Opportunities and Challenges in Using Online Learning to Maintain Continuity of Instruction in K–12 Schools in Emergencies

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Abstract

BACKGROUND: Distance learning provides a way to continue instruction in emergencies and can support social distancing. As we have seen with the COVID-19 pandemic, prolonged school closures can occur with little warning. Lessons learned from prior prolonged school closures can inform much-needed planning for future ones. In the 2017 hurricane season, more than 1,000 schools in the United States experienced closures lasting 10 or more days. Yet, despite the rapid expansion of online instruction, little is known about schools' use of it in public health and other emergencies. METHODS: In 2017-2018, we conducted 13 focus groups and 11 interviews with school practitioners to identify promising practices, barriers, and facilitators for distance learning in emergencies. RESULTS: We found few examples of use of distance learning during emergency school closures in 2017. While there are significant barriers to offering distance learning in an emergency, schools that already offer online learning prior to an emergency are best equipped to continue instruction during closures for some types of emergencies. CONCLUSIONS: Additional efforts could enhance preparedness for distance learning in K–12 schools in the framework of all-hazards preparedness.

Keywords: Distance Learning, Blended Learning, Disasters, Hurricanes, Influenza

Implications for Policy and Practice

- As of 2017, schools seldom used distance learning during emergency school closures to continue instruction
- While there are significant barriers to offering distance learning in an emergency, schools that already offer online learning are best equipped to continue instruction during closures for some types of emergencies.
- Schools should prepare for future school closures by planning for a range of realistic options like reduced school-day schedules that allow for some face-to-face instruction along with remote learning, ways to enroll students in short-term courses that temporarily replace the interrupted courses, and customized online and offline delivery systems that suit a range of student needs.

BACKGROUND

The US Department of Education defines distance learning as education that uses one or more technologies to deliver instruction to students who are separated from the instructor and to support regular and substantive interaction between the students and instructor synchronously or asynchronously.[1] Distance learning—which comes in a wide range of forms from sending home offline materials like worksheets and hard-copy textbooks to courses that are hosted entirely online with no face-to-face instruction—is frequently incorporated into instruction in K–12 schools in the United States.

Online learning is the most common form of distance learning in the United States. Many schools (1) augment primarily face-to-face instruction with online content or lessons; (2) provide blended learning courses, which mix face-to-face and online instruction; and/or (3) enroll students in credit-bearing fully online courses. As of 2020, 43 percent of math teachers, 38 percent of ELA teachers, and 25 percent of science teachers reported their school's required fo or recommended curriculum included online software for students..[2] According to the most recent estimate from federal sources which was in 2015–2016, 58 percent of high schools offered one or more courses entirely online, compared to 13 percent of middle schools and 3 percent of primary schools.[3] By 2020, the percent of schools is surely higher given the rapid expansion of online content and free resources such as the Learning Management System Google Classroom.

Because distance learning allows students to continue instruction outside the school building, it can minimize the disruption associated with school closure of short or long duration. School closures have manmade and natural causes, such as teacher strikes, hurricanes, flooding, or disease outbreaks such as the current COVID-19 pandemic. Even before the unprecedented

global COVID-19 pandemic, prolonged school closures, which we define as 10 or more consecutive school days, happened with some frequency. At least 1,000 US schools had such closures in 2017 following Hurricanes Harvey and Irma.[4,5] In an emergency that results in a prolonged school closure, distance learning can help give students a routine, which can confer psychological benefits; and it can minimize learning loss from interrupted instruction. In an infectious disease outbreak such as an the coronavirus or an influenza pandemic, furthermore, use of distance learning may reduce mixing and thereby decrease the risk of disease transmission.

Although distance learning can and is playing a significant role in emergencies, to date there has been very little research on the use of distance learning during actual events of prolonged school closure or on lessons learned to inform future responses.[6] In this article, we present qualitative data on whether and how schools have used distance learning in an emergency, and the barriers and facilitators to offering it in types of emergencies that can result in school closures of varying duration, including snow, hurricanes, and influenza pandemics.

METHODS

Participants

We conducted 13 focus groups and 11 interviews in 2017–2018 with school practitioners from across the United States via telephone and webinar. Interviewees included principals, superintendents, and other school and district staff with direct experience implementing distance learning in response to emergencies including snow, hurricanes, and flooding. Focus group participants included superintendents, principals, teachers, and representatives of distance

learning organizations and virtual schools. Focus group participants were not required to have any direct experience with distance learning in an emergency, although many used distance learning in routine practice.

