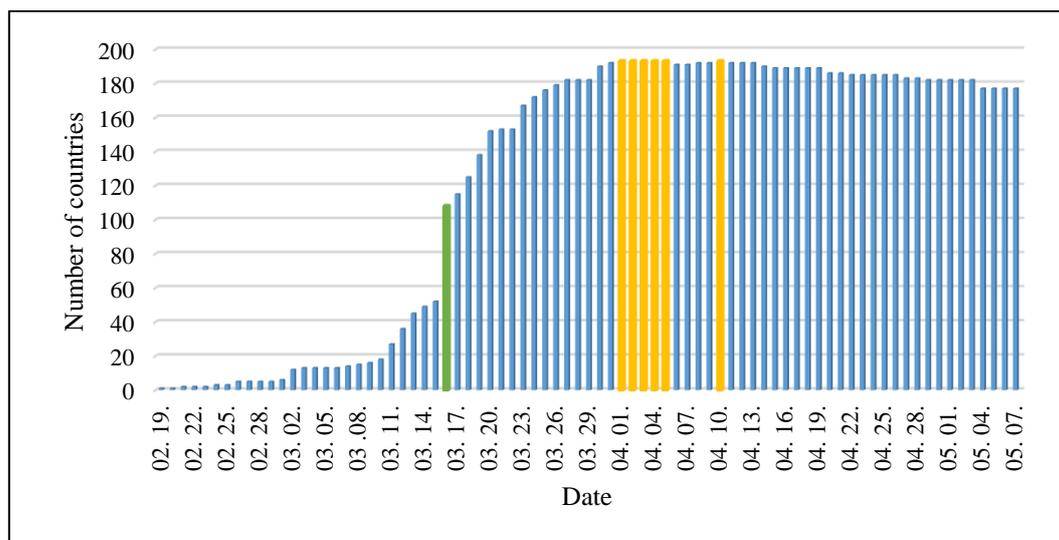
(edited by the author based of en.unesco.org)

Surprisingly, China was not first in the world to close all its schools, two days before the Chinese decision, Mongolia made the far-reaching decision. In Europe, Italy on the 10th of March, several other European countries, such as the Czech Republic, Romania and Greece, opted for full lockdown a day later. The 16th of March was special in several ways. I marked this column in green because Hungary joined the above mentioned initiative at that time. However, on this day, most European states switched to nationwide lockdown. On the 15th of March only 52 countries, and a day later, 108 countries had implemented the country-wide measure. In fact, on the 15th of March, schools in nearly twenty European states were already closed, and the Hungarian full lockdown order could have arrived a few days earlier. However, the Hungarian measures cannot be considered belated, because not only in Europe but also in the world, most countries joined the decision on the day when Hungary did. From then on, the number of countries grew almost steadily until the 1st of April, reaching a maximum of 193 in early April. We indicated in yellow columns the days during which most countries were affected. At the time of writing, on the 7th of May, 2020, 177 countries still maintain total school closure. It has been almost a whole month since the 10th of April, and the number of states is declining extremely slowly. We are probably beyond the zenith, but the very slow trend of decline suggests that we should only return very carefully to our usual protocols. We also need to keep in mind that the end of the school year is approaching, many countries may feel that there is too little time to reopen schools, the risk simply seems greater than the expected profit, so in many states the start of September can be predicted.

Figure 3 also shows the previous date range, but instead of the pure number of countries, I present the percentage of enrolled students related to distance education on the vertical axis. This is global data and it should be noted that not only total school closure can be affected, but also local. This is why there are similarities and differences between Figures 2 and 3.

