Investigating Remote Teaching Through Cultural-Historical Activity Theory: A Case Study in Lebanon

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Abstract
This case study investigates remote teaching in a higher education institution in Lebanon using Cultural-Historical Activity Theory (CHAT). It addresses the lack of cultural-historical studies examining remote teaching, while illustrating and enhancing the fourth generation of CHAT. The choice of Lebanon stems from the country's concurrent financial, banking, and political collapse. These crises that disrupt regular functioning can elucidate the interplay of activities that are often overlooked but play a vital role in the success of teaching. Following a sequential explanatory design, data was collected through a survey completed by 74 instructors of a private university in Beirut, 9 of whom were subsequently interviewed for more in-depth information. Drawing upon Engeström and Sannino's framework (2011), the study analyzed the contradictions/tensions experienced by instructors in online teaching, while also exploring how subjects resolved these contradictions. The most reported contradictions pertained to social interactions, internet connectivity, and demotivation. The most prevalent contradictions took place across activities, with 58 out of 92 contradictions remaining unresolved. The resolution of contradictions primarily relied on adjusting the tools employed in remote teaching. Instructors who went a step further by adjusting the rules governing social interactions or actively engaging with the community were able to overcome additional contradictions. Subjects did not mobilize the division of labor and coalitions of activities to address conflicts.

Keywords: Remote Teaching, Higher Education, Cultural Historical Activity Theory, Contradictions

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Introduction

Two years ago, the coronavirus pandemic had a profound impact on higher education institutions globally. According to UNESCO, as of April 1, 2020, educational institutions in 185 countries were closed, affecting 1,542,412,000 learners, representing 89.4% of the total enrolled learners (IAU, 2020).

In response to this unprecedented situation, remote teaching became the immediate solution to ensure uninterrupted learning and academic progress for students in their homes. While limited attention has been given to the social aspects of this teaching method, existing research primarily highlights two areas: perceptions and the challenges faced by students during the transition. A survey study conducted among Polish medical students[1] in 2021, examined their perception of online learning during the COVID-19 pandemic. Findings revealed several key advantages of online learning, including the ability to study from home, uninterrupted access to online materials, the flexibility to learn at one's own pace and the comfort of learning in familiar surroundings. In the Arab region, a survey was conducted among engineering students at Al-Zaytoonah University of Jordan to evaluate their perspective on online learning[2]. Results indicated that students generally expressed satisfaction with online learning. However, they did identify a few challenges that they encountered with internet speed as the primary difficulty and other challenges associated with using e-learning websites. Although those studies focus on teachers' and students' assessment of remote teaching, they were limited in that they overlook the aspect of adaptation to remote teaching from an instructor perspective and the impact of social interactions among instructors, students & the wider community. Also, they fail to highlight what components facilitated and interfered with such adaptation.

As per Engeström (1999), CHAT is applied in various domains of practice. This theory provides a methodological foundation from which to examine the relations between societal, institutional, and personal dimensions of human development. Baran & Cagiltay (2010) stated that CHAT is a suitable framework for online learning environments because it clarifies the social structure of online environments that portray a learner as an individual as well as a member of a larger community.

The Lebanese Context: Multiple Crises

Since 2019, Lebanon has been facing multiple crises such as rising political instability, the Covid-19 pandemic, an economic and financial crisis and the Port of Beirut blast. This turmoil has severely disrupted the academic years 2019, 2020 and 2021, forcing education institutions to switch to remote teaching in order to save what was left of the academic year. However, this e-learning environment has brought its own challenges, such as the low internet speed, the digital divide and the frequent electricity outages. The economic crisis affected the infrastructure of the country, with fuel shortages and the absence of maintenance leading to the near total collapse of the electricity network which in turn aggravated the situation for the connectivity infrastructure (internet, telephone)[3]. Those multiple crises forced educators to rethink their teaching practices whilst shifting abruptly to a “relatively

[1] https://doi.org/10.21203/rs.3.rs-41178/v1
[2] https://doi.org/10.3390/educsci10090232
[3] Source: https://today.lorientlejour.com/article/1265636/internet-connectivity-the-latest-in-a-line-of-services-falling-victim-to-lebanons-electricity-shortages.html

new" learning environment for the Lebanese educational system.The main aim of this research is to examine, using Cultural-Historical Activity Theory (CHAT), how instructors adapted and evolved their teaching practices in the context of remote teaching during times of multiple crises. Furthermore, this study aims to investigate the tensions that emerged during remote teaching and explore how individuals resolved them. It emphasizes the significance of coalitions of activities in enabling the success of remote teaching, considering the influence of past iterations of this activity and the surrounding activity systems.

