

Thematic Article

Pandemic and Education

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Abstract

The emergence and rapid spread of the Coronavirus in the spring of 2020 has fundamentally changed our lives. The most important change has been the attempt to minimise face-to-face contacts everywhere in order to keep the epidemic under control. Public gatherings were banned, shopping malls were closed, and sporting events were also cancelled. As COVID-19 spread as easily among children as among adults, schools could not escape the restrictions. During the first wave of the epidemic, institutions had to switch to emergency remote education (ERE) at very short notice, which presented a number of problems for all participants. These problems and experiences of the switch should be collected at all levels of education, as they not only help to prepare for similar situations, but may also lead to conclusions that can be used to make the methods and solutions of classroom-based teaching more motivating, more effective or even more efficient. In this paper, we review both the challenges of the transition and the possible implications for the future teaching-learning process by reflecting on the lessons learned.

Keywords: COVID-19; pandemic; education; emergency remote education

Introduction

The constantly evolving products and solutions of digital technology cause many problems and often provoke debates in society (Goldin et al., 2008), but their presence in the educational process is almost unquestioned today (Piccianon, 2019). Indeed, for young people growing up in the 21st century, ICT and the Internet are now clearly part of the education system, and most institutions (notably higher education) are unimaginable without digital technology (Nichols, 2020). In fact, the emergence of modern tools in schools started decades ago, but despite the permanent digitalisation of education, there has been no significant change in the way lessons are taught. Digital tools are already present in most classrooms, but their use is primarily to facilitate the work of teachers. However, they are not always accompanied by methodological innovation. Despite the modern tools, pupils often experience lessons in the same way (passively, not necessarily thinking) as before, but with digital support. We can only talk about real change, when designing and applying new types of activities (e. g. creative, teamwork-based tasks, instead of spectacular but only apparent changes) become a priority for the teacher. This is the only way to transform teacher-centred education (Learning 1.0), designed for passive, knowledge-consuming learners, into a learner-centred learning process (Learning 2.0) based on social and collaborative work. Technology should therefore enable learners to become active participants in their learning process by building knowledge. For example, they should be asked to produce a multimedia-based product instead of a paper, or to present a project using a collaborative platform, preferably with animations and videos, not as individuals but as a team.

In parallel to the slow evolution of contact classes, there was also an increasing demand from learners to access educational content online. However, there hasn't been much change in this area, as a completely digital education does not really fit into the narrow framework of the traditional education. This is the reason why it is hard to find examples of e-learning-based training or at least the integration of e-learning solutions into the educational process in public education institutions and in higher education institutions before 2020. In fact, in

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those institutions where some kind of e-learning framework was available, mostly served as a kind of "repository" (Erdős et al., 2016), where instructors merely provided access to traditional learning materials (e. g. notes, slides) for students.

As a result, the digital shift in education – which was often missing but in fact it was represented by very few teachers and professionals – took place with very little experience in the spring 2020. School closures have affected huge numbers of people; according to UNESCO data, on April 2020, there were more than 1.5 million students worldwide from primary school pupils to tertiary students, who were not allowed to go to school (Teräs et.al., 2020). This huge number raises the question: how did students and teachers cope with this extraordinary situation and what difficulties did they have to face during these months?

The answer is rather complex, the problems encountered during the transition to ERE can be grouped into four major categories: technological, methodological, social and mental challenges.

Lack of technology

In ERE, teachers – who work from home – and families have to have the equipment and internet access which is necessary to deliver education. For this reason, the lack of appropriate technology and/or internet access, or their poor quality, has been a key problem for those concerned. The situation was particularly difficult for disadvantaged families, whose members generally did not have the necessary equipment. However, such problems also occurred in homes where there were devices and the Internet was connected, but this was not enough for everyone, as the whole family had to share the resources after the outbreak. In many cases, the number of school-age siblings and parents working in a home office would have required more devices and more bandwidth, which not all families could afford, and the huge increase in demand created a significant shortage in these areas. Although many institutions have tried to help and have lent laptops and tablets to the people concerned, this solution was not available to everyone, nor was it a general solution. Therefore, some teachers and many students were limited or unable to carry out their tasks.

