Shamir-Inbal et al. *Research and Practice in Technology Enhanced Learning* (2023) 18:38
https://doi.org/10.58459/rptel.2023.18038

Research and Practice in
Technology Enhanced Learning

RESEARCH Free and Open Access

What are the pedagogical characteristics of elementary emergency e-learning? Crosschecking learning activities' analysis with perspectives of teachers, students and parents

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Abstract

This research examined the pedagogical characteristics of emergency online learning in elementary schools. The study adds to the educational technology literature, exploring the opportunities and challenges for students by triangulating analysis of learning activities with perspectives of teachers, students, and parents. Thematic analysis of the interviews with 22 teachers, 21 students, and 10 parents revealed 913 statements grouped into categories and subcategories. Furthermore, 93 learning activities were analyzed based on the recent e-CSAMR framework that combines the SAMR and collaboration models. Participants reported development of student independence, responsibility, and learning autonomy, while adversely mentioned feelings of disconnection and lack of social communication. However, analysis of learning activities reflected mostly basic rather than advanced techno-pedagogical levels of the original SAMR model and revealed that they did not sufficiently incorporate collaborative activities or design of learning artifacts. Theoretical implications supported the e-CSAMR framework and identified optimal components for emergency learning within the framework. The results highlight the need to integrate collaborative learning into distance online learning and suggest that appropriate support and training can transform challenges into pedagogical opportunities.

Keywords: Digital learning, SAMR model, e-CSAMR model, Elementary schools, Emergency remote teaching, COVID-19 pandemic, Teachers, Students, Parents

Introduction

During the COVID-19 pandemic, education systems around the world were required to transition to emergency remote teaching (ERT) in order to enable continuation of teaching,

learning, assessment, and communication processes with students (Hodges et al., 2020). This immediate transition to distance learning posed a challenge to the education system, resulting from the need to integrate distance teaching-learning strategies (Cheng, 2020). Research was quick to differentiate between online learning that had been designed, structured, and researched over the past decade, with ERT and the temporary shift to distance online learning due to a crisis (Hodges et. al, 2020). Schools are now quicker to transition to online learning in situations when previously learning would have been cancelled, as in the case of natural disasters such as heavy snow and hurricanes (Darling-Hammond et al., 2020). Therefore, it is to be expected that ERT will gradually transform into routine online learning (Lockee, 2021; Shamir-Inbal & Blau, 2021a) and as such, the quality of the distance learning should be assessed in order to improve student experience and also teachers' online lesson planning skills when learning via technology. The purpose of the current research was to examine pedagogical characteristics of online learning activities and compare perspectives of teachers, students and parents on ERT in elementary schools.

Literature review

Technology is an integral component of distance online learning. When assessing technology as a tool aimed to improve teaching and learning, it is crucial to understand the added value of technology to the learning process (Blau et al., 2020; Hadad et al., 2020; Kesler et al., 2022). Teachers and students alike use technology for synchronous and asynchronous communication (Blau & Shamir-Inbal, 2017a; Weiser et al., 2018). Students can be referred to a variety of rich, current websites and may interact with the content through web2 tools, promoting active participation and encouraging online dialogue (Shamir-Inbal & Kali, 2009).

Technology integration: SAMR and e-CSAMR models

The SAMR model (Puentedura, 2014) is a commonly used framework for examining the added value of pedagogical and technological integration in learning activities. This model presents four levels of integration: Substitution - in which technology replaces non-digital tools that have been used so far without changing the mode of operation, Augmentation - when technology presents more effective tools in implementing already familiar tasks, Modification - the first stage in a transition from improving existing tasks to a conscious utilization of the unique abilities of technology, and finally, Redefinition - when technology enables new capabilities that were heretofore not possible. The pandemic created a fresh opportunity for teachers to rethink, redesign, and plan their teaching strategies for the digital medium (Lockee, 2021), and the SAMR model is well matched to

measure how these strategies were geared towards successful distance online learning (Bokolo & Noel, 2021; Reedy et al., 2020; Svrcek et al., 2022).

During the first stage of dealing with ERT, student challenges seemed to focus on technical and autonomous learning skills (Chiu, 2021; Francom et al., 2021; Shamir-Inbal & Blau, 2021a). However, as online learning progressed, it became clear that the lack of emotional attachment to teachers and peers was at the core of distance online learning challenges (Chiu, 2021; Zuo et al., 2021). It was to be expected that teachers struggling to hone their technology skills, while transferring instructional strategies from classroom to online, would find the preservation of student contact and collaboration to be a level of complexity above their current abilities (Bergdahl & Nouri, 2020). However, it is the peer communication and peer collaboration that students lacked so intensely during the pandemic.

The importance of collaborative learning has long been recognized as crucial to student well-being and academic achievement (Blau, 2011; Cohen, 1994; Johnson & Johnson, 2018; Rohrbeck et al., 2003; Roseth et al., 2008). Technology has taken collaboration one step forward by enabling flexible timing and location. Accordingly, various platforms that promote online collaboration have been adopted by the educational community in order to enable online learners to continue collaborating effectively with their peers, e.g., Zoom, Microsoft Teams, Google Drive (Shamir-Inbal & Blau, 2016; Weiser et al., 2018).

The updated e-CSAMR (Shamir-Inbal & Blau, 2021b) framework integrates the levels of techno-pedagogical use with three levels of collaborative activities as described in the classic SAMR model. The first level of information sharing constitutes the lowest level of collaboration, in which students build a shared database without continuing to work together on the contents of the shared database. The second level is a division of roles, in which participants work simultaneously or sequentially on building a product and in the end connect all the parts into one common product. Peer feedback and plenary discussion are included at this level. The third and highest level of collaboration is synergistic collaboration that requires simultaneous collaboration between all participants in order to reach a common product. Peer teaching skills are likewise considered as synergistic collaboration. Moreover, the extended e-CSAMR framework introduces pedagogical student-centered components, such as enabling student selection in the learning process, creating activities, product construction, and presentation. The integration of the SAMR model and collaboration levels into a single e-CSAMR framework ensures that online activities are designed according to the highest constructivist values by promoting co-constructive learning outcomes.

