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The insider Change Laboratory in practice

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Abstract

This paper describes a Change Laboratory that took place in a laptop-mediated English language course at a large tertiary institution in the United Arab Emirates. Earlier research had suggested that despite much heralded technology interventions students were in fact failing in increasing numbers. The Change Laboratory aimed to make a collective improvement in face-to-face laptop-mediated classrooms. This paper focusses on the solutions proposed during the intervention, and further contradictions identified as the participants attempt to apply these solutions. A future model of activity is also proposed. The paper contributes to insider research, Activity Theory and technology enhanced learning. Suggestions for future interventions are also made.

1. Introduction

Cultural Historical Activity Theory (CHAT), has been described as 'a conceptual toolkit' (Hopwood & Stocks, 2008) possessing a 'utility for enquiry' (Bligh & Flood, 2017, p. 138) to guide research at all stages from design, data gathering, analysis and results presentation. Also described as 'the best kept secret in academia' (Engestrom, 1993, p. 64), CHAT can describe complex work activities and through the

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principle of contradictions identify issues that may be causing unintended outcomes. However, to utilize CHAT purely for describing the complexity of an activity is to fall short, and to paraphrase Marx (1852/1979) fall into the trap of merely describing the world as it exists. Instead, we should seek to solve problems as they occur, and not simply describe the world but actively seek to change it. Through the Change Laboratory (Engeström et al., 1996; Virkkunen & Newnham, 2013), a methodology firmly rooted in CHAT at all stages, it is possible to seek concrete change from abstract ideas. A Change Laboratory is a formative intervention for the development of work activity that is carried out by practitioners in collaboration with a researcher-interventionist (Virkkunen & Newnham, 2013). Through a cycle of expansive learning, a Change Laboratory, can address contradictions and allow participants to apply solutions and create new, concrete work practices. The methodology is addressed in more detail in a later section. This paper will describe one such Change Laboratory that took place in a preparatory English course at a federal university in the United Arab Emirates (UAE) in 2019.

1.1 The context

Recent decades have seen governments in the MENA region attempting to move from oil reliance to knowledge economies, and education has been placed at the forefront of this drive. The UAE has coupled the drive to improve education with a strong push for classroom technology. Degree programs in the UAE are largely taught in English. Students that fail to meet the English proficiency requirement can join a one-year English preparatory course.

The English preparatory course has often been at the vanguard of technology initiatives. The UAE has not been afraid to put their money where their mouths are (Miles et al., 2021) and has invested heavily in classroom technology. For example, in 2012 all students and teachers were issued with iPads in a move expected to revolutionise teaching and learning (Cavanaugh et al., 2013b; Cavanaugh et al., 2013a; Miles, 2019). In 2017 laptops quietly replaced iPads, but today's classrooms remain technologically advanced. Materials are delivered via learning management systems, assessments are 100% online and classrooms are Smart, with state-of-the-art touchscreens and fast Wifi networks.

However, this state of the art does not reflect the state of the actual (Selwyn, 2011). Neither iPads nor the current laptop-mediated classrooms have delivered the expected improvements to teaching and learning. In fact, recent research (Miles, 2018; Miles, 2021) actually suggests that results have remained static or have even declined. Fewer students are passing the English preparatory course and moving on to a degree program. In fact, almost 50% of students are failing to progress. See Table 1.

This is a complex problem, and there is no simple solution. The need is for collective improvement to teaching practice rather than isolated, individual efforts. Large numbers of students are negatively affected, so a collective solution has the potential to make a large-scale positive difference. I maintain that the answer is not another top-down management or ministry driven initiative, nor is it the application of new technology, and nor is it yet more institutionally mandated training. The approach needs to be

Table 1. Three-year average failure rates for the institution and research site [1]

Campus	Status	2016-17	2017-18	2018-19	3-year average
Research site	Total registered	704	487	586	592
	Failed to progress	300	241	224	255
	Institution	43%	49%	38%	43%
Institution	Total registered	5008	3861	3787	4219
	Failed to progress	2671	2264	1317	2084
	Failed %	53%	59%	35%	49%

1 Data collated from institution portal

critical yet not dystopian (Castañeda & Selwyn, 2018), and this criticality needs to be underpinned by a strong theoretical framework (Jameson, 2019; Passey, 2019). Furthermore, the intervention needs to be put into the hands of the teachers. The approach needs to combine all these facets in one clear, theory-driven intervention. The answer could, therefore, lie in a Change Laboratory, a theory-driven, participant led, critical and collective attempt to modify work practice.

My own role in this project is as the researcher-interventionist, analysing and designing each session for the intervention, but allowing the participants to lead the process. It is also important to note that I am an insider to the research. I have taught on the preparatory program for a number of years, and this combination of insider researcher-interventionist presents both unique advantages and challenges that are discussed later in the paper.

1.2 Research questions

- RQ1: What contradictions occur within the process of expansive learning as the participants attempt to apply solutions?
- RQ2: What contradictions occur within the Change Laboratory methodology that are not related to expansive learning?

2. Literature review

This Change Laboratory is a bottom-up intervention in a laptop mediated English language program. Previous research (Miles, 2019, 2021) had helped to identify several key themes that are now examined.