The rest of the paper is organized as follows: Section 2 describes the theoretical framework, Section 3 provides the methodology, Section 4 reports and discusses the main results, and Section 5 offers concluding remarks and proposes implications for future research.

Theoretical Framework

This study focuses on the phenomenon of adaptation and change from a social perspective, following CHAT, which is rooted in Vygotsky's work and developed later by Leontev and Engeström. According to Engeström, an activity is defined under CHAT as a purposeful, collective, and historically situated human endeavor that involves the interaction between individuals, artifacts (tools), and the sociocultural context in which the activity takes place. He argues also that when multiple activity systems converge and form coalitions, new possibilities for transformative change can emerge. These coalitions of activities involve the collaboration and coordination of different actors, tools, and goals across various activity systems (Engeström, 2021).

Cultural-Historical Activity Theory (CHAT)

CHAT studies human development by focusing on the activities they undertake individually or with each other. Through the mediation of the activity, societies and individuals mutually shape one another. This theory is rooted in Lev Vygotsky's work on the role of mediation; the latter refers to the process through which society and the individual mutually shape each other. It was subsequently expanded by Yrjö Engeström to include additional components. CHAT highlights that human activities are not static but are deeply influenced by the historical and cultural context in which they occur. In other terms, individuals and societies inherit cultural practices, tools, and knowledge from previous generations. For the purposes of this paper, the extended version of CHAT developed by Engeström will be utilized as the framework of analysis.

Engeström Extended Activity System

In 1987, Yrjö Engeström extended Vygotsky's model to include additional components: community, rules and division of labor. The extended version is presented in the figure below.

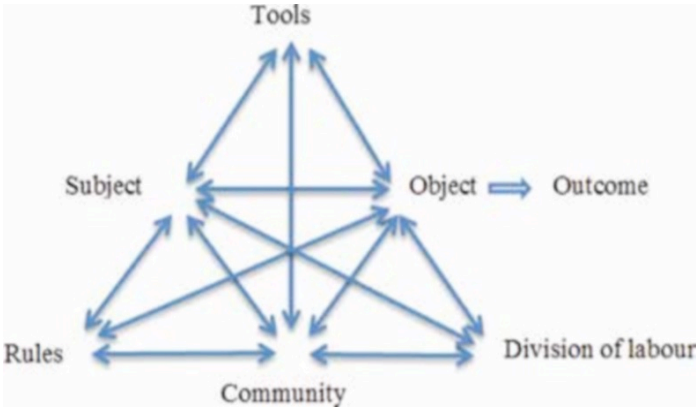

Figure 1: *Engeström's Extended Activity System (1987)*

The components that make an activity are illustrated above in figure 1. The two-sided arrow implies that the components might shape one another or develop during the process of an activity. (Engeström, 2021). For instance, the relationship between subject and community is mediated through the rules imposed, however the rules also affect the subject who is undertaking an activity and that same subject might accept or reject those rules set by the community.

In 2021, Engeström and Sannino proposed a fourth generation of CHAT that emphasizes coalitions of activities. It focuses on the interconnections and dynamics between different activity systems. Engeström developed this concept to analyze and understand how multiple activity systems can come together and interact to form broader societal changes. According to him, activity systems are not isolated entities but are interconnected and interdependent within a larger social context.