We recruited participants in several ways. For focus groups, we searched professional association websites and LexisNexis for school principals, teachers, and superintendents in districts with prolonged school closures, and we conducted snowball sampling. Within professional association websites, we searched for lists of members, conference attendees, and association leaders. In LexisNexis, we looked for names of school leaders who were quoted in the media about emergency preparedness. For interviews, we searched LexisNexis to identify experts in distance learning in schools. We also contacted via email every principal in high schools in Texas and Florida that reported school closures of 10 or more days following Hurricanes Harvey and Irma in 2017. School closure data were obtained using a database from a US Centers for Disease Control and Prevention research project that aggregates publicly available Internet data on school closure for surveillance purposes.[6]

A total of 68 participants, representing all 10 US Health and Human Services Department regions in the United States, participated in 13 focus groups and 11 individual interviews. The number of participants per focus group ranged from 2 to 7, with a mean of 4.

Instruments and Procedure

A team of six moderators trained in qualitative research conducted the focus groups via webinar and the interviews via telephone. Participants were contacted by email and offered a $50 gift card as an incentive. All focus groups and interviews were recorded and then transcribed.

Interviews followed a semi-structured protocol that explored direct experiences in offering distance learning in an emergency. The protocol covered: 1) current use and experience with online and blended (face-to-face and online) learning; 2) barriers to implementation of online and blended learning in routine times; 3) use of and experience with distance learning in an emergency; 4) barriers to implementing distance learning in an emergency; and 5) lessons learned from implementing distance learning in an emergency.

Focus groups also followed a semi-structured protocol that explored perceptions, rather than lived experiences, of offering distance learning in an emergency. The protocol covered: 1) types of reduced school schedules during an emergency; 2) models of distance learning and their applicability to an emergency; 3) perceived barriers and facilitators to using distance learning in a sustained emergency (e.g., for an influenza pandemic).

Data Analysis

We used standard qualitative analysis techniques to identify and characterize instances of themes arising from the various domains covered in focus group protocols (e.g., each identified practice) as well any unanticipated themes that emerged. Each transcript was read and independently coded by two coders. To ensure different coders were interpreting the data as similarly as

possible, we (1) developed descriptive codebooks that clearly defined and described each code; (2) performed intercoder agreement checks prior to analyses, where all analysts read the same text, coded independently, and discussed areas of disagreement; and (3) performed supervisory reviews of the analysis at regular intervals. We compared themes by emergency type as well as by perceptions (in focus groups) vs. lived experiences (in interviews) and reported any differences identified. Dedoose© qualitative research software was used to facilitate data handling, coding, and thematic analyses.

Below we present high-level themes and illustrative quotes related to (1) types of distance learning that are relevant to emergencies; (2) the role of distance learning in different types of emergencies and the common as well as uncommon barriers for each emergency type; and (3) lessons learned related to distance learning in recent snow, flooding, and hurricane events.

RESULTS

Distance learning strategies relevant to emergencies

Focus group and interview participants identified two distance learning strategies and discussed barriers to the implementation of each strategy to maintain continuity of instruction in an emergency (Table 1 of the appendix). These strategies can be broadly categorized as offline vs. online. The offline strategies consisted of sending home materials, or coordinating for families to pick up assignments from a physical location like a school, or one-way instruction such as lectures delivered by radio or television. Online strategies included shifting blended (face-to-face with online) courses to become entirely online; providing limited online content to students not already doing blended learning; and enrolling students in online, credit-bearing courses.

Focus group and interview participants generally endorsed online over offline distance learning for both short- and long-term emergencies. Their endorsement of online strategies was rooted in their perception that online instruction allowed for more frequent interaction between instructor and student, enabling instructors to assess student understanding and mastery sooner so they could adapt subsequent instruction based on students' demonstrated understanding. Respondents viewed timely assessment of student understanding as especially critical when implementing distance learning for five or more days and regarded lack of timely assessment as the primary limitation of offline strategies. As described by a state education agency official, "Learning is more than content delivery. Assessments are the keystone to making anything work. Old-school correspondence courses would require … mailing and getting things back. We would assess what is sent back and provide some sort of feedback."