Internet service providers were not prepared for the sudden surge in demand, and people living in smaller settlements felt the effects of insufficient penetration. The communication platforms (e.g. Zoom, Skype, Webex, Moodle, GoToMeeting, BlueJeans) were not always able to respond immediately to the demand, which complicated online education even more. The electricity consumption of the population has also increased, and in some countries it has not always been possible to ensure a stable power supply. Therefore, power cuts caused a lot of inconvenience for both students and teachers (Oyedotun, 2020).

As an online survey of 59 countries reflects, almost all (87 percent) of education systems reported that unequal ICT access at home was a problem when introducing ERE. In addition, inadequate internet infrastructure (for 62 percent) and electricity infrastructure (for 28 percent) was also a problem (United Nations, 2020a). Opportunities for students from lower-income or rural households were most often affected, but there were also significant differences between countries and regions. While less than 15 percent of students in Western Europe and North America had no internet access at the time of the study, the proportion was as high as 80 percent in sub-Saharan Africa. This lack of access precluded the students concerned from online distance learning (Giannini, 2020; UNESCO, UNICEF and the World Bank 202). The seriousness of the technical problems is also convincingly demonstrated by a UNESCO survey of 424 higher education institutions in 109 countries, conducted in April 2020. At the time of completing the questionnaire, 6 percent of European, American and Asian institutions and almost a quarter (24 percent) of African higher education institutions had stopped teaching (Marinoni et al. 2020), mainly due to technical deficiencies.

Lack of competence

The second group of problems was the lack of appropriate competences. Although the technical conditions were available, not everyone was able to use them properly. This was also true both for teachers and students; as a number of studies (e.g. Helsper et al., 2009; Buda, 2013) has shown that Prensky's (2001) digital natives are not a homogeneous group of young people, and not all of them use digital technology easily and at a high level for all tasks. Moreover, knowing the technical use of tools and platforms is only a basic knowledge, it can help mastering the methods and strategies that can be used to make online teaching and learning successfully. Simply transferring face-to-face lessons to a digital platform, or broadcasting synchronous lessons based on screen sharing, may achieve limited results. However, the most important actor in the learning process (OECD, 2005; Barber et al., 2007) – even in the online learning space – is the instructor, who has to manage the process. However, they need new skills and knowledge to adapt to the changed conditions and to effectively implement

the transfer of knowledge. In the TALIS studies 18 percent of teachers reported significant gaps in this area (Schleicher, 2020).

The transition to online education has been a major challenge for teachers who were still more committed to traditional pedagogical (mostly frontal) methodologies and teaching. They didn't only have to 'dive' almost blindly into an almost inexhaustible cavalcade of digital solutions, but they also had to rethink their applied learning approaches. At the same time, those who had already tried to apply their technology-based methodological solutions were now given the opportunity to test their ideas and concepts in a different situation. At the same time both groups of teachers had to face the fact that certain teaching tasks could not be done because they could not be conducted via the internet. Thus, laboratory exercises, fieldwork, music and art training along with activities requiring movement and personal contact had very shabby and limited results when done. In these cases, the quality of online education is particularly questionable (Sahu, 2020).

For the teaching of online transferable skills, there are basically two solutions of implementation that trainers can choose from. One possible type is "synchronous teaching", in which instructors and learners interact simultaneously via some kind of platform over the Internet. Despite the audio and video, the depth of these forms of communication is by far dissimilar to face-to-face encounters, especially in group settings. Body language, gesticulation, proxemics, volume or pace of speech are all important in face-to-face teaching, and in a way they can even be considered important teaching aids. On online platforms the sound may be fully effective, but only in appropriate technical conditions (Bao, 2020). However, under these circumstances the charisma of the instructor remains ineffective. In addition, if students are unable or unwilling to turn on their cameras during online classes, the instructor may have to teach the students blindly the entirety of class time. This may be quite frustrating and inevitably affects the instructor's performance, as it is very difficult to handle the lack of reactions and feedback from the students.

Another type of online teaching is the asynchronous mode, where the teacher and the learner do not enter the teaching-learning framework at a fixed time, but it is available to anyone at any time. The advantage of this solution is not only the time-independent but also the location-independent teaching, nonetheless it requires a learning material which is appropriate for individual learning process. However, such materials were generally not available at the time of the pandemic and would have taken a lot of time and effort to prepare. Because of the rapid changeover this was not possible. Therefore, as a fall-back solution a lot of educators uploaded books, notes, presentations (with audio narrations) or recordings of lectures somewhere to the internet, mostly to a framework supporting the knowledge transfer and learning process (e. g. LMS). However, processing these learning materials individually was not an easy task at all, and the learners found it difficult.