2.1 English language teaching

English Language Teaching (ELT) lacks a dominant a theory. The audiolingualism of the 1950s and 1960s gave way to the Communicative Language Teaching (CLT) in the 1980s, but 'no single theoretical position has achieved dominance' (Mitchell et al., 2019). Teachers today apply 'disciplined eclecticism' (Richards, C., et al., 2001) or even 'principled eclecticism' (Larsen-Freeman, 2012), like artists choosing from a palette of colours in order to make informed teaching choices. Teachers today are increasingly professionalized and qualified (Copland et al., 2020; Hyland, 2019; Keaney, 2016), yet there is a danger that theory and practice might disconnect as teachers and researchers do not exist in parallel (Copland et al., 2020). Worldwide, ELT teachers lack tenure, and this contributes to the lack of a serious research agenda in ELT (Garrett, 2009). In the UAE, lack of tenure combines with the uncertainty of annually reviewed contracts and the general insecurity of ex-pat life. Perhaps the modern ELT principled eclecticism is unsuitable for laptop-mediated classrooms.

2.2 Collaboration

Despite principled eclecticism, CLT forms the backbone of most course books and teacher training. Central to CLT is collaborative pair and group work. This reflects Vygotsky's zone of proximal development (1978) where novices learn with the help of a more knowledgeable other who scaffolds their development (Wood et al., 1976). In language classrooms, this role is interchangeable. Pairs can work together to solve language problems through 'collaborative dialogue' (Swain, 2000, 2006). Learning may be even more effective in small groups given the wider pool of language ability this creates (Dobao, 2012; Dobao, 2014a, 2014b; Dobao & Blum, 2013). In terms of classroom devices, Andersson et al. found deployment can help or hinder collaboration. Situations where devices were deployed in 'constellations' of one device between two (1:2) or one between four (1:4) were more effective than 1:3, for example (Andersson et al., 2016).

2.3 Computer Assisted Language Learning (CALL)

ELT has often been 'in the vanguard' (Levy, 1997, p. 3) of computers and language learning. The drill and practice dialogues of audiolingualism were highly attractive to early CALL developers due the relative ease of programming exercises lacking open-endedness (Levy, 1997). Today much CALL remains focused on individual learning and lacks opportunities for interaction, collaboration and negotiation (Berns et al., 2016).

CALL is, of course, one term among a plurality that includes Mobile Assisted Language Learning (MALL) and Web-enhanced Language Learning (WELL) (Tafazoli et al., 2019) reflecting the technological advances of recent times. One aspect of MALL is the use of applications and games, but while students are positive regarding gamification, actual sustained usage remains low (Blume, 2020; García Botero et al., 2019; Loewen et al., 2019).

While CALL has borrowed from other theoretical fields like Second Language Acquisition (SLA) and psycholinguistic theories (Chapelle, 2009) it remains a largely practical pursuit (Levy, 1997; Levy & Stockwell, 2013). Theory based research into CALL and ELT does take place, for example using TPACK (Koehler et al., 2012; Mishra & Koehler, 2009; Mishra & Koehler, 2006) in various contexts (Fathi

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& Yousefifard, 2019; Parr et al., 2013; Tai, 2013; Tseng et al., 2019), while in the UAE the SAMR model (Puentedura, 2010, 2012) and TPACK have been used to investigate the iPad initiative (Cavanaugh et al., 2013b; Cavanaugh et al., 2013a; Hargis et al., 2014; Miles, 2019). However, there remains serious scope for theory-driven research into ELT and CALL, particularly in device-mediated environments.

2.4 The impact of classroom devices

Few modern classrooms are device free. Laptops, tablets and the 'truly ubiquitous' mobile phone (Cook & Das, 2012) are the state-of-the-actual, and research falls into two clear camps.

On the positive side, research in ELT points to significant improvements in student writing, both in the USA (Grimes & Warschauer, 2008; Park & Warschauer, 2016) and the UAE (Mokhtar et al., 2009; Raddawi & Bilikozen, 2018; Tubaishat & Bataineh, 2009).

However, there is also research citing devices as serious sources of distraction perhaps causing lower grades (Gaudreau et al., 2014; Kraushaar & Novak, 2019). Fried describes a 'backlash' where lecturers insist laptops remain closed (Fried, 2008). In the UAE, devices are also a distraction (Awwad et al., 2013; Genena et al., 2019; Miles, 2019). Consequently, some institutions have considered banning laptops (Elliott-Dorans, 2018; Yamamoto, 2007), but this seems a Luddite solution and is impractical for a 'generation of multitasking students' (Gaudreau et al., 2014, p. 253) who are 'saturated in media' (Roberts et al., 2009, p. 314). Whether we like it or not, devices are in-class and students are online, a reality that must be acknowledged and accepted (Marinagi et al., 2013; Norris & Soloway, 2008).

2.5 ELT, research and classroom intervention

Technology focused ELT research tends to focus on training, for example pre and in service training and beliefs (Ghanaguru & Rao, 2017; Roberts, 2016), national training programs (Karim et al., 2019; Sofiana et al., 2019) and online language teacher education (Shin & Kang, 2018). Research in the UAE has reported positively on training (Cavanaugh et al., 2013b; Cavanaugh et al., 2013a; Hargis et al., 2014), although others are critical (Donaghue, 2015).

Examples of teachers carrying out interventions include improving spelling for SEN students (Eden et al., 2012) and identifying appropriate MALL interventions (Jordaan, 2014), but regional interventions remain top down and management driven such as the 2012 iPad initiative.

Small-scale action research occurs, but needs teacher motivation and institutional support (Edwards & Burns, 2015), and perhaps small-scale interventions are not reported. Medgyes (2017) argues that teachers do not see academic research as relevant. They self-evaluate, modify and share, but not via academic writing. Perhaps lack of tenure and a clear research agenda (Copland et al., 2020; Garrett, 2009) mean that interventions are not being reported outside the immediate classroom or relevant department. Better educated and more professional ELT teachers (Hyland, 2019) is not translating into teacher-led, theory based intervention in academic research.