Internet-based distance learning strategies were viewed as more closely approximating face-to-face classroom learning in the sense that they could be synchronous; however, participants noted that online strategies require several components to be successful. At a minimum, to do online instruction well over a long period, schools need a working learning management system (LMS), high-quality online course content, policies to address student access to devices and to the Internet, adaptation of content to student learning needs, and training and support for teachers to deliver instruction online. In other words, while interviewees typically ranked Internet-based above offline distance learning strategies for use during emergencies, they also acknowledged that online strategies pose significant demands.

Consequently, interview and focus group participants felt it was impractical for schools that were not already doing it pre-emergency to procure a LMS and online content, train staff, and provide access to computing hardware and high-speed Internet access immediately after an emergency like a hurricane. Instead, there was consensus that schools that were already offering blended learning courses or supplemental online courses during non-emergency times were best positioned to expand instruction during periods of school closure. There were very few scenarios in which interviewees could imagine launching online courses for the first time at the start of an emergency.

But offline strategies come with their own challenges. Participants noted difficulties distributing large quantities of hard-copy content to students and additional burdens on adults in the households, who, at a minimum, would need to coach students who could not yet read or students with disabilities. With online content, the use of audio and video in addition to printed words can serve broader age groups and a wider variety of abilities than can printed content alone.

Challenges of implementing distance learning in different types of emergencies

Participants agreed that distance learning is easier to implement in emergencies that do not harm physical infrastructure, do not significantly disrupt students' lives, and do not last long. Distance learning is easier to implement during a snow emergency, for example, than after a destructive hurricane or during a severe influenza pandemic that occurs in multiple waves.

Hurricanes often cause large-scale loss of electricity and Internet access, which are needed for online learning. Participants argued that this damage to infrastructure was a key reason that more schools did not expect students to engage in distance learning in the aftermath of Hurricanes Harvey and Irma. As explained by one district-level official, "We didn't offer distance learning during closure because many students did not have homes, students did not have electricity or Internet. Phone service in the area was nonexistent."

Similarly, complex, protracted emergencies like destructive hurricanes and severe influenza pandemics can traumatize students and families, and multiple participants pointed out that when students are in "survival mode," they cannot be expected to focus on learning. As described by a state official, "How important is school at that time in a student's life… other things [like seeking shelter, safety, and food] need higher priority." Paradoxically, while the need for distance learning increases with a closure of longer duration (e.g., in the case of a pandemic) because more face-to-face instruction has been lost, it becomes increasingly difficult to maintain student engagement over time when there is "no face-to-face component to instruction."

Lessons learned in recent emergencies

Among interviewees who had experience with distance learning in an emergency, four described implementing online learning for a dismissal of one to two days due to snow, one interviewee described implementation of blended learning in response to flooding in a school building, and six described their experience with distance learning in response to Hurricanes Harvey and Irma. We compare and contrast use of distance learning for snow days and for those hurricanes below.

Shorter disruptions: snow days. In all four instances of distance learning because of school dismissals for snow, schools did not require students to complete their assignments on the day of the dismissal. Students were given anywhere from 3 to 10 extra days to complete work in case they lacked Internet access or faced some other logistical barrier to distance learning. As described by one local district representative, "We also gave them three additional days—we usually do this when a student is absent—to finish the assignments in case the student was out shoveling snow all day or something."

In addition, there was no expectation of synchronous instruction. As described by one district representative, "The distance learning day did not strictly follow school hours, and students were free to set their own hours and pace. Distance learning was performance-based; districts expected that students complete defined tasks or assignments rather than be present at a set time. As described by one local district representative, "They [students] had complete freedom on when to do the assignments." According to another, "We give you a performance-based credit with this. The students are not required to log in at the time they would normally go to school. It is more for them to complete it [assignment/module]."

Districts gave the same flexibility to their teachers. For example, one school district representative asked teachers to keep office hours of their choosing so that students could get immediate feedback during those hours via email, text, Facebook, etc. In all examples, teachers also had freedom to set the goals of the distance learning day. According a local district representative, "We had some standardized things that we wanted everyone to have, and then

teachers had some flexibility in what they wanted their courses to look like." According to another:

> We gave them [teachers] three options: Make this a remediation lesson—something that you have already taught your students but plan to revisit at some point in the school year (e.g., the science class reviewed the scientific process). Or use the lesson that you were supposed to teach in person that day (this is hard to plan for ahead of time, but the physics class did this because that class was already used to completing something online for every class—so they were able to continue just the same). Or make the lesson a preview of something you were going to teach later in the year.