Characteristics of online learning: media naturalness and flipped classroom frameworks

During the COVID-19 lockdowns, teachers used various digital platforms based on synchronous and asynchronous learning. An important distinction between face-to-face meetings in class and synchronous communication can be found in the Media Naturalness Theory (Kock, 2005). This theory examines the naturalness of the media according to five criteria: being present in a common physical place, synchronicity, transmitting facial expressions, body language, and natural speech. According to the theory, a synchronous environment that does not involve a common presence in the same space will be weaker in conveying social communication cues since body language is only partially transmitted (Weiser et al., 2018). Yet synchronous learning through videoconferencing is able to provide a relatively high level of media naturalness to class interactive learning (Blau et al., 2017). It also allows for two-way communication through viewing (digital camera), speaking, listening (microphone and headphones), and sharing screens for presentations and teamwork. Such use makes it possible to preserve class instruction similar to that conducted in the regular classroom, in which plenary activities take place as well as individual and group assignments and social activities. However, it seems that the great popularity of the various videoconferencing platforms ignores the fact that synchronous teaching can lead to the application of traditional pedagogical models, in which the teacher is at the center and his role concentrates on knowledge transfer (Weiser et al., 2018). Asynchronous learning is designed to promote students' independent learning, but it lacks a social media dimension. The learning material can be uniform or differentiated and can be learned individually or in collaboration in small groups (Sharma & Kumar, 2017). The role of the teacher in such activities, in addition to designing the activity itself, is to offer guidance in this independent learning process and provide scaffolding to support learning (Avidov-Ungar et al., 2023; Hadad et al., 2021; Kesler et al., 2022; Porat et al., 2023; Yondler & Blau, 2021).

The combination of both synchronous and asynchronous online learning establishes an effective way to make students active partners in the learning process, while maintaining a fairly natural interaction. Such a combination should be maintained in ERT and in routine learning and helps monitor student well-being. One of the models that allows for this type of integration is the redesigned model of flipped learning (Blau & Shamir-Inbal, 2017b). This model presents a range of measures to promote optimal learning processes and learner involvement, while taking into account the various learning locations and their unique opportunities. In this way, asynchronous activity demanding self-regulation learning can take place at home, whereas the teacher can promote active learning, building collaborative knowledge and a learning outcome presentation in synchronous learning.

Parental involvement in distance online learning

The transition to distance learning presented new opportunities and challenges, not only to the teachers, but also to students and parents. Parental involvement was crucial among the younger students in order to maintain learning (Misirli & Ergulec, 2021; Yang et al., 2021), as most younger students were unable to connect online to lessons, follow a timetable, or keep track of the learning. Throughout the distance learning period, parents to some extent took the place of teachers and were required to provide emotional, organizational, and academic assistance to their children. Hence, it was of great importance that during this period, teachers cooperated with parents and developed effective means of communication with parents and students alike (Bubb & Jones, 2020; Shamir-Inbal & Blau, 2021a). Accordingly, in able to fully understand the students' experience it was imperative to examine perspectives of all the different factors involved - teachers, students, and parents. A number of research initiatives focused on student experience through the perspective of school practitioners and parents (Blau & Presser, 2013; Shamir-Inbal & Blau, 2021a; Yang et al., 2021), although, fewer studies investigated the young students' unique point of view (Fiş Erümit, 2021; Manca & Delfino, 2021).

Aims and research questions

The proposed study examined characteristics of online teaching-learning processes that were conducted during the COVID-19 emergency period in grades 1-6 in elementary schools in Israel.

The study examined the following research questions:

1. What were the pedagogical characteristics of online learning activities during ERT?
2. What were the students' opportunities and challenges while engaging with the online learning activities - from the perspectives of the teachers, students, and parents?

Research method

This study was conducted in the mixed method deriving from the qualitative approach allows an in-depth examination of an investigated phenomena. It was combined with the quantitative approach that allowed an exploration of the differences between the participant groups regarding the research phenomena. During the study, we examined learning characteristics of elementary students and their ability to cope with the online learning from different points of view - students, teachers, and parents. The study focused on the pedagogical aspect of distance online learning and did not deal with the organizational and

technological aspects of the various schools, despite the general importance of examining teaching processes and learning in an online environment.

Participants

The study involved 22 elementary homeroom teachers, 21 students from grades 1-6, and 10 parents from a geographically and social-economically diverse sample of elementary schools throughout Israel (see Table 1 for details). The Ministry of Education ethics committee did not approve sampling that involves an explicit connection between the students and teachers participating in the study. The research separated both the teachers and students into two groups - teachers and students of grades 1-3 (age 6-8) and grades 4-6 (age 9-11). This was due to the fact that younger students require additional support, assistance and scaffolding to sustain the remote learning process.

Regarding the participating teachers, the choice of elementary school homeroom teachers arose from the fact that they teach a significant portion of the core subjects and are in closer communication with the students, especially during emergencies. The underrepresentation of male teachers is consistent with their representation in Israeli elementary education. The participant teachers were recruited through teacher social networks and the students and parents - through school websites. The participating teachers all had experienced distance learning during the COVID-19 period and had at least three years of prior teaching experience.

In addition to the teachers, 21 students participated in the study. All students had participated in both synchronous and asynchronous distance learning classes, 11 junior students from grades 1-3 and an additional 10 senior students from grades 4-6. Selecting students who experienced these two modes of distance online learning made it possible to understand how they coped with learning interaction in the synchronous online classroom and what independent learner skills they required for asynchronous activities.

Parents of younger students (6-8 years old) participated in the study together with their children. These parents were active in organizing and facilitating the remote learning and therefore vital to understanding the distance learning processes (Bubb & Jones, 2020). Table 1 summarizes the demographics characteristics of the study participants.

Table 1 Participants' demographics

Population	Grades	Gender division	Participants
Teachers	1-3	Male - 1 Female - 10	11
Teachers	4-6	Male - 0 Female - 11	11
Students	1-3	Male - 5 Female - 6	11
Students	4-6	Male - 4 Female - 6	10
Parents	1-3	Male - 1 Female - 9	10

Research tools and procedure

A call for participation in the study was published on teacher social networks and school websites and contained a link to a Google form. Participants who volunteered to participate in the study provided contact information in order to schedule a virtual interview.

Student participation in the study was subject to the approval of their parents and the consent of the students themselves. As mentioned, students from grades 1-3 were interviewed together with their parents following previous research, in which it was found that parental support is critical to the success of young students' online learning, especially during emergencies (Shamir-Inbal & Blau, 2021b). In other words, parents were perceived to be an integral part of the teaching-learning process in the online environment, whether as an assistant giving technical assistance or as a mediating factor in teacher instruction.