Social challenges

Social and societal disadvantages are an elusive problem area related to ERE. People need face-to-face encounters and experiences, and these experiences cannot be substituted 100 percent with any other solution. For this reason, one of the most serious problems of ERE has been the impersonalisation and loss of direct interactions between teachers and learners (Espino-Díaz et al., 2020; Ferri et al., 2020). Learners did not have the opportunity to talk face-to-face with each other and their teachers to share experiences. These encounters would have been particularly important for those starting their studies at the same educational institution. This made it very difficult for them to develop a sense of belonging to the community, which was also significantly reduced in the upper years. The school atmosphere, meetings and discussions in a shared physical space are important not only because they improve cooperation and develop social relations, but also because they stimulate thoughts and emotions among participants, thus motivating them to interact. A less stimulating environment at home does not have this effect.

However, not only the teaching-learning process has moved to the online space, but also recreation and social activities. As a consequence, the different processes were completely merged, especially as the physical space had to be shared with family members. Family closeness was experienced as a particularly new situation by those who had lived away from the family during the period of attendance education. A significant proportion of pupils who had already begun to live independently and had adopted an individual lifestyle were forced back into the parental household they had left behind. The loss of familiar surroundings and freedom, the shrinking and monotonous nature of important peer and friendship contacts and leisure activities, coupled with the problems of reintegration within the family, reinforced the sense of loneliness.

In addition to the obstacles to children's socialisation in their peer group, the lack of a school's childcare function was a problem for many, as there was also the need to care for children who remained at home. This

meant not only childcare but also the provision of meals; the closure of schools meant the loss of school meals. In the first months of the epidemic, 370 million children in 195 countries were affected, hunger and malnutrition among the most disadvantaged increased (United Nations, 2020b). The disruption has also affected health and psychosocial services, as educational institutions also serve as essential sites for prevention and counselling. However, these have also been lost due to closures.

Mental challenges

Social and physical isolation (e.g. lockdowns, restrictions on cultural and leisure activities, closure of catering outlets, etc.) and the worries for the life and health of themselves and their loved ones amongst older people increased overall levels of anxiety. It is very difficult to overcome with the fact that personal contacts between people can cause illness and even death. This psychological strain created a constant tension, which in itself led to considerable fatigue and increased mental stress, especially during the first wave of the epidemic.

The disruption to the way of life and the previous daily routine was also a major source of stress, exacerbated by the forced separation of families. The feeling of helplessness and defencelessness in the face of the virus as an intangible threat, and the nervousness of parents (e. g. because of existential difficulties) were also felt by the children and affected their stress.

The monotony generated by the merging processes and the increasing sense of boredom reduced pupils' motivation to learn, which in turn often triggered a negative process. In fact, online lessons became more and more demanding and longer due to low motivation levels and mental fatigue. The lassitude dulled perception, reduced both the responses received and the ones given, and frustration gradually increased. Some learners found the new form of education so stressful, their stress levels increased so much during the pandemic education that they became rude and impolite in the online space, especially towards the instructors (Oyedotun, 2020). This may have contributed to the fact that various studies (e.g. Besser et al., 2020; Li et al., 2020) have consistently reported elevated stress and higher anxiety levels in relation to instructors. Moreover, the changed working conditions not only had a negative impact on the mental health of trainers, contributing to feelings of burnout, but also resulted in a deterioration of their physical well-being due to the lockdown, particularly among women and younger age groups (Lizana et al., 2021). Research by Pierce and colleagues also indicated the strongest problems in these groups. In their study, they looked at the entire UK adult population in a nationally representative sample using a questionnaire survey. Their data, collected in the spring of 2020, were compared with the results of their previous longitudinal study. They found that the prevalence of mental disorders above the clinical threshold increased from 18.9 percent in 2018–19 to 27.3 percent during the first wave of the COVID–19 epidemic (Pierce et al., 2020).