By illustrating Engeström extended version in this study, we defined each component accordingly as the following:

- *Subject*: would be the instructors undertaking the remote teaching activity
- *Tools:* the instruments mediating the activity in question would be the equipment (laptop, cellphone...), the educational platforms, and all the features included in those platforms. These tools have a direct relationship with the subject because they shape how the subjects would use them to execute an activity or task (what can be done and how).
- *Rules:* would be the norms set by the instructors, the institution, or the community, for example instructors require students to raise their hand before speaking, or to open their cameras while undertaking an exam.They shape subjects in the way they're applied but subjects can accept, reject or alter those rules according to their needs.
- *The community* refers to the instructors in the same institution, the students learning remotely, and colleagues in other institutions.
- *Division of labor* is constituted of the distribution of roles, tasks and responsibilities among participants, whether they are students, instructors, staff (IT), or leaders (Dean, department chairs.)
- *Object*: on a macro level, the goal of the activity would be achieving the key performance indicators of the course or the program. On a micro level, the goal would be to finish a specific task assigned by the instructor or something related to the lesson.

CHAT and Change: The Concept of Contradictions

Contradictions constitute a key concept in CHAT and are characteristic of activity systems. They are historically accumulating tensions within and between activity systems (Engeström, 2001).

They are considered crucial for understanding human learning and development as they serve as the driving force for change and development. (Engeström and Sannino, 2021). They create disruptions and conflicts but also spark innovative attempts to address perceived problems. As per Sannino (2018), contradictions are historically emergent and systemic phenomena that must be approached through their manifestation. Murphy and Rodriguez-Manzanares (2008) define contradictions as a "tension, denial, contrast or opposition between two propositions".

Engeström (1987) classified contradictions into four distinctive levels:

- *Primary contradictions*: within an individual component of an activity system;
- *Secondary contradictions*: between components within the same system;
- *Tertiary contradictions*: between an existing activity system and a culturally more advanced form of it;
- *Quaternary contradictions:* between the central activity system and other co-existing neighboring activities

In their study, Discursive manifestation of contradictions, Engeström and Sannino (2021) discussed four types of manifestation of contradictions along with their respective resolutions, synthetized in the table below. I will be contended with the resolution types only as this study will investigate also how individuals resolved the contradictions within the context of remote teaching.

Table 1: *Types of discursive manifestation and their resolution*

Manifestation	Feature	Resolution
Double bind	Facing pressing and equally unacceptable alternatives in an activity system	Practical transformation (going beyond words)
Critical conflict	Facing contradictory motives in social interaction, feeling violated or guilty	Finding new personal sense and negotiating a new meaning for the initial conflicting situation
Conflict	Arguing, criticizing	Finding a compromise, submitting to authority or majority
Dilemma	Expression or exchange of incompatible evaluations	Denial, reformulation

Throughout this paper, the terms "contradiction" and "tension" will be used interchangeably to refer to the conflicts within the context of remote teaching. This paper answers the following research questions: What tensions arise in the remote teaching activity? How are these tensions resolved in this system? Which components of CHAT were part of the resolutions?

Methodology

Type of Research and Participants

This qualitative study uses a mixed-method approach, specifically employing a sequential explanatory design. The research begins by collecting quantitative data, which is then followed by a qualitative phase with in-depth interviews. The participants in this study are 74 instructors, 46 males and 28 females, from a prestigious private university in Lebanon. These instructors voluntarily agreed to take part in the research.

Data Collection Tools and Analysis Technique

A survey was conducted using a non-probability sampling approach including a total of 19 closed-ended questions, 13 open-ended questions, and additional general information questions. The questions addressed various aspects related to the subject's state and use of spaces and tools at the beginning then at the end of their remote teaching phase.

Out of the 74 instructors who responded to the survey, 9 expressed their willingness to provide more information and were subsequently interviewed. The interview questions were tailored to each individual instructor, focusing on the changes in practices and state throughout their remote teaching experience. The interviews took 45 to 60 minutes.

The analysis technique of the data was predicated on the specific research questions posed. The survey data, consisting of multiple choice and Likert scale questions, was quantitative in nature so we utilized the Statistical Package for the Social Sciences (SPSS). The surveys also included open-ended questions that enabled the collection of qualitative data. This qualitative data was analyzed using the thematic analysis technique. To conduct the thematic analysis, we transcribed all nine interviews and carefully examined instructors' narratives where tensions, contradictions, conflicts, or problems arose during the discussions. 92 problematic instances were identified. The instances of tensions were then classified into major themes. Each instance of tension in teachers' narrative was then analyzed and coded according to Engeström and Sannino's framework (2021), presented above.