Semi-structured interviews

Semi-structured interviews were conducted with all participants with the goal of attaining a broad and in-depth examination of the set of perceptions and considerations in assimilating technology in the classes. Since the data was collected during the COVID-19 pandemic, the interviews were conducted remotely via the Zoom video conferencing platform. The data was collected by three trained researchers, experienced in qualitative research methods and specialists in educational technology. The interviews with the teachers lasted about 60 minutes and with the students and parents about 30-40 minutes. In the interviews teachers were asked to present various learning activities they used during that period, as well as to specify who designed these activities. In addition, they were asked about students' ability to cope with these learning activities.

Students were requested to report how they learned during this period and to describe lessons that were particularly experiential and interesting for them. The students described difficulties they encountered and how they faced these challenges. As mentioned, the interviews with the junior students were conducted together with their parents, while senior students were interviewed alone. During the interviews of the junior students with their parents, parents were asked to describe the benefits and challenges their children faced during the distance online learning and how they coped.

The coding was conducted by two qualified researchers who specialize in qualitative research and learning technologies. For the analysis each participant was given a code to ensure anonymity. The code referred to the participant's group and serial number in the sequence of interviews. A grade 1-3 teacher was coded as TJ (Teacher of Junior students), grade 4-6 teachers as TS (Teacher of Senior students), students in grades 1-3 as JS (Junior Students), grade 4-6 students as SS (Senior Students) and Parents as P (Parents).

The statements collected in the various interviews were analyzed bottom-up and grouped into two main categories of opportunities (N = 426) and challenges (N = 487). Each category was divided into subcategories according to the thematic analysis as presented in Table 6 and Table 7. To test the inter-rater reliability, 25% of the statements were recoded by a second rater and a high level of agreement was found (Cohen's Kappa = 0.84). Each discrepancy was discussed among the raters until resolved. Triangulation between the perspectives of three different stakeholders (teachers, students and parents) offered unique insights into the teaching and learning processes.

Additionally, a Chi-square goodness of fit analysis was performed to examine the significance of differences in the frequency of teachers, students and parents interview statements, as a function of the students' age.

Online learning activities

In order to broaden the understanding of what is actually happening in the various study groups, teachers were asked to present online synchronous and asynchronous learning activities that they performed in ERT. During the interviews, teachers presented detailed examples of learning activities they conducted during distance learning, explained the process of the activity, described the tools they used to interact with their students, and demonstrated student outcomes. The analysis of the online activities presented by the participants made it possible to establish the pedagogical design that the teachers actually used in the ERT period. These teaching activities addressed a variety of fields of knowledge as described in Table 2.

The analysis of the activities was performed in three stages according to the e-CSAMR framework described above (Shamir-Inbal & Blau, 2021b). In the first stage, the activities were mapped out according to the four SAMR levels. In the second stage, the activities were analyzed according to the e-CSAMR collaborative levels used during the online instruction. In the third stage, additional parameters were examined, such as students' independent control and choice over the learning process and outcome, the level of multidisciplinary learning, and the nature of the learning artifact that students needed to prepare.

Table 2 Teaching activities analyzed by a variety of disciplines

Areas of knowledge	Activities grades 1-3 (N = 50)	Activities grades 4-6 (N = 40)
Science and Environment	2	1
Math	7	13
Hebrew Language	14	4
Culture and Heritage	10	10
Social Emotional Sessions	17	10
History and Geography	-	2

Findings

The first research question dealt with online activities conducted in distance learning. A total of 93 learning activities were analyzed, 53 of which were activities for grades 1-3 and 40 activities for grades 4-6.

Levels of technology use according to the SAMR model

The study analyzed the learning activities according to the four levels of the SAMR model - Substitution, Augmentation, Modification, and Redefinition - to establish the added value of technology to the pedagogy. Additionally, a Chi-square goodness of fit analysis was performed with the purpose of examining the significance of the differences in frequency of activities in each SAMR level between the two age groups. These findings are presented in Table 3.

From the summary table of the activity analysis, it appears that the use of technology value in favor of advancing pedagogy according to the SAMR model is low. The analysis shows that in most of the activities, the technology tools had been adapted to traditional

Table 3 Level of technology use according to SAMR model (N = 93)

Subcategory	Activities grades 1-3 (N = 53)	Activities grades 4-6 (N = 40)	Representative statements
Substitution (N = 55, 60%)	**37**	18	"We learned how to write a recommendation. Students wrote (in our LMS tool - Google Classroom) a recommendation for a book or a trip according to their choice. Then I chose some of these recommendations to display on the Zoom screen. Together we checked, according to the rubric, if all the elements of recommendation were written, and then we thought together what we could add or delete from these recommendations." (TS8)
	X^2 (1) = 7.142, p = .008		
Augmentation (N = 30, 30%)	13	17	"When we learned one of the vowels, I showed them a picture of an island, because it is the sound of the vowel. I asked what each student would take with him to a desert island, but it had to contain the vowel that we learned. They could write, draw a picture, or photograph anything they wanted to take with them to the island." (TJ1)
	X^2 (1) =. 862, p = .353		
Modification (N = 8, 10%)	3	5	"We started working with a thought organizer tool. Then I asked the students to assume the holiday was a person and what they would ask him. I wrote the questions they asked on a white board. Later I gave them a task of searching for information on the internet to look for answers to the questions we asked earlier. At the end, using a collaborative Padlet board, they wrote five new things they had learned on this subject." (TJ10)
	X^2 (1) = .042, p = .527		
Redefinition (N = 0, 0%)	0	0	

remote work, so that their use did not constitute a change in teaching methods and did not indicate a significant use of technology for improving pedagogy. Teachers seemed to continue using traditional teaching strategies, even though they were using digital tools (Kock, 2005), just as they were accustomed to in their face-to-face classroom. In activities designated for grades 4-6, significantly fewer Substitution (lower-ranking) tasks and more Augmentation or Modification tasks (intermediate levels) were found. No Redefinition activity was found in either age group.