The consequences of emergency remote education

One important impact of online education during school closures is that it has improved the digital competence and problem – solving skills of both students and teachers. Teachers have made more progress, as they remain in charge of the teaching-learning process and therefore have more responsibilities. This improvement is a direct consequence of the fact that both groups had to get acquainted with a good number of new programmes, communication platforms and web interfaces that they had used for a longer or shorter period of time. In the initial period, many clicks and misconfigurations caused unpleasant moments and minutes, and the problems that arose had to be solved somehow in order to start or continue the teaching–learning process. In this respect the first wave of the epidemic (spring semester of 2020) was a period of accelerated learning and experimentation, sometimes not only in terms of programmes but also in terms of the tools themselves. This basic situation has become much more differentiated in the second and third waves of the pandemic, mainly due to teachers finding their "digital voice". They have chosen (or have been imposed) the platforms, programmes and tools that best enable them to achieve their goals. Their methodological repertoire has been enriched, they have become more confident in using different programmes, in short, they are much better prepared to do their job in the newer waves.

Another significant impact of emergency absence education was in the area of learning losses. This type of negative effect was already plausible based on previous research (e.g. Lavy, analysing the 2006 PISA study database) concluded that an extra lesson per week in a subject improves test scores by about 6 percent over the school year (Lavy, 2015). Carlsson and colleagues also found that instructional time has a significant positive effect on test scores. Based on their research results, they argue in their paper that 10 days of absence already

leads to a significant difference in students' knowledge (Carlsson et al., 2015). It was expected that forced school closures due to the pandemic would have similar consequences.

Engzell and colleagues have investigated changes in the knowledge levels of Dutch primary school pupils during emergency absence education (Engzell et al., 2020). The national examination results of about 350,000 Dutch students in mathematics, spelling and reading comprehension in the first half of 2020 were compared with the examination results of the three years prior to 2020. They found that students acquired around 3 percentage points less knowledge during the first pandemic wave than they did in the same period in previous years. This is equivalent to about one fifth of a school years' worth of knowledge, meaning that students made little or no progress with the curriculum during the period of absence. It was also shown that the negative impact was not uniform across pupils; the fallback could be up to 55% higher for children of parents with lower levels of education than for children of more educated parents. Thus, while social inequalities are blunted in face-to-face education, more or less levelled out by the school, they are amplified in online education. This based on the fact that different families are able to compensate the absence of school or direct teaching to a rather different extent. The quality of the home environment, the technical conditions and the individual competence of parents in supporting their child's learning are decisive factors in digital education. This completely new situation has significantly increased the role of parents as substitute teachers in the transfer of knowledge. Bonal and González, looking at Spanish families, found that for students in lower secondary education, there were significant differences between parents with high levels of support and those with lower levels of education. Families with lower parental education have fewer resources and knowledge to help their children with school tasks (Bonal et al., 2020). In the latter case, most of the time during the quarantine period, educational tasks dominated home activities due to the precarious daily routines, while for other families this was not a problem, they were able to create structured conditions to support the child's learning and even had enough time for other activities. Educational inequalities were therefore significantly exacerbated; young pupils in schools in disadvantaged regions were particularly hit hard. Simulations of developing countries participating in the PISA studies have led some experts to predict a very negative future for third-grade pupils in these countries. It is estimated that a three-month school closure will lead to a cumulative loss of knowledge that will result in 72 percent of students either dropping out or being on the verge of dropping out altogether by the tenth grade (United Nations, 2020b).

Although the loss of knowledge has not been evenly distributed, almost all students have acquired less knowledge during school closures than they would have in the course of attendance. Kuhfeld and Tarasawa compare this effect to the 'summer break effect', already known in education research (Kuhfeld et al., 2020), as students' knowledge also tends to decline during this period. Other studies (e.g. Hammerstein et al., 2021; Kuhfeld et al., 2020; Van Lancker et al., 2020) have confirmed this parallel and have even quantified the negative impact of knowledge loss due to online education on economic development. According to an OECD analysis published in September 2020, the loss of learning can be permanent and felt at the national economic level: students affected by the closure can expect a 3 percent reduction in lifetime earnings, but also lower GDP in the countries concerned for the rest of the century (Hanushek et al., 2020).

The future of education?