Reporting of Results and Discussion

Participants' Profiles

All participants confirmed they have used remote teaching prior to taking the survey. 9 instructors have been using educational technology for one year, 4 for two years, 2 for three years, 47 for more than three years, and 12 instructors did not provide a response regarding this question.

In terms of age, 30 instructors were above 50 years old, 29 fell within the age range of 40-49, 12 were aged between 30-39, and 3 were less than 30 years old. Regarding educational qualifications, 46 instructors held a Ph.D. degree, while 28 held a master's degree.

In terms of weekly teaching hours, 30 instructors taught remotely for more than 6 hours, 31 taught between 3-6 hours, and 13 taught less than 3 hours.

In terms of face-to-face teaching experience, 54 instructors had more than 10 years of experience, 11 had between 5 and 10 years, and 9 had less than 5 years.

Finally, 60 instructors reported having received assistance from their peers or the institution in using the platform for remote teaching while 14 instructors stated that they did not receive any help.

Challenges of Remote Teaching

The survey asked respondents to indicate whether they found challenging a list of social, political, economic, and technological items (see results in Table 1). The survey investigated whether participants overcame the challenges through their remote teaching experience. Hence, respondents were asked to indicate whether the challenges appeared only at the beginning of, only at the end of, or throughout their remote teaching experience.

Table 2: *Percentage of instructors who faced the listed challenges while teaching remotely.*

	Never a challenge	Was a challenge at the start	Was a challenge at the end	Always a challenge
Connectivity/Electricity	10.8	33.8	14.9	40.5
Using the platform	43.2	44.6	2.7	9.5
Social isolation	36.5	36.5	5.4	21.6
Work environment	51.4	32.4	4.1	12.3
Economic crisis	39.1	20.3	20.3	20.3
Political crisis	51.3	20.3	8.1	20.3
Health issues	60.8	20.	6.8	12.1
Psychological issues	78.4	12.2	1.3	8.1
Other	86.5	6.8	1.3	5.4

The majority (89.2%) of the respondents faced challenges with internet connectivity and electricity. While this challenge persisted throughout remote teaching for 40.5% of the respondents, 33.8% of them seemed to have overcome it by the end of remote teaching. It is noteworthy that when the confinement was lifted, instructors at the studied university continued to teach remotely because students could not afford the commute to the campus due to inflation. However, instructors who could afford the commute started teaching remotely from campus, where a reliable internet connection and electricity are provided 24/7.

The majority of respondents found the use of the platform (56.8%), social isolation (63.5%), and economic crisis (59.9%) challenging. While most of them (7/9 = 44.6% out of 56.8%) became familiar with the educational platform and (4/7 = 36.5% out of 63.5%) overcame social isolation, only 1/3 of instructors overcame the challenge of the economic crisis. Additionally, 20.3% of instructors were affected by the economic and political crises throughout the phase of remote teaching. Although these crises were created by other activity systems, such as banking and governing, they affected the subjects of teaching activities and the conduct of remote teaching in some ways.

The work environment was also challenging to 48.6% of the respondents, 32.4% of whom resolved this issue. In the interviews, instructors mentioned the challenges of working from home because the activities of other family members could interfere with the teaching

activity. Some instructors resolved this by going back to teaching from campus after the end of the lockdown or finding solutions to the disturbances they encountered.

The instructors who participated in the interviews mentioned tensions they faced as they taught remotely, which we classified thematically (see Figure 2). Some of the tensions echoed the ones listed in the survey, such as connectivity, electricity, and learning to use the platform. We start by defining the additional challenges as identified in teachers' narratives during the interviews: the tensions about interaction, interference, and factual/virtual.