Figure 3. Percentage of students enrolled in training in distance education worldwide
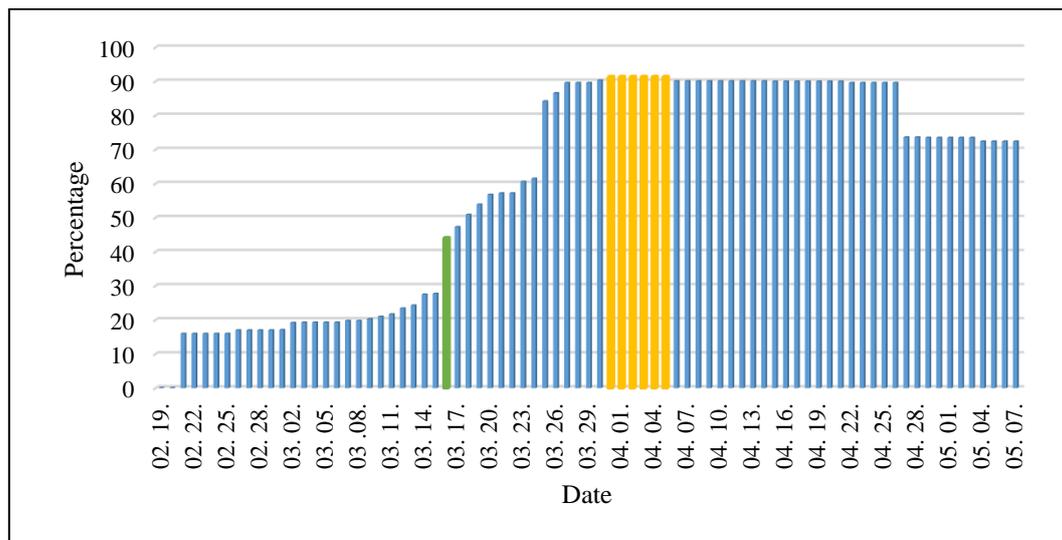
(edited by the author based of en.unesco.org)

Behind the outstanding columns lies either the high population of the countries or the large number of countries. Thus, for example, the appearance of China in the data can be seen on the 21st of February, with nearly 280 million students, increasing participation to 16% immediately. On the day of the great accession at the 16th of March, it was already 44% - at that time 56 countries joined the full lockdown - for which I marked the data in green because it was also the date of the Hungarian decision. The increase may seem less drastic than in the previous figure. This may be because in many states, local measures were already in place at the time and because of these, students were already considered affected. On the 25th of March, with the accession of India, the number of students surveyed increased by nearly 400 million. Subsequently, the culmination occurred with approximately one billion 600 million people. At that time, the involvement was extremely high at 91.3%. The related data for the days from the 1st of April to 5th are marked in yellow. For the rest, there is only one outstanding column, and that is in connection with the 27th of April. On that day, it was decided in China to reduce the full lockdown to partial. Currently, on the 7th of May, the participation rate is still very high, at 72.4%, but as in the number of countries, there is a slow decline in these data (UNESCO, 2020).

Video conferencing applications

When designing and managing distance learning processes, educators need to reach out to some kind of videoconferencing tool in addition to learning management systems. Video conferencing is a technology that allows real-time transmission and reception of audio and video data over a network between users who can be at any distance from each other. A solution that can ensure that people living in different locations can hold face-to-face meetings without having to do so in physical space. Video conferencing can be organized between groups from different remote locations or even between two people. In either case, participants can use their camera, microphone, and speakers, either located on or connected to their computer. When participants talk to each other, their voice is transmitted over the network and passed on to the speakers of the others. Video streamed over the network is displayed in the other participant's software interface window. Multipoint video conferencing allows three or more participants to sit in a virtual conference room and communicate as if they were sitting directly next to each other (Isaac & Omame, 2020). In this paper, we discuss the characteristics and parameters of four currently popular applications.

Skype

Skype is a telecommunications application that provides video chat and voice calls from computers, tablets and mobile devices over the Internet to other computers, but also to phones and smartphones. Users can send instant messages, exchange files and images, send video messages, and make conference calls. Looking at the world of informatics, the software was released a long time ago, in August 2003, by Janus Friis from Denmark

and Niklas Zennström from Sweden. Skype allows users to send instant messages, voice-based communication through a microphone, and video-based communication using a webcam over the Internet. Calls inside Skype are free for users, while calls to landlines and mobile phones are possible using Skype Credit, which costs money via traditional phone networks (Nascimento & Melnyk, 2016).