2.6 Change Laboratories and agency

There are examples of Activity Theory driven research in the UAE (Al Ali, 2020; Miles, 2020; 2021) but I was unable to identify any Change Laboratories. Recent Change Laboratory examples are not uncommon (Barma et al., 2017; Englund, 2018; Nleya, 2016) yet few are concerned with ELT (Mbelani, 2018; Montoro, 2016). Interestingly, Montoro (2016) reports that the triangles representing the activity system were not 'readily picked up by the participants' of a Change Laboratory involving English Language teachers.

In Change Laboratories, the participants should have agency in that they can act independently and have will and control over the direction the intervention takes. This may not, however, be the case. Change Laboratory research highlights the challenges when participants lack agency to make actual changes to practice (Englund & Price, 2018). Similarly, institutional neoliberal management practices may mean academics lack the agency to make improvements in educational institutions (Vähäsantanen et al., 2020). There is a struggle between academics and those in positions of authority (Di Napoli & Clement, 2014). Educational institutions are complex activity systems, and partnership and equality between academics and authorities is needed for the system to work effectively (Saroyan, 2014).

Even given the agency to make concrete changes, Change Laboratories do not guarantee a new model. Large amounts of time and commitment are required (Virkkunen & Newnham, 2013) and by their nature Change Laboratories are 'pilot units' (Bligh & Flood, 2015), limited initially to local exploration (Garraway, 2020).

2.7 The project aims

This project carries out a teacher-led, bottom-up intervention strongly rooted in theory at all stages of the research, from design to implementation to data analysis,

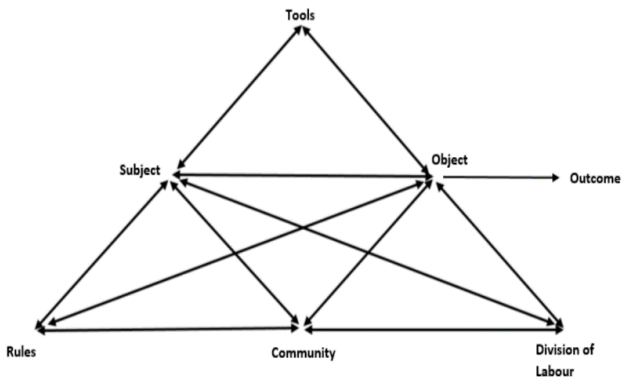
and aims to make collective improvements to teaching and learning in face-to-face laptop-mediated ELT classrooms. By identifying the contradictions potentially causing failure and attrition, and by proposing solutions to these problems, the aim is to create a new model for face-to-face laptop mediated teaching that may be more broadly applicable in contexts beyond this project, where both technology and English language are seen as key to improving education.

3. Activity theory

The Change Laboratory and CHAT are intertwined and cannot be separated, and 'understanding the theory-methods relation is crucial' (Bligh & Flood, 2015, p. 142). CHAT can be used for standalone analysis, but a Change Laboratory is in itself inseparable from the theory. Most modern Anglophone research utilizing CHAT is based on Engeström's third generation Activity Theory (1987/2015), which he summarises with 'the help of five principles' (Engeström, 2001, p. 136).

The activity system is the prime unit of analysis. All human activity is social, be it a small project team or a large organization. Whatever its size or scope, this can be represented by the activity system (Miles, 2020). The activity has an *object* with intended *outcomes*. The relationship between the *subject*—the group or individual—and the *object*, is mediated by *tools*. These can be physical, conceptual, or even more knowledgeable others. Subjects are part of a *community*, and this relationship is mediated by *rules*. The relationship between the *community* and the *object* is mediated by the *division of labour*. Ultimately, all the elements of the system are interrelated and have influence on the object of the activity. The activity system is usually represented as a triangle. See Figure 1.

Figure 1. The activity system (adapted from Engeström, 1987/2015)



Note that activity systems do not exist in isolation, and are 'always a node in a network of functionally interdependent activity systems' (Virkkunen & Newnham, 2013, p. 35). See Figure 2.

For a school, the object activity represents actual classroom teaching. The subject-producing activity relates to teacher training. Instrument producing activity is the production of textbooks, eLearning materials and so on, while boards of governors, school management and education authorities are involved in the activity of rule production. Culturally more advanced versions of the central activity also exist. For example, developing nations may look towards established education systems and use these as models on which to base and improve their own current practice.

Activity systems are separate, yet interdependent, and interrelated systems may share objects. Students and teachers, for example, partially share the object of knowledge creation, a goal one would hope is also shared by educational management at both local and national levels. This is represented graphically in Figure 3.

It is crucial to remember that although the activity system is the basic unit of analysis, it is not merely a 'static classification structure to depict the elements of an activity system' (Virkkunen & Newnham, 2013, p. 44). Research must consider the relationships between elements within the activity system and between related interdependent systems.

Activity systems are multi-voiced. Activity systems are collective, and populated by a variety of actors and voices. This multi-voicedness multiplies across the interacting activity systems increasing the complexity of activity systems analysis.

Historicity. In order to understand where we are now, we need to know where we came from. An activity system is the result of developmental, mediated action that has taken place over lengthy periods of time, and 'their problems and potential can only be understood against their own history' (Engeström, 2001, p. 136). Past and present cannot be separated.