Levels of collaboration based on the e-CSAMR model

The level of collaboration in the learning activities was examined on a scale of three levels of collaboration according to the e-CSAMR framework (Knowledge Sharing, Cooperation, and Collaboration). A zero level was used in the analysis to map activities in which there was no collaboration at all. Additionally, a Chi-square goodness of fit analysis was conducted with the purpose of examining the significance of the differences in frequency of activities in each collaboration level between the two age groups. Table 4 presents the teachers' activities according to the collaborative hierarchy, Chi-square test results according to the different age groups, and a descriptive example of the activity.

The table shows that a large number of analyzed activities (42%) in the younger classes did not contain any components of collaborative learning compared to the older classes. In the older classes, the beginnings of collaborative elements were detected, especially at the level of cooperation in building a common database in which participants worked simultaneously on different parts of a task.

The most prominent strategy found was a whole classroom debate. It should be noted that no activities were demonstrated that showed collaborative sequencing, and no peer feedback activities were found. However, there were a few activities found that implemented a high level of collaboration within the framework of synergistic collaboration and peer teaching. The activities mapped as peer teaching implementations mostly included social activities in which a student shared a personal topic but did not touch on the current curriculum.

Additional teaching characteristics

Additional pedagogical parameters of online instruction emerged while analyzing the learning activities in accordance with the extended e-CSAMR framework. These parameters were: student choice, multidisciplinary learning, and the type of learning artifact (Table 5). These dimensions enriched the understanding of the teachers' activities design. A Chi-square goodness of fit analysis was conducted with the purpose of examining the significance of the differences in frequency of parameters between the two age groups.

Table 4 Level of collaboration in learning activities (N = 93)

Collaboration level	Type of collaboration	Activities grades 1-3 (N = 53)	Activities grades 4-6 (N = 40)	Representative statements
No collaboration (N = 39, 42%)	No online collaboration	**26**	13	
		X^2 (1) = 4.33, **p = .037**		
Knowledge Sharing (N = 12, 12%)	Knowledge sharing - building a common database	5	7	"I sent them to search the net for information about Indians, and they wrote all sorts of things they learned about them on a Padlet board. I asked them to collect special things, like legends, stories, things that would interest us, and they gathered information and shared it with the class." (TS4)
		X^2 (1) = .333, p = .564		
Cooperation (N = 35, 36%)	Parallel cooperation	4	8	"I let them work in Zoom breakout rooms in heterogeneous groups of 3-4 children in a group. For example, in a language lesson I gave them an assignment where all four children had to create a class activity reviewing the learning content. At the end we all met on Zoom and each group presented what they had done." (TJ6)
		X^2 (1) = 1.333, p = .248		
	Sequential cooperation	0	0	
	Peer feedback	0	0	
	Whole-class debate	15	8	"We talked about the issue of 'responsibility'. I posed a question for discussion - What am I responsible for? I asked them to think about things they take responsibility for and how they can increase their responsibilities at home ... They shared their answers in the virtual plenum." (TJ11)
		X^2 (1) = 2.130, p = .144		
Collaboration (N = 10, 10%)	Synergistic collaboration	0	1	"Tomorrow we have a lesson in which they will have to write questions. I'll divide them into groups, each group will get a section, and together they will write as many questions on the subject as possible." (TS1)
	Peer instruction	4	5	"In the summary of a book we read, each child had to choose something from the book - a topic or event - and teach it to the class in the virtual classroom." (TS9)

Table 5 Characteristics of learning activities

Category	Activities Grades 1-3 (N = 53)	Activities Grades 4-6 (N = 40)	Chi-square test
Student choice/ Student control over Learning Process and Outcome			
Lesson topic choice/ artifact topic choice/ artifact medium choice	12	13	X^2 (1) = .691, p = .406
No choice	41	27	X^2 (1) =. 129, p = .719
Multidisciplinary Learning			
Multidisciplinary - yes	2	0	-
Multidisciplinary - no	51	40	X^2 (1) = .103, p = .747
Character of Artifact			
Writing in a printed workbook	8	8	X^2 (1) =. 253, p = .614
Practice in a digital system	4	3	-
Free writing	7	3	-
Preparing a lesson for peers	7	5	X^2 (1) = .021, p = .884
Creative artifact	13	6	X^2 (1) = 1.143, p = .285
Digital research	1	5	-
Digital recording	3	0	-
No artifact	11	10	X^2 (1) = .127, p = .721

The table shows that distance online learning maintained instruction per subject, so that almost no lessons were observed implementing multidisciplinary instruction. It also appears that in most activities the student did not have any control over the learning process or artifact outcome as they had no choice regarding the lesson topic, artifact topic, or the artifact medium. Regarding the construction of learning artifacts, it seems that in a large proportion of activities no artifacts were required at all. When any learning artifacts were required, they mostly resulted from standard tasks performed in the textbooks. It should be noted, however, that when younger students were asked to create an artifact, it tended to be more creative and open-ended.

Students' coping with distance learning tasks: opportunities

To answer the question of how students cope with distance learning activities we mapped the opportunities and challenges that arose from experiencing ERT learning and how students, teachers, and parents who participated in this study perceived these opportunities and challenges.

The students and parents reported opportunities that students experienced during the distance learning period, whether these were emotional, academic, or social opportunities. It is interesting to note that teachers did not report any student related opportunities in distance learning, although this may be due to the many challenges that the teachers experienced. Table 6 shows the various opportunities and strengths that students and parents described as a result of online learning during this period. There were 426 statements in this category: 263 student statements and 163 parent statements. In order to examine the significance of the differences in the number of statements observed between

the total number of students and parents according to their frequency in the study, a Chi-square goodness of fit test was conducted. Table 6 presents these findings.