After the pandemic of the spring of 2020 – while tackling the growing social and mental health problems and the economic difficulties of parents staying at home with young children –, preventing the learning crisis from becoming a generational disaster has become a priority. This is why the reopening of educational institutions has been a top priority in all countries, most of which have tried to reopen at least some of their educational institutions despite the much more serious epidemic situation. This was particularly feasible in the case of the older age groups. Accordingly, policy interventions have been aimed at creating the conditions for reopening. Almost all countries have prepared or approved specific health and hygiene policies and measures for schools. For example, in many places they made the wearing of masks compulsory, required frequent testing of pupils and airier seating arrangements to maintain distance, or even introduced group breaks or multi-shift teaching where possible. (It is important to note that while these provisions were necessary for health protection, they also had a negative effect, because they implicitly created a constant sense of danger in many pupils.)

The United Nations' recommendations on reopening school (United Nations 2020a) highlighted that setting realistic and minimum learning targets would be an important way of reducing the academic stress that accumulates during school closure. In summarising the findings of the 59-country study, they also highlighted the need to introduce catch-up programmes to address learning losses and prevent drop-outs, particularly for

marginalised groups. These programmes should be accompanied by ready-to-use teaching materials and teaching aids for teachers, which will help to reduce their workload to some extent, as the period of ERE is also very demanding for them. The report also points out that, in the long term, it is crucial to provide adequate support to improve the home learning environment for disadvantaged families, both in terms of equipment and learning aids and practical guides.

As a result of the proposals and, above all, the measures taken on the basis of experience, there are significant differences between ERE in the first wave and in subsequent waves. In the spring of 2020, decisions were often taken in a hurry and with incomplete knowledge, but this was less and less the case later. By the autumn, routine solutions had emerged and there were fewer unknown situations. As a result, 73 percent of countries had fully or partially opened schools by September 2020, with a further 5 percent giving a later reopening date in an international survey (UNESCO, UNICEF and the World Bank, 2020). The 2020 autumn school term started in most countries with the threat of further school closures looming over the horizon, and in many places, partial or full school closures were indeed imposed. However, days or even weeks of absence from school are increasing the decline in pupil performance. The challenge of today and of the near future for educational institutions therefore is to map as accurately as possible the extent and areas of learning loss. The gaps identified must then be filled, otherwise not only will the individual losses be huge, but there will be serious social consequences.

However, some believe that making up for the learning losses will not necessarily be a problem because the quality of work in schools will be higher than before. They assume that ERE has improved the methodological culture of teachers and that they will be able to catch up with pupils in the reopened schools. They are undoubtedly right that online education in the pandemic period has been a major compelling force for learning about the digital possibilities in education. As a consequence, a significant number of teachers have been exposed to many digital teaching solutions, programmes and methodologies that they had not encountered before. This was despite the fact that these options were generally available before the outbreak of the epidemic, but for various reasons they did not become a widespread part of mainstream educational practice. It would be a mistake to think, however, that once the epidemic has been overcome, all teachers will continue to use the opportunities they have learned in the context of non-prescriptive, in-service teaching. This is certainly not the case! And the reason for this is not that the solutions learned are only applicable in the online space. Factors such as the technical equipment of the school, the age of the pupils, the number of individual devices, the type of skills taught, etc. are all factors. However, the main reason for the difference is rooted in the different attitudes of teachers towards digital technology and their different levels of digital competence. Therefore, the differences between teachers in their use of ICT in education are likely to be even greater. There will be some who will take digital flights, using newer and newer programmes and methods to enrich their lessons, but most will be content with the solutions (or some of them) they have learned during the pandemic and will only go forward in small steps. At the same time, there will certainly be some – hopefully a very small number – who, freed from the constraint, will hardly use digital technology in their lessons, even going backwards compared to their own previous practice. This assumption is confirmed by the results of a study by the EdWeek Research Centre. In a representative survey, the researchers found that while 58 percent of teachers had a more positive attitude towards the use of digital technology in education as a result of emergency absence education, 21 percent of those surveyed had a negative attitude as a result of the experience (Bushweller, 2020).