The principle of contradictions. Activity systems have intended outcomes. The presence of an unintended outcome, for example high failure rates, signifies the presence of contradictions. Contradictions are disruptions in the activity system. These could be caused by the introduction of a new tool, new rules or a change to the object of the activity. In order to resolve the unintended outcomes, the contradictions need to be identified. Contradictions take place within or

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Figure 2. The activity system as a node in a network of activity systems (based on Engeström, 1987/2015)

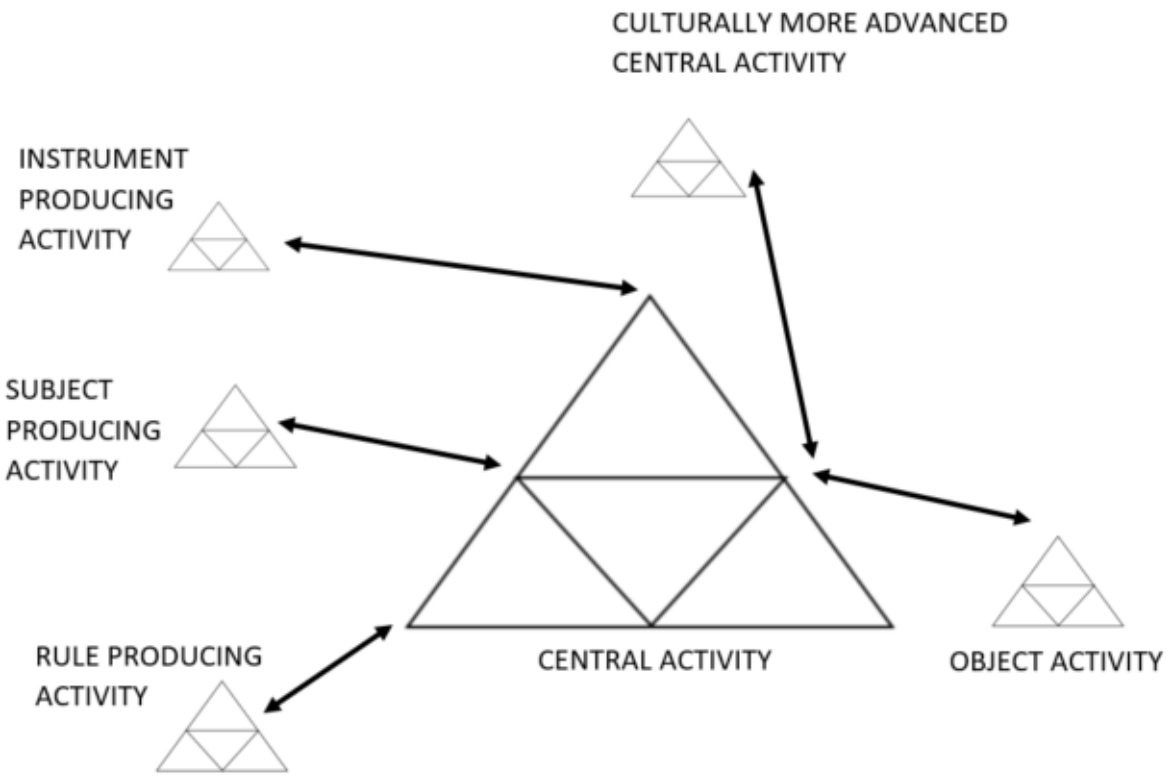
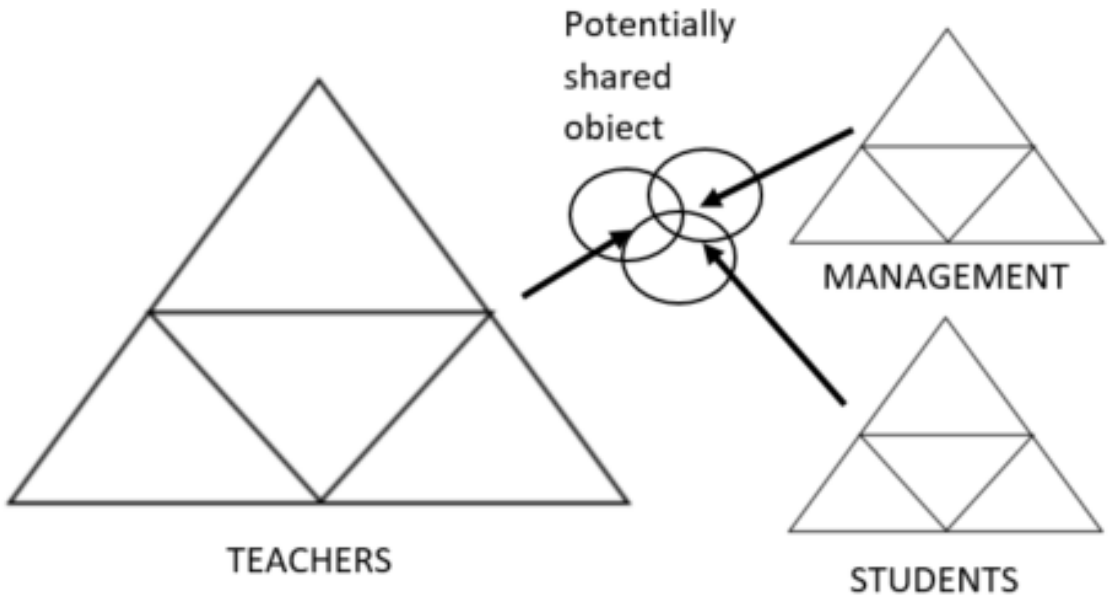


Figure 3. The activity system as a node in a network of activity systems (based on Engeström, 1987/2015)