Longer disruptions: hurricanes. The distance learning offered after a large-scale disaster like Hurricanes Harvey and Irma was much more limited. None of the six interviewees required distance learning while school was closed, but all students who were already using an LMS for a particular course or who were enrolled in an online course were free to continue using these resources to get ahead in their coursework if they were so inclined.

Schools did not require or offer new content via distance learning for two main reasons: to be sensitive to the hardships many students were experiencing, and because it was difficult to assess which students had electricity and which were displaced from their homes. As described by a Texas high school principal, "It is hard to expect a student to learn if they are in a shelter."

Another high school principal in Texas pointed out that distance learning played a much more important role in the recovery period after the school had resumed operations than during the 10 days when the school was closed. Upon resumption, her school offered online courses to certain students who were absent for an extended time after school resumed. As she explained, "Enrolling in a self-paced online course was easier for these students than catching up in the in-person class."

Practitioners' recommendations for distance learning

Interviewees had some recommendations regarding implementation of online distance learning strategies in an emergency.

- **Offline material fills some important gaps**. Acknowledging the limitations of offline material, several interviewees still recommended that schools make printed materials available to students who lack Internet access or a computing device. As described by one local district representative, "We had a front office staff … go to the school during the closure to prep [hard-copy] assignment packets for parents to pick up."
- **Even during emergencies, distance learning should implement hallmarks of effective instruction**. A district representative mentioned the importance of setting clear expectations by presenting learning objectives for each distance learning day. The same participant recommended finding a timely way to collect formative feedback from students, teachers, and parents so that changes can be made as needed to help students remain engaged in instruction during a long-term closure. Finally, one district representative suggested that teachers' contracts include the expectation that they post

lessons and assignments to the LMS on snow days to ensure they are prepared and accountable.

DISCUSSION

The experiences of the educators we engaged in interviews and focus groups indicate there are significant challenges to both online and offline learning in the context of prolonged school closure. Depending on the reason for the prolonged closure, distance learning of *any* type may not be feasible. Depending on the type of emergency, disruptions to housing, electrical service, and employment make all types of distance learning—delivered offline or online—challenging to implement. We are not aware of any public school affected by Hurricane Harvey or Irma that shifted to online learning while school was closed. Instead, all examples of distance learning we identified were asynchronous, somewhat voluntary, and much more limited in their scope of course subjects and hours than a regular school schedule. Our findings suggest that at this time, educators should have modest expectations for distance learning in a major natural disaster.

Each type of distance learning has drawbacks for school closure scenarios. For offline distance learning, the exchange of printed material slows teachers' ability to gauge student understanding and adapt subsequent instruction, and printed material reaches a narrower range of ages and student abilities than online content that can marshal audio, visual, and printed word in combination and with varying degrees of synchronicity. For both offline and online learning, there is a risk that over time, students will become increasingly less engaged. In addition, there is a concern that distance learning is incompatible with state regulations for seat time and mandated hours of instruction and attendance required for funding.

The barriers to delivering online instruction during school closures are also formidable. About 14 percent of children age 3-18 did not have internet access at home as of 2017 and internet access is highly correlated with family income. Only 72 percent of children in the lowest income bracket had high-speed internet service installed at home.[7] Even in schools and school districts with the infrastructure and resources to equip students with computer hardware and high-speed Internet access plus a LMS and online course offerings before an emergency, widespread electrical outages in hurricanes, floods, or earthquakes impede online learning. Further, the policies and infrastructure required for quality online learning require long adoption periods (e.g., for teacher training and preparation), suggesting that schools and districts would have difficulty launching and offering online learning upon the outset of an emergency. Therefore, robust online learning strategies to support continuity of instruction during a disaster are likely to be feasible only for those already offering at least some supplemental online courses and/or blended learning.

Nonetheless, hundreds, if not thousands, of schools experience emergency-related closures each year, most commonly due to weather and natural disasters.[6] And the COVID-19 crisis shows we cannot neglect planning for future school closures due to health crises. Because various kinds of emergencies will continue to cause prolonged school closures and because preemptive school closures, prior to widespread disease transmission, may be recommended to slow disease transmission during a severe influenza pandemic,[8] there is an urgent need to plan ahead for ways to deliver instruction to students using distance learning during emergencies. As school practitioners in our study explained, stopgap measures like static hard-copy assignments or URL

links to isolated online content do not constitute a sequenced course of instruction needed to introduce students to new content. Instead, those stopgap measures are intended to keep some modicum of engagement and can, at best, reinforce concepts previously taught.