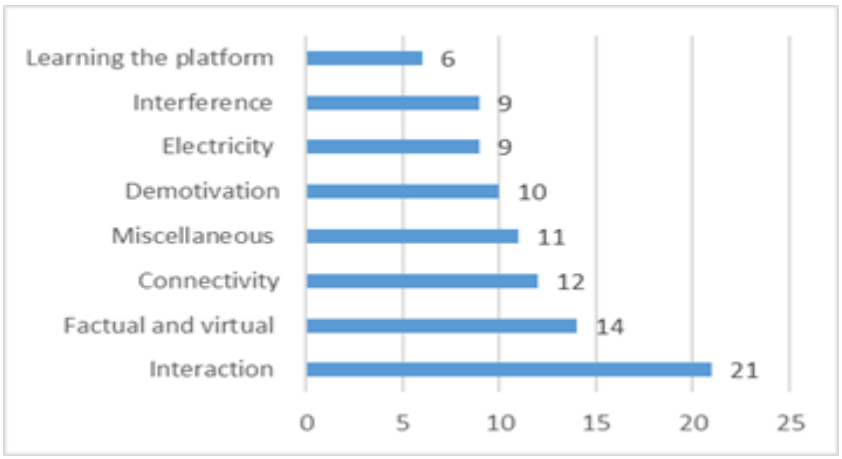

Figure 2: *Themes of challenges emerging in instructors' narratives from interviews (by number of instances)*

Interaction refers to the reciprocal communication or influence between two or more entities, whether individuals, groups or even between humans and technological systems. In remote teaching, instructors and students interact with each other and with digital interfaces, such as software applications, websites, or electronic devices.

Interference refers to the disruption of a process by external factors, the intrusion that negatively affects the normal course of something. In the context of remote teaching, interference can stem from simultaneous activity systems that exist alongside the remote teaching activity. For instance, the home activity system may introduce interference, with younger children engaged in activities like playing while older children attend online classes and the parents, who are instructors, are involved in the activity of remote teaching.

Factual and virtual Factual is related to reality and is something concrete, and in remote teaching, it means the fact of being present in the flesh. On the other hand, virtual refers to something that exists in a simulated or artificial form, often created or experienced through digital technology. It represents an environment that is computer-generated or digitally simulated, imitating the characteristics or aspects of the real world such as remote teaching environment. In the context of this study, some instructors emphasized the contrast between the factual environment (teaching on campus) and the virtual environment.

The findings indicate that several key contradictions emerged during the study, primarily focusing on social interaction among instructors and students (community) as they occurred in 21 instances, the contrast between the factual and the virtual was identified in 14 instances, connectivity issues in 12 instances, demotivation in 10 instances and electricity in 9 instances (see Figure 2). The following instances illustrate some of these contradictions:

> *The students got lazy as we were recording the sessions. Because people didn't have electricity or because there was no connection so instead of taking the courses in parallel, they relied on the videos, which meant that they got to a point where they needed to ask questions but it was too late and then in addition they lost the reflex to take notes of the things we say in class, well, they completely forgot. So, for me, I confirm that online teaching is really to help out in extreme cases.*

In this case, the instructor initially had a positive attitude towards remote teaching but it gradually turned negative as she encountered challenges related to recording sessions for students with unstable connections or lack of electricity. The instructor was concerned that the students were not taking notes. From the instructor's perspective, remote teaching was seen as a viable option only for extreme circumstances. We have identified four clear contradictions. The first tension centers around the instructor's negative shift in motivation towards online teaching, as revealed through the survey responses (demotivation). The second tension arises from students overly relying on recorded materials, leading the instructor to perceive it as laziness (interaction). The third and fourth tensions relate to the challenges posed by unstable connectivity and electricity, which disrupted online instruction (connectivity & electricity).

The following instance illustrates the tensions between the factual and the virtual:

> *The goal was to give the students a certain presence in the virtual, the facticity, the body that is there...it is to ensure that for the students. For my part, it was always open, I also always asked students to open their camera and they wanted to use it but sometimes for lack of connection and in addition they were at home and not here on campus so they couldn't use it and it was hard.*

In this instance, the instructor wanted to maintain a sense of "presence" in her remote teaching sessions by keeping her camera on at all times and requesting that her students do the same. However, her students encountered limitations due to poor internet connectivity, and some of them were unable to turn on their cameras. Hence, a tension within the tool arises when students' connectivity is not stable. This hinders the objective, set by the teacher as physical presence. The problematic relationship that emerged is between two activity systems "*remote teaching*" and "*connectivity infrastructure system*". As a resolution, the instructor used the camera feature as a tool to draw attention to her students and negotiate her presence in the milieu which connected all participants in the activity.