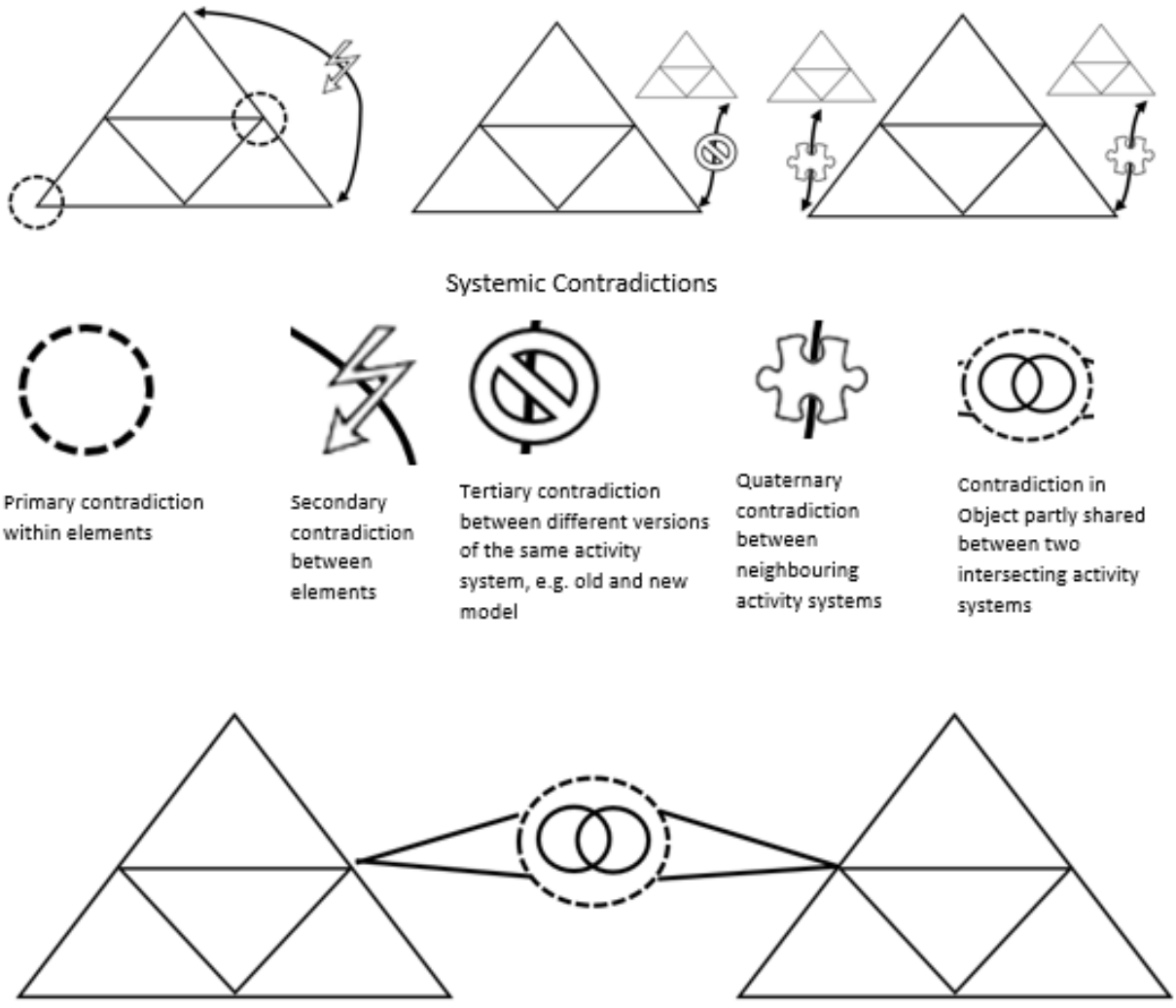
between activity systems. Systemic contradictions take four forms (Engeström, 1987/2015):

- *Primary contradictions* that occur within one element.
- *Secondary contradictions* that occur between elements.
- *Tertiary contradictions* occurring between systems and the attempt to apply a new model.
- *Quaternary contradictions* between neighbouring systems.

These contradictions can be visually represented in a form that is 'useful for Change Laboratory research-interventions' (Bligh & Flood, 2015, p. 152). These representations are displayed in Figure 4.

The possibility of expansive transformations. Activity systems are in a state of long-term qualitative transformation. Contradictions are identified, solutions are proposed and modelled, and finally a new model of activity emerges. This may take place collaboratively and collectively. The process of expansive learning occurs continuously as existing systems develop their current states. All activity systems are thus 'the offspring of historical systems, a culturally more advanced version of the previous system' (Miles, 2020). This process of expansive learning is commonly applied by researchers through direct intervention known as the Change Laboratory.

Figure 4. A graphical representation of systemic contradictions, based on Bligh and Flood (2015, p.152)



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3.1 The Change Laboratory

While expansive learning occurs naturally, the Change Laboratory is a deliberate intervention designed to foster change. A clear series of steps is followed in order to 'apply a Vygotskyan, developmental approach in real-world, collective, organisational settings' and 'render the process more directly *visible* to its participants' (Bligh & Flood, 2015, pp. 145-148).

The theoretical underpinning is a constant chain of double stimulation. In double stimulation (Vygotsky, 1978), the subject is given a task to complete (stimulus 1). They are then given a tool, an idea or more knowledgeable other (stimulus 2) to solve the problem. Learning then occurs in this *zone of proximal development*. The Change Laboratory is essentially the real-world application of double stimulation.

As *first stimulus*, the interventionist prepares 'mirror data'. This is data that demonstrates a problematic aspect of the current practice, and could consist of video, interview data, customer feedback and so on.

As *second stimulus*, the participants are given theories and concepts to help explain the mirror data. This will include the activity system model. Once the contradictions are identified, these form the next *first stimulus*, which the participants attempt to overcome by creating new rules, tools etc. (*second stimulus*) until a new model of the activity emerges.

This process of expansive learning is both a collaborative activity and agency building, while participants are both individuals yet collective actors. The central role of the actors means that the Change Laboratory is essentially different from other linear interventions.