Although Skype is a commercial product, its free version appeared as early as around 2007 among some teachers and schools interested in global education projects (Branzburg, 2007). Teachers use Skype in a unique way to achieve educational goals. The value of software video conferencing lies in the fact that it allows to connect students who speak different languages, hold virtual field trips and visit experts from different fields of study. Based on the experiences mentioned above, students can apply what they have learned in their classroom to their everyday lives, and these can open up additional learning opportunities (Nascimento & Melnyk, 2016). In addition to the positives, it should be mentioned that by 2020, Skype will have significantly lost its popularity. This may be due to development deficiencies, a user interface that cannot be explicitly described as user-friendly, and a relatively high number of unexpected exits.

Zoom

Zoom Video Communications, Inc. (Zoom) is a U.S. communications technology company headquartered in San Jose, California. It provides videophone and online chat services through a cloud-based, direct communication software platform and is used for teleconferencing, telecommuting, distance learning and social networking. Eric Yuan, a former engineer and CEO of Cisco Webex, founded Zoom in 2011 and launched his software in 2013 (Weiner, 2017). Zoom is compatible with Windows, macOS, iOS, Android and Linux. Use of the platform is free of charge for video conferencing with up to 100 participants at a time. If more than two people are involved in the call, the system sets a time limit of 40 minutes. For longer or larger conferences, with more features, there are paid subscriptions that cost 15-20 dollars per month. Participants do not need to download the app if they are using Google Chrome or Firefox; they can click on a link and connect from the browser (ZOOM, 2020).

Thanks to its user-friendly interface and usability, Zoom has quickly become popular with a wide variety of users. Features include face-to-face chat, group video conferencing, screen sharing, use of plug-ins, browser extensions, and the ability to record appointments. During the COVID-19 pandemic, Zoom was able to realize a huge increase in the number of users due to the exponential growth of teleworking, distance learning and online social connections. Thousands of educational institutions have switched to online classes using Zoom. By February 2020, Zoom had 2.22 million users, so they could register more customers in the second month of the year than in the full year of 2019 (Abbott, 2020).

Zoom has been criticized for its security vulnerabilities and poor appearance, in response to which increased software control has occurred. CEO Yuan apologized in April 2020 for security issues, claiming that some of the issues are due to Zoom being designed for large institutions with full IT support. Zoom executives have announced a focus on privacy and a transparency report. In April 2020, the company released version 5.0 of Zoom, which, for the time being, appears to have successfully resolved a number of security and privacy issues. By default, the new version includes passwords, enhanced encryption, and a new security icon (Warren, 2020).

Google Hangouts

Google Hangouts is a communications software developed by Google. Hangouts was originally a feature of Google+, becoming a standalone product in 2013 when Google integrated both Google+ Messenger and Google Talk into Hangouts. In 2017, Google began developing Hangouts into a corporate communications product. Hangouts is now part of the G Suite family, with two primary products, Google Meet and Google Chat. G Suite is a set of cloud-based computing and collaboration tools, software, and products developed by Google Cloud. The initiative was launched on August 28, 2006 under the name "Google Apps for Your Domain". While Google services are free for consumers to use, G Suite adds enterprise features such as custom email addresses (@ your-company.com), unlimited cloud storage (depending on plan and number of members), additional administrative tools and advanced settings, as well as ongoing phone and email support (Google, 2020).

Hangouts basically allow conversation between two or more users. The service is available online on Gmail or Google+, as well as through mobile apps available for Android and iOS (Hamburger & Bohn, 2013). In response to the COVID-19 crisis that began in early 2020, Google began offering more advanced features of Meet to G Suite or G Suite for Education users. These options previously required a corporate account. The use of the tool increased 30-fold in 2020 between January and April. In the last week of April 2020, 100 million users a day came

to Meet. Regarding the huge number, it should be noted that Zoom realized 200 million users a day at the same time (Lardinois, 2020).

Previously, you had to have a Google business or G Suite account to initiate and host Meet video conferencing, but due to the growing demand for video conferencing, Google announced that free access to Meet would begin in May 2020. Google's long-term plans have previously included making Meet available to Google account holders, but the COVID-19 crisis has accelerated the process. Following the announcement, Google's product manager recommended that consumers use Meet instead of Hangouts (Boland, 2020). The important information is that free Meet calls can only have one host, but up to 100 users can participate in the connection. It's worth comparing this to the 250-person limit for G Suite users and 25-person Hangouts. Importantly, unlike business calls with Meet, consumer calls are not recorded or stored, and Google has stated that user data from Meet will not be used to create targeted ads. Although call data is not claimed to be used for advertising purposes, Google reserves the right to collect data about call duration, attendees, and attendees' IP addresses based on an analysis of Meet's privacy policy. By June 2020, Google hopes users will switch to Meet and Chat, along with the consumer version of the classic Hangouts.