The table shows that most of the statements referring to learning opportunities relate to different aspects of independent learning with an emphasis on developing personal

Table 6 Student opportunities as perceived by students and parents (N = 426)

Subcategory	Student statements grades 1-3 (N = 118)	Student statements grades 4-6 (N = 145)	Total student statements grades 1-6 (N = 263)	Total parent statements grades 1-3 (N = 163)
Development of personal responsibility for learning and personal planning (N = 128, 30%)	33	41	**74**	54
			X^2 (1) = 4.515, p = .034	
	"After English class I can take a short break, and then I have a math lesson. Both are on Zoom, so I can choose if I want to do the tasks or wait until later, because we can submit assignments until 7:00 p.m." (SS1)			
Strengthening the relationship with the teacher who is available to help (N = 97, 27%)	40	33	**73**	24
			X^2 (1) = 3.22, p = .073	
	"Sometimes the teacher calls me. When I was in lockdown, she called to see how I was and gave me all the study assignments." (SJ6)			
Strengthening parental involvement (N = 68, 19%)	12	15	27	**41**
			X^2 (1) = 22.242, p < .001	
	"I sent the teacher the exercise pages I completed in my textbook on WhatsApp using my mom's phone. The teacher sent back a message that it was good work. But it's my mother that checks my homework first." (JS1)			
Active participation task performance and experiential learning (N = 66, 14%)	40	33	**73**	24
			X^2 (1) = 24,613, p < .001	
	"In science we learned about the senses. For the sense of sight, for example, students were asked to make an artifact out of a cardboard box that would look like binoculars and to make a small hole in it. They put various items inside, opened and closed the hole, and checked what they saw. This was an experiential activity for them." (P1)			
Helping colleagues and keeping in touch with friends (N = 33, 7%)	9	21	**30**	3
			X^2 (1) = 8.727, p = .003	
	"Sometimes in the morning Zoom session we talked and when it was over we did not close the Zoom and kept talking." (JS9)			
A sense of learning and success, development of reflective thinking (N = 30, 6%)	12	18	30	0
	"I felt like I was the only one answering the teacher's questions, but I thought the questions were relatively easy. Even though it was a bit embarrassing that I was the only one that answered, I had a fun experience and I felt really good about it." (JS8)			
Students helping the teacher (N = 4, 1%)	0	4	4	0
	"Sometimes a student asked a question, and the teacher didn't understand the question, so other students tried to help and explain what he didn't understand. Thus, the students helped the teacher throughout the lesson." (SS4)			

* Notes: [1] The test was not performed in cells that did not meet the basic assumptions and test conditions. [2] The test was performed on the total frequency of student statements in grades 1-6 compared to the total parental statements according to their relative prevalence in the sample.

responsibility, a sense of learning and achievement, and reflective thinking. Parents rated this at the top of the opportunities with a significant difference from the students' reports. The students, for their part, emphasized the connection with the teacher. They referred to the fact that the teacher called them, wrote messages to them, and answered their questions on WhatsApp. It is clear that this communication was highly meaningful for them. Fourth and sixth grade students attached greater importance to keeping in touch with friends, as well as the value of peer learning. On the other hand, few statements of grade 1-3 students and their parents were found in this subcategory, perhaps due to the young age of the learners.

Students' coping with distance learning tasks: challenges

Teachers, students, and parents also reported the challenges they encountered during the distance online learning period, whether academic or social-emotional challenges. Table 7 shows the challenges students encountered in the learning during this period. There were 487 statements in this category: 195 teacher statements, 226 student statements, and 66 parent statements. In order to examine the significance of the differences in the number of statements observed between the total number of teachers, students, and parents according to their frequency in the study, a Chi-square goodness of fit test was performed as shown in Table 7.

It can be seen from Table 7 that most of the statements about student challenges arose from the student and teacher reports and fewer from the parent statements. The most common challenge was dysfunction and disconnection due to the physical distance from the classroom and the teacher. The teachers defined this as the most difficult challenge compared to the students and parents. Another inhibiting factor was difficulty in understanding the lesson material, which was probably related to the physical disconnection and the decrease in the level of media naturalness (Kock, 2005). These difficulties were mainly expressed among the students compared to the teachers and parents and may explain the disconnection and fatigue that teachers experienced from the other side of the camera. In addition, inhibiting factors were reported in the students' daily conduct, such as independent learning, maintaining a clear framework for studies, and discipline problems. In this subcategory, equal reporting emerged between the three different participant groups - teachers, students, and parents. These challenges manifested themselves mostly through difficulty getting out of bed, connecting to class on time, and submitting their assignments on time. Also, in the subcategory of difficulty in exposure and self-participation there was full agreement among all groups of participants. Students in both age groups voiced complaints about lack of social communication and peer learning.

Table 7 Student challenges according to the perceptions of teachers, students, and parents (N = 487)

Subcategory	Teacher statements grades 1-3 (N = 116)	Teacher statements grades 4-6 (N = 79)	Student statements grades 1-3 (N = 80)	Student statements grades 4-6 (N = 146)	Total teacher statements grades 1-6 (N = 195)	Total student statements grades 1-6 (N = 226)	Total parent statements grades 1-3 (N = 66)
Feeling of dysfunction and disconnection (Zoom boredom) (N = 155, 24%)	48	36	11	12	**104**	23	8
	X^2 (2) = 1.714, p = .180		X^2 (2) = .191, p = .662			X^2 (2) = 49.124, **p < .001**	
	"I do not like distance learning, because I need to switch on the camera and only see the teacher as a small picture. It is more difficult for me to see, hear, and learn from a distance. Sometimes my computer gets stuck, and this is really hard." (JS5)						
Difficulty in understanding (N = 98, 20%)	16	12	12	**45**	28	**57**	13
	X^2 (2) = .571, p = .450		X^2 (2) = 22.42, **p < .001**			X^2 (2) = 18.85, **p < .001**	
	"For example, I explained a math exercise by using a story about picking apples. I actually did this with illustrations of the apples being picked from the tree, but the students did not understand what I wanted from them." (TJ11)						
Difficulty in self-management (N = 74, 15%)	15	14	15	18	29	33	12
	X^2 (2) = .034, p = .853		X^2 (2) = .634. p = .426			X^2 (2) = .932, p = .627	
	"Every time before the start of a class, sometimes it's three or four times a day, I call or send a message from work to one of her older brothers that she has a Zoom class. She does not need help in learning, but the matter of keeping to the schedule is very difficult." (P6)						
Difficulty in exposure and participation in Zoom (N = 68, 14%)	6	**14**	14	16	20	30	18
	X^2 (2) = 3.2, **p = .074**		X^2 (2) = .392, p = .531			X^2 (2) = 3.617, p = .164	
	"Even though the teacher asks to turn on the camera, I don't turn it on." (JS3)						
Lack of social communication and peer learning (N = 38, 8%)	0	0	12	**24**	0	**36**	2
	-		X^2 (2) = 5.23, **p = .022**			X^2 (2) = 47.78, **p < .001**	
	"My son doesn't have a phone. His other friends do, so they connect with one another, but he can't. There's only one friend here in the neighborhood that he can meet with. He really misses friends. I would be happy if there were more opportunities to create social activities through Zoom." (P3)						
Technology difficulties (N = 33.7%)	4	2	11	14	6	**25**	4
	-		X^2 (2) = .704, p = .401			X^2 (2) = 17.78, **p < .001**	
	"There is a student whose technology situation is really complex, also for his parents. They aren't able to help at all, so I make sure to send him all the assignments, both on WhatsApp and as a PDF file that he can download and get into." (TJ6)						
Need for parental support (N = 23, 5%)	**14**	0	6	3	14	9	9
	X^2 (2) = 14, **p < .001**		-			X^2 (2) = 2.29, p = .317	
	"One of us usually helps her. From the very beginning we connect together for the meeting and throughout the class we are available to her for all kinds of technical matters or situations where she needs our help, even beyond things that happen directly in class." (P10)						
Confusion between home and school (N = 23, 5%)	**9**	3	5	6	**12**	**11**	**0**
	X^2 (2) = 3, **p = .083**		X^2 (2) = .211, p = .646			X^2 (2) = 5.80, **p = .055**	
	"For example, I had a student who was just embarrassed to be seen in his room, embarrassed for us to see all sorts of his personal things, but in the end we solved the problem and he cooperated with us." (TS5)						
Student overload (N = 15.3%)	4	0	0	**11**	4	**11**	0
	-		X^2 (2) = 12.1, **p = .001**			X^2 (2) = 7.83, **p = .020**	
	"I had to type something and did not do it, because I had so many tasks at this time and just couldn't do it." (SS7)						