In summary, the Change Laboratory is a theory-based and theory-driven intervention. It aims, through Vygotsky's double stimulation in combination with collective agency, to foster change in collective activity. The strong theoretical background and clear methodology give it the potential to change organisations, develop concepts and empower individuals (Bligh & Flood, 2015).

3.2 The case for the Change Laboratory

A Change Laboratory is a major commitment for participants and researcher-interventionist alike, as the 'exceptionally close alignment between ontology, epistemology, theory and methology' (Bligh & Flood, 2015, p. 166) necessitate understanding of unfamiliar concepts, new terms and language and potentially counterintuitive procedures. This is no small task, but is achieveable given commitment.

Other intervention methodologies exist, but lack the theoretical strength and agency of the Change Laboratory. Action research, for example, is less prescriptive and non-specific. Design based research (DBR) applies theories at different levels (Penuel, 2014 in Bligh & Flood, 2015) and lacks the agency central to the Change Laboratory. In the Change Laboratory, the researcher-interventionist is not the leader. Sessions are analysed (researcher) and subsequently designed (interventionist) but this dual role does not take charge of the intervention. Agency is given to the participants who make their own way through the cycle of expansive learning. In this project, the teachers are given the chance to make a difference from the bottom up.

The Change Laboratory allows abstract ideas to become concrete solutions. Concrete changes might make tangible differences to teaching and learning and most importantly, might increase the success of our students.

4. Research design and methodology

Change is not a simple process. Rather than applying externally mandated change or pre-determined solutions, a Change Laboratory seeks to redefine an activity and its object. New tools, rules and so forth may be developed, as might new interrelationships with neighbouring systems. A whole new activity system may emerge from the historical ashes of its predecessor. These are broad aims (Bligh & Flood, 2015) and requiring broad planning.

A Change Laboratory is not directionless. There are four key steps that require careful thought and consideration:

- *Step 1*: The location for the intervention must be decided, the work unit identified and participants selected.
- *Step 2*: The intervention must be designed in terms of scope, timings and a suitable venue.
- *Step 3*: Mirror data must be collected.
- *Step 4*: The actual sessions must be designed and implemented.

It is important to acknowledge that this is very much an *insider* Change Laboratory. I have been a member of the work unit under investigation for some years, and am currently still a teacher on the preparatory course. Being an insider to the research site presents several advantages. I am 'immersed in the organization and have built up knowledge

of the organization from being an actor in the processes being studied' (Brannick & Coghlan, 2007). I possess a level of pre-understanding that would take an external researcher a potentially prohibitive amount of time to acquire (Smyth & Holian, 2008 in Unluer, 2012). There are potential issues. Insider researchers might over-assume during interviews and consequently fail to probe, and must consider the duality of roles balancing institutional duties with research. There are also questions of power dynamics, especially when working with a group of peers. Peers may differ significantly in terms of age, gender, and ethnicity. Green (2014, p. 6) highlights the need for 'impression management to establish respect and avoid a power struggle with participants'. Any power differential needs to be minimalized, and the researcher-interventionists role as co-researcher, rather than leader, needs therefore to be emphasized. If this is indeed achieved would need to be investigated by an outside researcher.

However, in this case I decided the benefits of greater understanding, established intimacy and insider knowledge should outweigh the disadvantages and moved ahead in this role.

This insider knowledge greatly facilitated steps 1 to 3. For example, I was able to choose participants from a group of volunteers based on personal knowledge. Organizing a venue was also easy, and as an insider I had access to relevant mirror data via institutional data and the work unit prior to the intervention. This would not have been possible for an outsider. I was also able to schedule the Change Laboratory as training, and participants therefore received credit towards their annual professional development requirements.

The sessions were based around the seven stages of expansive learning (Bligh & Flood, 2015; Engeström, 2016):

- *Questioning accepted practice and wisdom*. Current accepted practices are rejected.
- *Analysing the situation*. The group investigates and represents the structure and history of the present situation.
- *Modelling*. A new model is proposed and potential solutions suggested.
- *Examining the new model*. The group works with the new model, either in discussion or practice, in order to understand it better.
- *Implementing the model*. The model is applied practically, becoming more concrete as this progresses.
- *Reflection and evaluation*. The group evaluates the new practice, critiquing and identifying further modifications.
- *Consolidation*. The group attempts to embed the new practice in a stable form.

4.1 Initial Mirror Data

The production of mirror data is a 'significant commitment for the researcher/interventionist throughout the intervention' (Bligh & Flood, 2015, p. 156). Mirror data is basically data that is presented to the participants as evidence of problems – contradictions – in the work activity. It can take various forms, such as documents and statistics as well as observations of actual practice. As an insider, I could gather mirror data from the institution portal, students and also teachers over a one-year period. The mirror data for session one is summarized in Table 2.

Table 2. Summary of mirror data sets

	Mirror Data Set 1	**Mirror Data Set 2**	**Mirror Data Set 3**
Source	Published pass results over three academic years (gathered from the institution portal)	Online survey (administered to students)	Focus groupsInterviews to the doubleClassroom observationsEmail interviews(Miles, 2018; Miles, 2021)
Stakeholder voices	Management / the institution	Students	Teachers
Summary	Actual pass rates are much lower than published pass rates	Students report behaviour and attitudes that contrast sharply with data set 3	Teachers report a number of issues with students, behaviour and the use and deployment of technology

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The purpose of mirror data is to provide evidence of the problem. The three data sets are extensive and clearly demonstrate the presence of contradictions. The data is longitudinal, having been gathered over a one-year period, and representative. The key stakeholders are involved, and the mirror data is thus multi-voiced, reflecting the activity system's community of multiple viewpoints.