However, their reticence will not last for long because of the transformation of education everywhere. Indeed, one of the major changes in the future of education will certainly be the prevalence of hybrid education, which will necessarily require teachers to use technology. Hybrid education is likely to be most widespread in higher education, where students have already expressed such demands as the first wave of hybrid education is winding down. In fact, a significant proportion of teachers said that they would choose this solution if they could (Buda et al., 2021). Hybrid teaching was basically understood by both groups as one part of the courses being delivered in the form of face-to-face (offline) and the other part via the internet (online). Primarily, lectures and correspondence courses would be held in the online space, while the face-to-face mode would remain for practical courses. This form of teaching is feasible in higher education, but is not really feasible in primary and secondary education, where subjects cannot be divided up in this way.

The other interpretation of hybrid education is feasible in all types of schools. Those who interpret the concept in this way believe that in future it should be possible to attend classes in both face-to-face and online formats. In this case, for example in the event of a communicable disease or some other kind of incapacity, or in order to save travel time and costs, pupils could be able to join in the class from a distance. However, this solution would mostly force students into a passive spectator role, although under the right technical conditions

they could of course be connected in both directions and could even become active participants. The difference between these two solutions draws attention to the duality of the use of digital technology: it opens up many new opportunities for teachers and students, but also often poses some constraints. For example, they influence what and how students learn, but they also have a double effect on students' motivation. Their use can increase intrinsic motivation, but interesting, spectacular lessons, which are a common demand, also raise the level of extrinsic motivation. This is why teachers need to explore newer and newer programmes and change at least some of their teaching methods from time to time. The multitude of programmes and platforms offer many opportunities to do so, and even to deliver personalised education. This is what many predict as one of the most important after-effects of emergency distance learning.

There is no doubt that learners can make the most progress when they are given tasks that match their level of knowledge, skills and interests. However, it should also be born in mind that such student-centred, individual tasks have a significantly different impact on the development of social and emotional skills than activities carried out in pairs or groups during in-service training. In addition, if these individual tasks are not carefully structured, or if the vast majority of tasks are delivered in digital format, they can have a negative impact on the learning process. In fact, most learning requires reading and even the learners generally prefer to read on screen rather than on paper, the length of the text makes a difference. In the case of interaction and entertainment, if pupils are exposed to only short texts – because of the quality of it – they have no difficulty in interpreting them. However, when the text is longer than a page, comprehension scores are worse for digital texts compared to paper reading (Alexander et al., 2017). Test results from PISA studies also show that students who spend a lot of time online using social networking sites extensively perform worse, while students who mainly characterised by using the internet to find information and learn, perform better (Echazarra, 2018).

So digital technology can be used for good or for bad by teachers and learners alike. Of course, ICT can be both over – and underused in the classroom. But the question is how. There is great potential for digital solutions, but they do not work effectively in a traditional teacher-centred education. Teachers who also use digital tools to teach in a frontal method will not be more effective, compared to teachers who use such solutions to activate and collaborate with learners (Lannert, 2018). But learners should be made aware that the computer and the internet will not learn anything for them. Learning requires thinking, which can be tedious and even time-consuming, but not all the answers can be obtained after a few quick keystrokes. We need to learn quite a few thinking skills to succeed. Of course, you can skip this process and blindly follow the GPS instructions, but mostly you'll find yourself lost. Which would not have happened if, after interpretation and evaluation, we had overruled the command we received.

A huge amount of data can be collected on where students are in their thinking and knowledge acquisition using digital technology (Martin et al., 2013). With the normalisation of face-to-face teaching, a good number of tests should be used to accurately map learning loss. However, if the institution has also used some kind of educational framework for ERE, the task is easier because such systems record all student interactions with the curriculum. They may keep track of every mouse click, the time spent on each activity (e.g. reading, problem solving), the number of attempts to complete a test, typical errors, etc. Learning analytics can be used to track students' progress, to know exactly where they are in the curriculum at a given time, to detect whether they are doing the assigned learning activity. In addition to problematic parts of the material, it is also possible to accurately identify those who need additional help. With this solution, the entire educational process could be completely personalised in the future (Molnár et al., 2020). This is why Johnson et al. (2016) argues that learning analytics is one of the most significant developments of the 21st century.

Unfortunately, COVID-19 is certainly not the last virus that will influence our lives. For this reason, and also for the future of (digital) education, much will depend on what we do in the near future with the data and experiences gathered during ERE. This will help to develop redesigned schools that respond to the challenges of the 21st century and meet the needs of society.

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