* Notes: [1] The test was not performed in cells that did not meet the basic assumptions and test conditions. [2] The test was performed on the total frequency of student statements in grades 1-6 compared to the total parent statements according to their relative prevalence in the sample.

It is interesting that this claim was not reflected by teachers and significantly very little among parents. Teachers and parents may not have been aware of the lack of social and academic-social contact for students. It is possible that if teachers had performed more collaborative learning activities this difficulty would have been reduced. Regarding technological difficulties, here too the students clearly reported more difficulties compared to the teachers and parents, who reported very little on the subject. On the other hand, it was clear to everyone that parental support was needed, especially when it came to helping younger students. When students reported home-to-school mixing, they referred to the fact that they had difficulty disconnecting themselves from home conduct and switching to a learning mode. Here there was also a significant difference between student statements and statements from teachers and parents, who barely addressed this issue. Finally, the students stated a learning overload that neither the teachers nor the parents seemed to be aware of.

Discussion

This research analyzed learning activities carried out over the emergency distance learning during the COVID-19 pandemic and their impact on the students from the perspectives of three stakeholders involved in the distance learning - teachers, students, and parents.

Opportunities and challenges: teachers, students and parents' perspectives

The research examined the students' opportunities and challenges during the online learning period from the perspectives of the participants. These perspectives were crosschecked with the pedagogical characteristics of the learning activities according to the e-CSAMR framework (Shamir-Inbal & Blau, 2021a). The discussion merges the findings from both research questions and, in this manner, it is possible to show how the pedagogical characteristics of the learning activities had an impact on the students' overall learning experience. Moreover, the students' experience served as a window into their learning and social and emotional needs while learning remotely (Chiu, 2021; Ewing & Cooper, 2021). These must be considered when planning future pedagogical activities - both in emergency and in routine learning.

The three different participant perspectives in this study - teachers, students, and parents, afforded a clear and comprehensive picture of the opportunities and challenges in distance learning. This is similar to previous research which found that each group viewed the distance learning in a different manner (Bubb & Jones, 2020). For example, the teachers in our study could identify student challenges only, but no opportunities. The students, on the other hand, reported similar numbers of opportunities and challenges, while parents mentioned significantly more opportunities than challenges (see Table 6 and Table 7). The discrepancy between the groups is interesting and can be interpreted as such that the teachers themselves, being physically separated from the students, were mainly aware of

the challenges the separation entailed; although the students, who experienced distance online learning up close, and their parents were in a better position to assess both the opportunities and the challenges. Indeed, one of the major opportunities that both students and parents cited was the teachers' availability to answer questions and help them with the learning, indicating that teachers' efforts to deal with the challenge of the physical disconnection from the students were much needed and appreciated by both students and parents (Bubb & Jones, 2020; Misirli & Ergulec, 2021). Another example of the teachers' awareness of the physical disconnection was the high proportion of social and emotional activities (Table 2) when synchronous meetings became a unique time frame in which the students interacted with each other. This will be referred to later in this paper.

Learning activities analysis according to e-CSAMR

The findings showed that most pedagogical activities designed for remote teaching were ranked low on the SAMR model (see Table 3). The situation in the senior grades was only slightly better than the junior grades, as there were more activities on the Augmentation level. However, activities on both lower levels of the SAMR indicate that teachers tended to transfer traditional pedagogies used in the face-to-face classroom to the digital environment without realizing the potential added value of technology in online learning. The scarcity of learning activities on SAMR Modification and Redefinition levels could be attributed to the teachers' lack of skills and experience in planning online digital activities or to insufficient planning time (Hodges et al., 2020; Kong, 2020).

Additionally, as shown in the collaboration analysis (see Table 4), most activities had no component of collaboration. Among the activities that did encourage collaboration, the most common type of collaboration was whole class discussion coordinated and led by the teacher, which is consistent with previous research findings (Bergdhahl & Nouri, 2021; Rannastu-Avalos & Siimin, 2020). The reference to collaborative work was echoed by students in both the opportunities and challenges of distance online learning, as students reported that online activity enabled them to keep in touch with their classmates and teachers. Nevertheless, those same students concurrently reported a lack of social communication and peer learning. It seems that, though the online communication had the potential to enable social interactions, it did not succeed in fulfilling students' needs (Chiu, 2021), nor did it necessarily entail a high amount of student engagement (Shamir-Inbal & Blau, 2021b; Ewing & Cooper, 2021). Interestingly, the teachers did not refer to the effect the reduction in social learning during ERT had over the students. Similarly, parents scarcely addressed this issue. This might offer a partial explanation of the finding regarding their low level of collaborative activity. The additional activity characteristics analysis afforded a deeper look into the different aspects of student control and ownership over the learning process and showed that in most activities students had no control or choice over

the learning outcome (68 activities out of 93, see Table 5). Moreover, a relatively high number of activities demanded no learning artifact whatsoever. Learning artifacts constitute a central and important pedagogical component in designing constructivist teaching processes (21 out of 93; see Table 5) (Kesler et al., 2022; Shamir-Inbal & Kali, 2009). However, it is important to note that most of the activities that required no artifact were social and emotional activities based on an open discussion and dialogue, and it is possible that following this they did not necessitate the production of a tangible artifact. The findings above compose a picture of instructional activities done during the emergency learning period that are relatively low in cooperative learning skills, student ownership, and control. All these skills, which are considered essential 21st century learning skills (Chalkiadaki, 2018; P21, 2019; Trilling & Fadel, 2009), have become fundamental to the success of distance online learning as students are physically detached from the school and teachers and are forced to take a more central and independent role in the learning process (Christensen & Alexander, 2020; Latorre-Cosculluela et al., 2021).