Analysis of Tensions

We analyzed the tensions based on their types, primary through quaternary, as defined by Engeström and Sannino (2021) (see Figure 3). We also studied the resolutions of these tensions and the lack thereof (Figure 4). Then we highlighted the components of Engeström's triad that were used to resolve the tensions (Figure 5). As we report the results of these analyses, we will quote teachers' narratives to illustrate CHAT in the context of remote teaching.

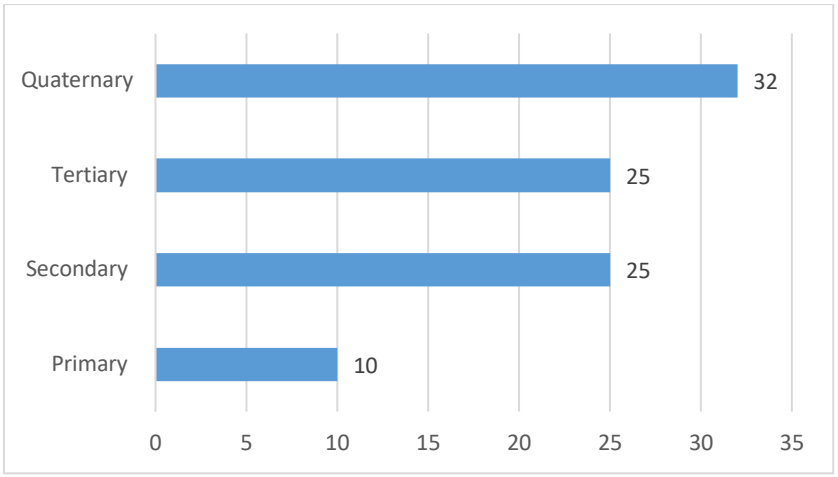

Figure 3: *Type of tensions (by number of instances in teachers' narratives)*

The most frequent types of tensions were observed to occur across different activity systems, referred to as "quaternary" tensions with 32 occurrences. The tertiary and the secondary contradictions come in 2nd with 25 occurrences each. 10 instances involved primary tensions. We will give examples of these types based on teachers' narratives next. While the types of tensions can be analytically differentiated, teachers' narratives involve interlaced multiple tensions, as the following excerpts illustrate.

The quaternary tensions involved three interfering activity systems: providing internet connectivity, supplying electrical power, and concomitant activities in the spaces where teachers and students were located during the remote teaching sessions. The following quote is an instance of the third quaternary tension, which has not been illustrated yet:

> *My husband was working in the other room, my children are very young (you probably hear them now in the background), they did not understand that this is serious and I work and they interrupted to go to the bathroom, to eat, to drink so I had such things, crying fits and they hit each other, a bit of everything.*

In this case, the instructor is teaching remotely from home, where her husband and children are engaged in other activities: work for the husband and play for the children. The family members had to conduct their activities in the same or adjacent space where the teaching activity is conducted, possibly due to the confinement. The needs of the young children, "to go to the bathroom, to eat, to drink", interrupted the flow of their mother's online teaching. According to play activity rules, kids reach out to an available trustworthy adult for their needs. When their mother is teaching on campus, she would be out of reach, but now she is at home and thus available. The husband's activity interfered indirectly with the teaching activity, since the father, the other trustworthy adult is present in the house but may not be available.

The following excerpt involves secondary, tertiary, and quaternary tensions:

> *I want them to turn on the cameras which is very important so I can become familiar with their faces, but once they do that the connection becomes horrible, so they have to turn off the camera so I am teaching like a black screen, I don't know their faces, I can't see the expressions on their faces.*

This instance involves several tensions. The quaternary tension is between the activity system of providing connection to the internet and the activity of remote teaching. The failure of providing reliable and affordable internet connectivity to various locations in Lebanon is hampering the teaching activity to proceed according to the teacher's desire. The problem could also arise from the activity systems providing learning platforms that require strong internet connectivity.

The secondary tension is about the relation between the subject and community, namely teacher and students ("I can become familiar with their faces"). Teaching requires teachers to know their students. In remote teaching, the relationship subject-community is mediated through tools, such as cameras and microphones connected to a platform such as Teams. Due to the limited internet connection, teachers cannot maintain good quality voice transmission with cameras of participants open. There is a tension in the subject-community relationship between connecting through audio or visual media. The quaternary tension induced a secondary tension.