For schools to offer online learning in future emergencies, they should proactively focus on building up the capabilities to deliver blended or online learning in routine times and then address ways to overcome new challenges that emergencies are likely to present (e.g., lack of electricity, down server, staff absenteeism). This advice is consistent with the US Department of Education's National Education Technology Plan, which states "to be transformative, educators need to have the knowledge and skills to take full advantage of technology-rich learning environments."[9] That knowledge and skill are difficult to acquire during an emergency.

STRENGTHS AND LIMITATIONS

This study had two primary limitations. First, we did not include the perspective of parents or students. In addition, although we engaged a large number of stakeholders, findings represent the perspectives of focus group and interview participants and may not be generalizable. The strengths included the following: The study engaged a large number of focus group and interview participants, included persons from all 10 Health and Human Services regions of the United States, and assessed a number of distance learning strategies and their applicability to different types of emergencies.

CONCLUSIONS

The potential for online learning in routine and emergency times is strong. As the National Education Technology Plan states, "Technology-enabled learning allows learners to tap resources and expertise anywhere in the world."[9] Adding technology-enabled learning and multimedia communication can help develop collaboration, critical thinking, and complex problem-solving and help to prepare students to excel in the 21st century workforce. There is also early evidence that the personalized learning that online and blended learning courses can provide can improve student academic achievement.[10] And during periods of emergency, online learning has the best ability to approximate the kind of synchronicity and instructional adaptations that face-to-face learning can provide. Given the high rates of adoption of online learning during the COVID-19 crisis, it is likely that schools will integrate online learning to some degree in even regular school times. However, the need for well-developed IT infrastructure, and the likelihood of power and Internet outages, limits the applicability of online learning at this time for all contexts and types of emergencies.

Schools should prepare for future school closures by planning for a range of realistic options like reduced school-day schedules that allow for some face-to-face instruction along with greater remote learning, ways to enroll students in short-term courses that temporarily replace the interrupted courses, and customized online and offline delivery systems that suit a range of student needs. No single distance learning option is likely to work for all students or in all scenarios, but being prepared to offer a variety of instructional modes under different conditions can help bridge long periods of school closure and better support students.

HUMAN SUBJECTS APPROVAL STATEMENT

This study was approved by RAND's Institutional Review Board.

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Appendix

Table 1: Distance learning strategies and barriers to implementation during sustained emergencies

Distance Learning Strategies	Leading Barriers
Strategy 1: Using hard-copy materials or radio and television lectures	• Cost • Difficulty keeping students engaged • Challenges with meeting the needs of different students (e.g., English language learners or students with disabilities) • Limited instructional value because little to no assessment or feedback • Limited capacity to arrange materials into a coherent curriculum • Need for adult supervision while children are at home
Strategy 2: Moving blended (face-to-face and online learning) course content	• Need to convert face-to-face lessons into online lessons and to train teachers to do so

Distance Learning Strategies	Leading Barriers
into fully online courses	• Need for adult supervision while children are at home • Limited IT support and staff to triage technical issues in an emergency
Strategy 3: Providing limited online content to students not currently doing blended learning	• Lack of access to Internet or computer (for staff and students) • Lack of staff and student exposure to online learning • Limited instructional value because little to no assessment and feedback • Limited capacity to arrange materials into a coherent curriculum • Challenges with meeting the needs of different students (e.g., English language learners or students with disabilities) • Lack of teacher preparation • Need for adult supervision while children are at home Limited IT support and staff to triage technical issues in an emergency
Strategy 4: Enrolling students in online credit-bearing courses	• Lack of access to Internet or computer • Need for parental involvement • Challenges with meeting the needs of different students (e.g., English language learners or students with disabilities) • Lack of teacher and parent familiarity with online instruction (if the teacher of record does not change and the same teacher is switching to online instruction) • Cost • Logistical challenges related to start-up of online courses (e.g., enrolling large numbers of students, changing the teacher of record) • Misalignment between online courses and in-person instruction (e.g., may not cover material in the same order) • Limited capacity of existing online courses to absorb new students (e.g., existing online instructor cannot answer questions and

Distance Learning Strategies	Leading Barriers
	provide timely feedback to hundreds of additional students without working additional hours or hiring additional instructors and support staff) • Incompatibility with state funding requirements for school days or hours (seat time) • Limited IT support and staff to triage technical issues in an emergency