Microsoft Teams

Microsoft Teams is a unified communications and collaboration platform that combines persistent workplace chat, video conferencing, file storage (including working with files), and application integration. The feature is integral to the Office 365 office software suite and includes add-ons that allow non-Microsoft products to connect properly (Chin, 2020). Microsoft announced the creation of Teams at an event in New York and launched the service on March 14, 2017 worldwide. The software was created during an internal corporate hackathon and is currently led by Brian MacDonald, Microsoft's vice president of corporate operations. A hackathon is a gathering where different professionals have to come up with some promising digital innovation in a very short time and possibly even implement it in a rudimentary form. On May 3, 2017, Microsoft announced that Microsoft Teams will replace Microsoft Classroom in Office 365 Education. On July 12, 2018, Microsoft introduced a free version of Microsoft Teams that offers communication capabilities for most platforms free of charge, but limits the number of users and the file storage capacity of the software. By March 19, 2020, Microsoft Teams was able to present 44 million users per day, largely due to the 2019-20 coronavirus pandemic (Protalinski, 2018).

Teams allow communities and groups to join through a specific URL or invitation that can be sent by the group administrator or owner. Using Teams for Education, administrators and teachers can create special groups for classes, professional learning communities, employees, and any additional users. Within the Teams application, members can set up channels. Channels are conversation topics that allow members to communicate without email or group SMS. Users can reply to messages with text, images, GIFs, or even custom memes. Microsoft Teams also provides teachers with the ability to distribute, feedback, and classify student materials on the Assignments tab, which is available to Office 365 for Education subscribers. Quizzes can also be issued to students through integration with Office Forms (Thorp-Lancaster, 2018).

Summary

In order to slow the spread of COVID-19, UNESCO is working with national ministries of education on the widespread closure of schools to ensure the continued learning of children and young people through alternative channels. A global education agreement can be reached to support countries in disseminating their best distance learning practices and reaching out to the most vulnerable children and young people. Technical assistance can be developed for the rapid preparation and deployment of inclusive distance learning solutions using hi-tech, low-tech, and no-tech approaches. Webinars can be organized for education ministers and other stakeholders to share national efforts to maintain the provision of inclusive education in different contexts. A repository of national education platforms designed to support the continuity of curriculum-based studies could open. Last but not least, global monitoring of national and local school closures and the number of pupils affected is also highly recommended (UNESCO, 2020).

References

Abbott, E. (2020, April 20). Students and teachers struggle with remote education due to coronavirus. *TheHill.* https://thehill.com/changing-america/enrichment/education/493698-students-and-teachers-struggle-with-remote-education.

Abdulamir, A. S., & Hafidh, R. R. (2020). The Possible Immunological Pathways for the Variable Immunopathogenesis of COVID-19 Infections among Healthy Adults, Elderly and Children. *Electronic Journal of General Medicine, 17*(4), 202. https://doi.org/10.29333/ejgm/7850

Basilaia, G., & Kvavadze, D. (2020). Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. *Pedagogical Research, 5*(4), Article e0060.

Boland, H. (2020). Google launches free version of Meet in bid to topple Zoom. *The Telegraph.* from https://www.telegraph.co.uk/technology/2020/04/29/google-launches-free-version-meet-video-calling-app-bid-topple.

Branzburg, J. (2007). Talk is cheap: Skype can make VoIP a very real communication option for your school. *Technology & Learning, 27*(8), 36.

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet, 395*(10227), 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Cakir, Z., & Savas, H. (2020). A Mathematical Modelling Approach in the Spread of the Novel 2019 Coronavirus SARS-CoV-2 (COVID-19) Pandemic. *Electronic Journal of General Medicine, 17*(4), 205.