Media naturalness influence on the opportunities and challenges

Although distance synchronous sessions through videoconferencing platforms such as Zoom or Microsoft Teams are considered high in media naturalness (Blau et al., 2017; Kock, 2005), this precisely constitutes a problem in that it encourages teachers to unconsciously continue class instruction using similar strategies to routine face-to-face learning (Weiser et al. 2018). However, synchronous learning is far from being equivalent to face-to-face classroom learning. During periods when students are isolated in their homes, not communicating easily with their peers or studying in a common physical space with them, a general decline in learning quality is expected due to the lower level of media naturalness (Blau et al., 2017; Kock, 2005). The findings from the student challenges as reported by teachers, students, and parents corroborated this, as all three participant groups reported strong feelings of student dysfunction and disconnection, as well as difficulty in understanding lesson content (see Table 7). On the other hand, both students and parents reported that a major opportunity afforded by this same disconnection was the development of student independence, responsibility, and autonomy in their learning. This is consistent with findings from previous research emphasizing the development of students' autonomous learning and digital literacy during ERT (Chiu, 2021). In this way, we can see how the same attribute of distance learning may simultaneously lead to both opportunities and challenges, depending on the angle from which we are examining it. Perceiving the ERT experience on the scale from challenge to opportunity, as described by teachers, students, and parents, is presented in Figure 1.

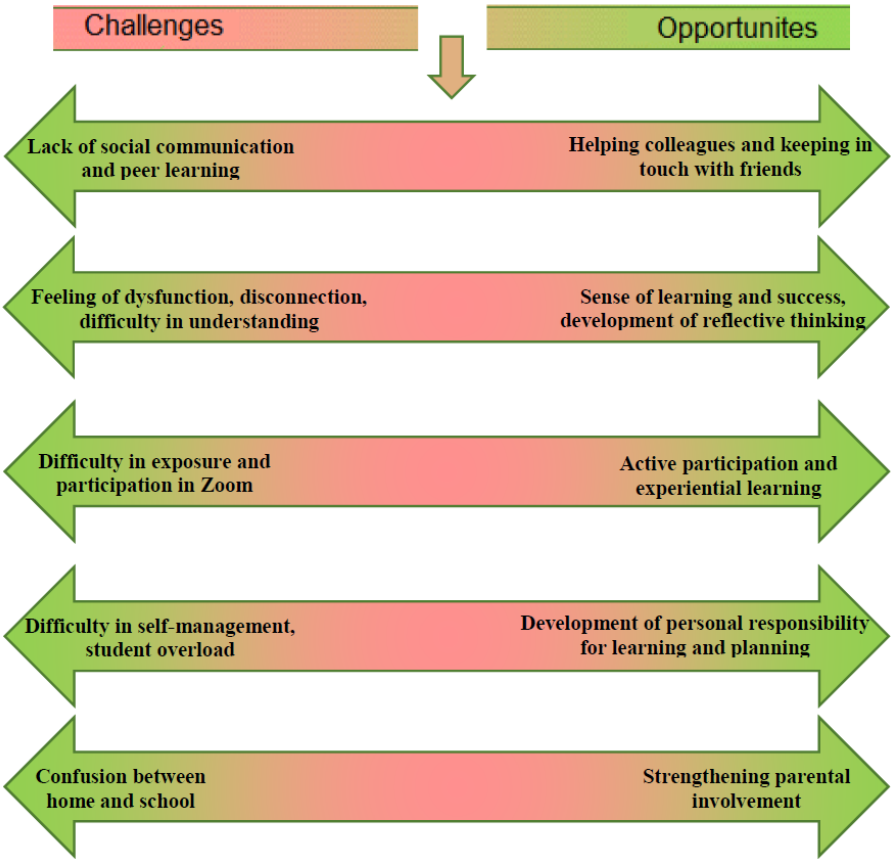

Fig. 1 Categories related to in both opportunities and challenges

As presented in Figure 1, the opportunities and the challenges can be viewed as a continuous sequence. The same issue can be perceived as a challenge, but with the appropriate training and support it can be transformed into an opportunity. In this way, when students are experiencing a lack of social communication and peer learning, once the teacher is able to incorporate collaborative and peer learning into the curriculum this might transform into an opportunity. Adversely, if an opportunity is not recognized and maintained, it can transform into a challenge as in the case of development of personal responsibility and planning versus an overload of work.

Optimal distance online learning

In light of these findings, in order to maintain successful and optimal online learning, especially in emergency time, technology integration must aim to attain the higher levels of the SAMR model combined with the higher levels of student collaboration levels and students' task performance. Figure 2 presents the essential components of online emergency learning that emerged from the research according to the e-CSAMR framework as detailed above.