4.2 Carrying out the Change Laboratory

The collection of mirror data is an ongoing task. A second stimulus in one meeting may become first stimulus in the next session, and so on. The sessions need to be transcribed, analysed and the mirror data identified so that the next set of stimuli and tasks can be prepared. This is a major commitment for the researcher-interventionist.

The Change Laboratory basically consists of 6 main phases (Figure 5). Note that these phases do not correspond to single meetings. One phase may consist of several individual sessions. Similarly, the process is not necessarily one direction, and phases may be cycled back to as needed or combined.

The process is facilitated through the use of surfaces, the 'central tool of the Change Laboratory' (2007, p. 2). Engeström advocates the use of three sets of surfaces, one to represent the present, one the past and one the future (Figure 6). Essentially, the surfaces represent the mirror to present the first stimulus, a presentation space for the second stimulus, and a working area for the group to discuss ideas and solutions in the third, central space. Engeström recommends the participants should be set facing the surfaces, and a scribe should be assigned to take minutes of the meeting. While a session typically starts in the right-hand panel, participants do not need to rigidly progress from right to left. Discussion typically moves between all three panels in both directions.

Figure 5. Phases of the Change Laboratory adapted from Engeström et al. (1996, p. 11)

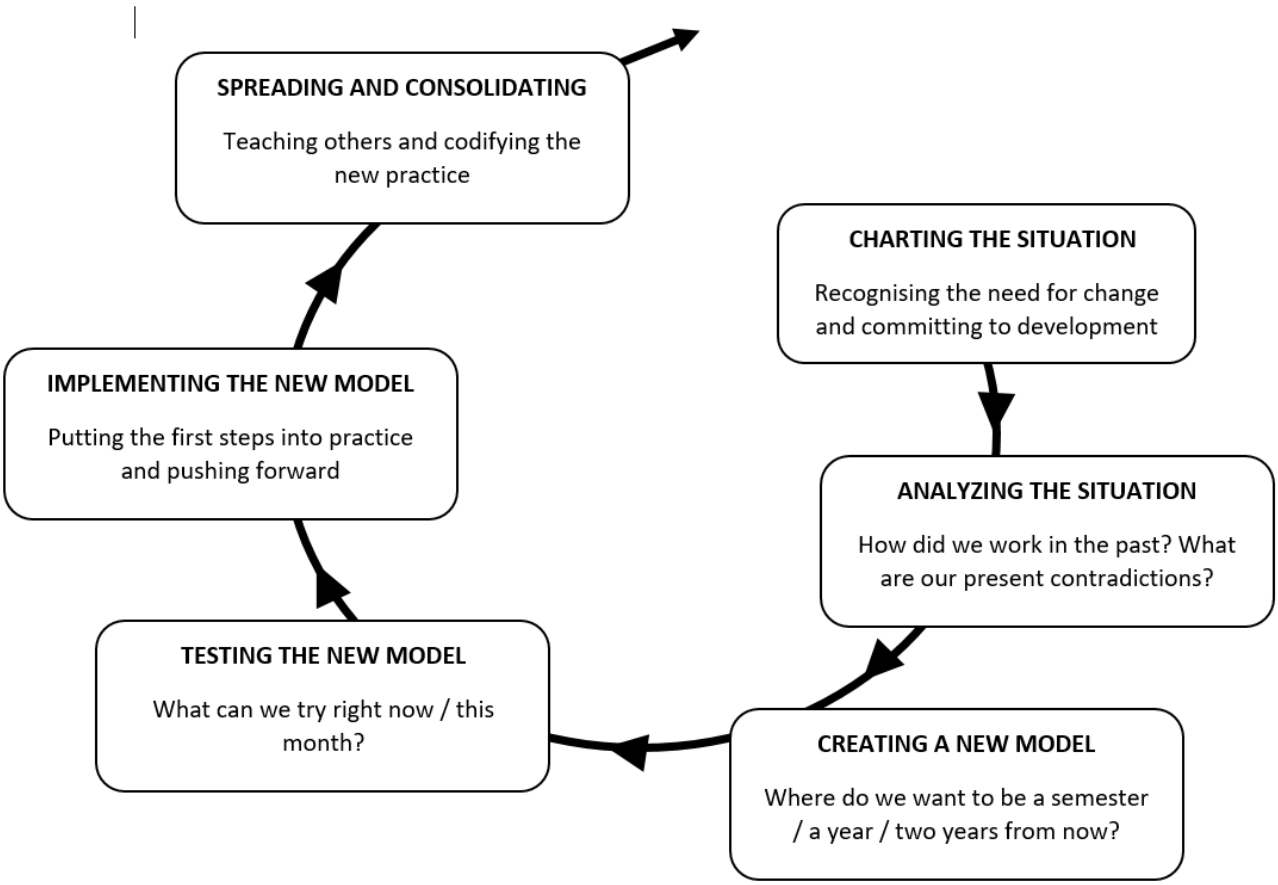
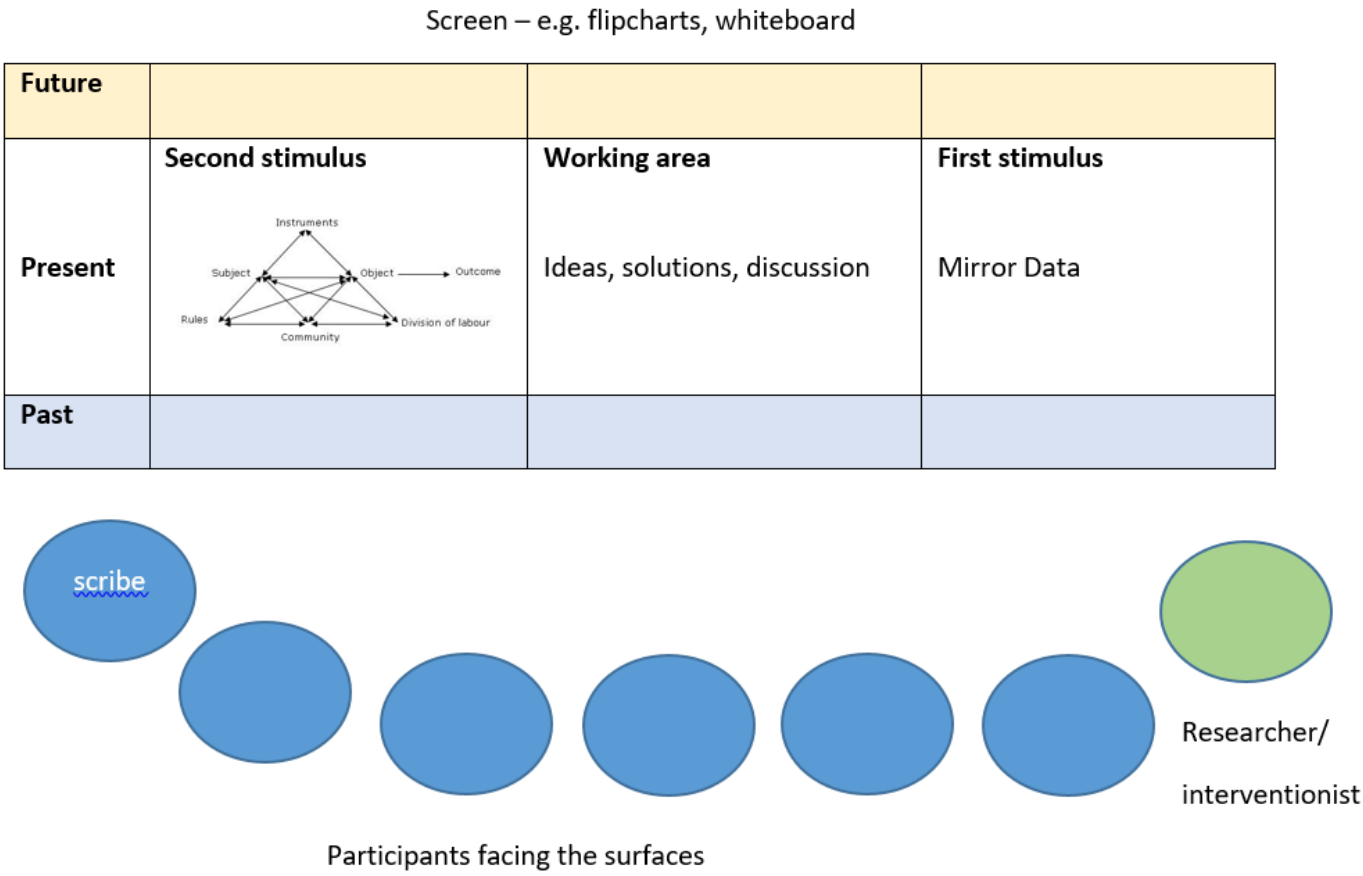