Chin, L. (2020, June 2). *Getting started with your Microsoft Teams upgrade - Microsoft Teams.* https://github.com/MicrosoftDocs/OfficeDocs-SkypeForBusiness/blob/live/Teams/upgrade-start-here.md.

Faherty, L. J., & Schwartz, H. L., & Ahmed, F., & Zheteyeva, Y., & Uzicanin, A., & Uscher-Pines, L. (2019). School and preparedness officials' perspectives on social distancing practices to reduce influenza transmission during a pandemic: Considerations to guide future work. *Preventive medicine reports, 14*, Article e100871.

Germann, T. C., Gao, H., Gambhir, M., Plummer, A., Biggerstaff, M., Reed, C., & Uzicanin, A. (2019). School dismissal as a pandemic influenza response: When, where and for how long?. *Epidemics, 28*, Article e100348. https://doi.org/10.1016/j.epidem.2019.100348

Google (2020). Choose a Plan. G Suite by Google Cloud. Google. from https://gsuite.google.com/pricing.html#choose-a-plan.

Hamburger, E., & Bohn, D. (2013). Exclusive: Inside Hangouts, Google's big fix for its messaging mess. *The Verge.* from https://www.theverge.com/2013/5/15/4318830/inside-hangouts-googles-big-fix-for-its-messaging-mess.

Hermann, Z. (2020). *Hány diákhoz nem jut el az online távoktatás?. [How many students do not reach online distance learning?]* Közgazdaság- és Regionális Tudományi Kutatóközpont Közgazdaságtudományi Intézete. from https://www.mtakti.hu/koronavirus/hany-diakhoz-nem-jut-el-az-online-tavoktatas/12769.

Isaac, A. U., & Omame, I. M. (2020). Application of Social Media and Video Conferencing in Smart Library Services. *Library Philosophy and Practice, 1,* 1–13.

Lardinois, F. (2020, April 29). Google is making Meet free for everyone. *TechCrunch.* https://techcrunch.com/2020/04/29/google-is-making-meet-free-for-everyone.

Majumder, P., Biswas, P., & Majumder, S. (2020). Application of New TOPSIS Approach to Identify the Most Significant Risk Factor and Continuous Monitoring of Death of COVID-19. *Electronic Journal of General Medicine, 17*(6), em234. https://doi.org/10.29333/ejgm/7904

Nascimento, L., & Melnyk, A. (2016). The usage of Skype for educational purposes. *Revista Mangaio Academico, 1*(1), 12–17. Article e2525-2801.

Protalinski, E. (2018 July 12). Microsoft launches free version of Teams. *VentureBeat.* https://venturebeat.com/2018/07/12/microsoft-launches-free-version-of-teams/

Sintema, E. J. (2020). Effect of COVID-19 on the Performance of Grade 12 Students: Implications for STEM Education. *Eurasia Journal of Mathematics, Science and Technology Education, 16*(7), 1851. https://doi.org/10.29333/ejmste/7893

Thorp-Lancaster, D. (2018, June 5). Microsoft Teams for Education celebrates first year with batch of new features. *Windows Central.* https://www.windowscentral.com/microsoft-teams-education-celebrates-first-year-batch-new-features.

UNESCO. (2020). COVID-19 Educational Disruption and Response. from https://en.unesco.org/covid19/educationresponse.

Uscher-Pines, L., Schwartz, H. L., Ahmed, F., Zheteyeva, Y., Meza E., Baker, G., & Uzicanin, A. (2018). School practices to promote social distancing in K-12 schools: review of influenza pandemic policies and practices. *BMC public health, 18*(1), 406. https://doi.org/10.1186/s12889-018-5302-3

Warren, T. (2020, April 22). Zoom releases 5.0 update with security and privacy improvements. *The Verge.* https://www.theverge.com/2020/4/22/21230962/zoom-update-security-privacy-features-improvements-download.

Weiner, Y. (2017, October 2). The Inspiring Backstory of Eric S. Yuan, Founder and CEO of Zoom. *Medium.* https://me-dium.com/thrive-global/the-inspiring-backstory-of-eric-s-yuan-founder-and-ceo-of-zoom-98b7fab8cacc.

ZOOM (2020). Zoom Meeting Plans for Your Business. Zoom Video Communications. https://zoom.us/pricing.