The tertiary tension is manifested when the instructor says, "I am teaching a black screen […] I can't see the expressions on their faces". Teachers commonly rely on gestural cues to check whether students are engaged in the case of live communications. Teaching remotely with cameras turned off blocks the flow of cues from learners, which are expected based on in-person teaching. This tension is tertiary because it is a tension between former and current modes of teaching activity: the subject is used to rely on cues from students which the modified activity (remote teaching) cannot afford. Thus, the visual access to teacher's interlocutors stops at the "black screen", which becomes the interlocutor in remote teaching shaped by stances from former in-person teaching.

The next excerpt illustrates primary and tertiary tensions:

> *Teaching online itself, maybe it's not my forte, I try to give my best and to get better and all of that, but it doesn't beat having students in front of you in a physical classroom, and at the beginning it was an issue yes, but I eventually got used to it. But it is still a very minor grievance, let us say.*

The primary tension is manifested in the subject's struggle with the remote teaching ("Teaching online […] that"). It concerns one component, the subject, and their emphasis on improving their performance. A Tertiary tension is also involved in this excerpt, manifesting in "but [remote teaching] […] grievance". The mode of in-person teaching weighs on the teacher's mindset and emotions ("minor grievance") as she adapts to remote teaching. In this instance, the tertiary tension operates around the habit of having a physical classroom with students, carried over from former teaching activity, which the current teaching activity cannot provide.

The 10 instances of primary tensions pertained to the component of subject. The secondary tensions pertained to relationships between three components: subject, community, and tool.

Overall, the analysis of the types of tensions in teachers' narratives shows that the main challenges for the respondents arose from the interference or malfunctioning of other activity systems (quaternary tensions). This finding is aligned with the survey results (Table 2). The typology analysis reveals the salient influence of the former physical teaching in a classroom

on the conduct of the current remote teaching. Teachers might have been addressing the challenges of remote teaching with the mindset of in-person teaching.

Analysis of Resolutions to Tensions

The figure below represents the types of resolutions identified in teachers' narratives during the interviews.

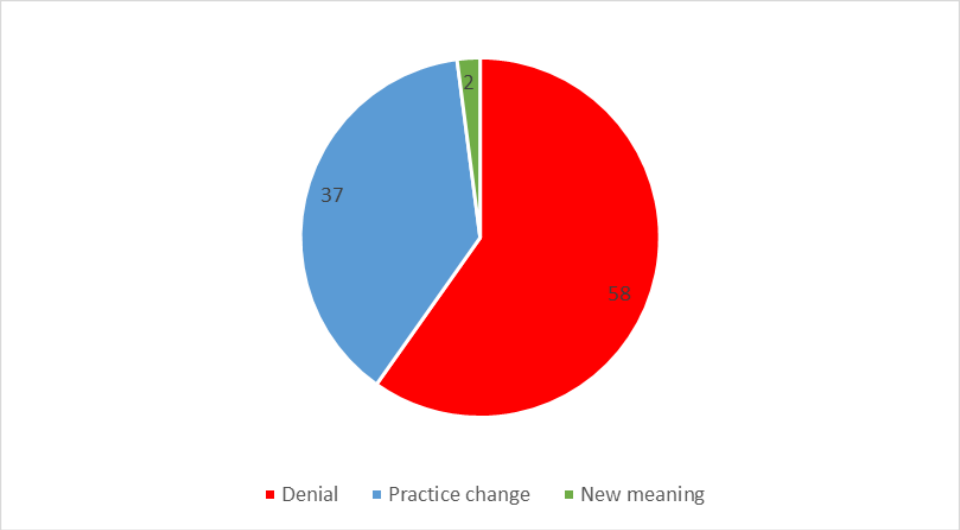

Figure 4: *Type of resolutions (by number of instances)*

In 58 instances, instructors did not mention resolutions to alleviate the tensions. The predominant trick to resolving the tensions was to change practices. There were two resolutions that occurred by changing meanings.