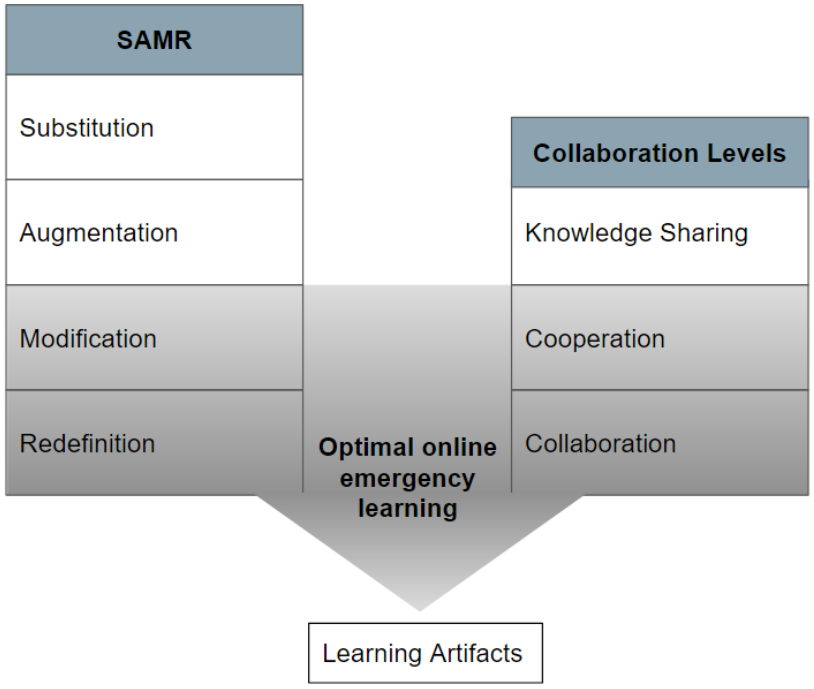

Fig. 2 Optimal components in routine or emergency online learning based on the e-CSAMR model

As Figure 2 demonstrates, teachers are encouraged to utilize technology in a manner that will enhance learning and exploit the digital medium to its maximum potential in order to improve pedagogy. Likewise, learning activities should include group synchronous and asynchronous collaboration, as well as more creative and independent learning outcomes.

It is possible that one of the main obstacles to the implementation of high-quality technology is a lack of adequate training (Ertmer & Ottenbreit-Leftwich, 2013; Redmond et al., 2021). Although, even in a situation where teachers have been trained to implement high-level technology, the difference between using technology during routine versus emergency time is significant. In routine teaching, learning conditions are known to a certain extent, and there is usually ample time to plan learning activities. In emergencies, teachers are working under pressure, the spaces are less familiar to them, and there is only partial control over the learners (Hodges et al., 2020). In order to enable teachers to take advantage of the added value of technology and improve pedagogy, it is recommended to create diverse frameworks for teacher training which include collaboration. These frameworks will direct teachers to techno-pedagogical implementation adapted to the higher levels of SAMR, including collaborative learning, knowledge construction, independent inquiry, and meaningful student creation as suggested in the extended e-CSAMR framework. When instruction is geared towards the development and growth of independent flexible learning skills, these skills, when mastered, will be applied to the

learning process in the various contexts, whether they be home or classroom, routine or emergency time (Chalkiadaki, 2018; P21, 2019). The redesigned model of flipped learning (Blau & Shamir-Inbal, 2017b) concentrates on the characteristics of optimal pedagogy in the digital space and thus constitutes a suitable model for the planning and guidance of teacher training. Additionally, the models map out the affordances of the various learning spaces and the activities best applied to each space. As part of these training programs, it is advisable to ensure that teachers are provided with sufficient time to plan optimal teaching activities as defined in the model, whether the planning will be carried out individually or in groups with fellow teachers.

Conclusions, limitations, and future directions

The aim of the study was to examine characteristics of online teaching-learning processes that were conducted during the ERT in elementary schools through the perspectives of teachers, students and parents. The findings from the study showed that the quality level of technology integration in the emergency learning period was relatively low, and there was insufficient use of collaborative learning activities among students. Both opportunities and challenges reported by the participants focused on similar issues of autonomous and independent learning and on social and collaborative learning.

In the study, the e-CSAMR framework revealed the pedagogical characteristics of online ERT. Additionally, the findings contribute to the characterization of online pedagogy in primary schools adapted to emergency learning conditions and to the understanding of the potential to enhance online learning, both in routine and ERT. Analyzing the pedagogical design of teaching activities resulting from existing teacher practices can, on the one hand, illuminate optimal strategies that exist in the field of practice and, on the other hand, help identify and define a gap between a desired and current situation. With appropriate professional development programs teachers will be able to plan quality online learning activities that utilize the pedagogical opportunities that technology offers. Through this research it will also be possible to focus education policy makers' demands on teaching staff, to adjust quality instructional content networks, to strengthen school-home communication, and create customized professional development programs for teachers.

This research examined the characteristics of online pedagogical activities during emergency learning. However, the research did not compare ERT to routine teaching, which could potentially highlight the characteristics that emerged from the emergency situation itself in comparison to those that arose due to insufficient technological-pedagogical knowledge and training among the teachers. Future studies can compare routine and emergency learning in order to emphasize the source of the characteristics found in this study. Additionally, it is recommended to examine the various e-CSAMR model components of SAMR and collaborative levels and learning artifacts, not only

through the eyes of the teachers but also directly in the classroom through observations and artifact analysis.

Abbreviations
e-CSAMR: Electronic Collaboration Substitution Augmentation Modification Redefinition; ERT: Emergency Remote Learning.

Acknowledgements
This paper presents partial results of a study that was supported by the Chief Scientist Foundation, Israeli Ministry of Education. The grant recipients were Prof. Ina Blau, Dr. Tamar Shamir-Inbal and Esti Schwartz. The grant recipients are thankful to all the post-doctoral fellows, graduate students, and research assistants who worked on this project. The authors specially thank Dr. Shlomit Haddad, Ms. Orit Avdiel and Ms. Talia Or-Griff for contributing to the data analysis presented in this paper.

Authors' contributions
TSI was responsible for conceptualization, funding acquisition, project administration, supervision, methodology, interpretation of data, project administration, interpretation of data and writing—original draft, and review of the manuscript, and contributed to editing of the manuscript. ES was responsible for data curation, formal analysis and investigation, interpretation of data and writing—original draft, and contributed to editing of the manuscript. IB was responsible for conceptualization, funding acquisition, supervision, methodology, interpretation of data, review of the manuscript, and contributed to editing of the manuscript. All authors had full access to all data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis and validation. All authors read and approved the final manuscript.

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Funding
This research was supported by the Chief Scientist Foundation, Israeli Ministry of Education.

Availability of data and materials
The data [in Hebrew] are available from the corresponding author upon request.

Declarations

Ethics approval
Ethical approval has been granted by the institutional Ethics Committee and the Chief Scientist Foundation, Israeli Ministry of Education.

Competing interests
The authors declare that they have no known competing financial interests or personal relationships that could potentially influence the work reported in this paper.

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Received: 1 August 2022 Accepted: 11 February 2023
Published online: 8 March 2023

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