The resolutions by changing practices included instances of turning cameras on or off, recording or stop recording the online sessions, use or not use of the "mute all" button, and changing the place where the online sessions are live streamed. Other resolutions by changing practices also show that subjects creatively mobilized other components of CHAT, such as having recourse to the community for resources, using a tool to regulate subject-community interactions, and changing rules in other activities. The analysis results of these resolutions will be published in a future paper.

Conclusion

In this case study, we examined remote teaching using CHAT and identified contradictions that emerged within or beyond this remote teaching activity system. The major contribution of this paper is to illustrate the fourth generation of CHAT in the context of remote teaching and illustrate its value in the design of resolutions to tensions produced by a system of activities. The fourth generation of CHAT emphasizes that individual activity systems cannot operate in isolation. This implies that multiple activity systems need to work together, forming interconnected networks and relationships to support and enhance their functioning. Engeström and Sannino (2021) suggest that activity systems form coalitions to address tensions and conflicts, and ultimately enhance their overall performance and effectiveness. The investigation of remote teaching in the case of Lebanon revealed the interconnectedness of multiple activity systems, as the quaternary tensions prevailed in the survey and teachers'

narratives. However, resolutions by coalitions to these tensions were not mentioned except for the case of managing the concomitant interfering activities at home, where remote teaching was delivered from home. Respondents could be encouraged to extend the coalitions to the national level to ensure smoother functioning of remote teaching. This call involves a change of identity of the teacher, who is responsible not only for educating in a classroom but also ensuring an optimized coalition of activities for productive teaching.

The tertiary tensions were also salient in the studied sample. The historic in-person teaching mode seemed to weigh on how teachers are adapting to remote teaching. Most interviewed teachers concluded that remote teaching was not productive. In fact, the university reverted to in-person teaching because of instructors' negative report about their experience with remote teaching. On the other hand, some instructors predominantly relied on the tools to resolve their challenges in remote teaching, which will be . Respondents could be encouraged to explore other CHAT components in resolving their challenges. For instance, ongoing formative assessment, which could be accomplished by checking students' facial gestures and probing those who seem struggling with the content during in-person teaching (subject-community relation), could be achieved through small assignments to be submitted individually or collectively to the teacher (subject-division of labor). Work assignments could also resolve the concern of some instructors about checking whether students were actively engaged, sleeping, or absent on the other side of the screen.

As we analyzed remote teaching using CHAT, we struggled with how to classify spaces where participants are located during the online sessions. Teachers, for instance, changed rooms to ensure a productive environment for the conduct of remote teaching. We resorted to considering the space as a tool for the sake of this paper. However, we acknowledge that this question requires further thinking in future work.

Appendices

Appendix A

Table 2. Obstacles to achieving the quality of distance learning under the Corona pandemic.

Obstacles Category (Groups)	Obstacles	Professors Repetition (n = 100)	Students Repetition (n = 300)	Overall Repetition (n = 400)	Overall Percentage (%)
Personal obstacles (self-imposed obstacles)	1-The weak motivation of students to distance learning.	65	112	177	44.3
	2-The difficulty of students' understanding of some subjects in the absence of classroom interaction.	60	175	235	58.8
	3-Get used to face-to-face learning.	61	95	156	39
	4-Some professors are not convinced of the usefulness of distance learning.	20	39	59	14.8
	5-Lack of willingness to implement the distance learning system.	69	105	174	43.5
Pedagogical obstacles	1-Difficulty learning some applied courses and remotely oriented work.	18	47	65	16.3
	2-The lack of clarity of the methods of remote evaluation.	47	48	95	23.8
	3-Lack of preparing the university community (administration, professors, etc.) to deal with distance learning.	64	0	64	16
Technical obstacles	1-Weak internet flow (speed).	80	156	236	59
	2-Security and confidentiality of data and information.	66	63	129	32.3
Financial and organizational obstacles	1-The lack of capabilities to communicate remotely (devices, internet, Apps, etc.).	82	155	237	59.3
	2-Lack of training in the use of technology.	71	69	140	35
	3-Multiple electronic media and the absence of uniform controls between all.	52	42	94	23.5
	4-The home environment is not suitable for distance learning.	46	60	106	26.5

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