Figure 6. A representation of a session adapted from Engeström (1996, p. 3)



A set of surfaces was used throughout the Change Laboratory. The venue for the sessions was a standard classroom with a Smart screen which was used to display the surfaces on Microsoft OneNote. Engeström suggest sessions are video recorded, but this was impossible due to cultural sensitivities. However, the sessions were audio recorded. While the role of scribe was assigned initially, it was later dropped as the role prevented the scribe from actively participating.

Post-session the meeting was transcribed and initial coding to elements of the activity system took place using nVivo. This initial coding formed the basis of analysis for planning the subsequent meeting. These steps of transcription, coding and planning took place after each session. It is very true that 'Change Laboratory interventions generate voluminous data' (Bligh & Flood, 2015, p. 158). The collection of mirror data, both prior and during the intervention, combined with the transcripts has indeed created a deep pool of data for the researcher/interventionist that is not only voluminous but also high-yielding.

Sessions took place at fortnightly intervals during one academic semester, summarized in Table 3.

The surfaces were used throughout. The 'completed' surfaces can be seen in Figure 7.

4.3 Following up on the sessions

Following the project, all participants completed a short survey approximately 4 months after the project had concluded. Planned classroom observations were planned but prevented, by the move to online classes necessitated by COVID19.

4.4 Issues

The Change Laboratory is a major commitment, both for the participants and the researcher/interventionist. Participants need to commit considerable time to attending the sessions and planning and modelling activities all the while grasping complicated theory. The theory is in fact the first

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Table 3. Summary of Change Laboratory Sessions

Session	First stimulus	Second stimulus	Comments
Charting the situation	Mirror data gathered from Institutional pass rates Student survey Teacher interviews and focus groups	Activity system mode	Discussion took time to gather momentum but eventually flowed freely.
Analysing the situation	Timeline of English preparatory course	Activity system mode	Participants struggled to use CHAT terms but were more comfortable with their own language.
Continuing to chart and analyse the situation	Meeting 1 coding hierarchy chart Meeting 2 historical activity system model	Activity system mode	Role of scribe abandoned as this was seen to prevent participation. Following this session, a model of the current system and contradictions was created.
Creating a new model	Current activity system model	Activity system mode	Enthusiastic participation although again not using the theoretical language. Solutions began to be proposed.
Creating and testing the new model	Local future activity system model Institutional future activity system model	Graphic of language points	Participants began to describe experimental practices proposed as solutions.
Testing and implementing the new model	Emerging ideal activity system model	Graphic of language points	The emerging new model was discussed, and solutions continued to emerge.
The new model and continued challenges	Continued discussion of emerging ideal activity system model	Graphic of language points	This final session concentrated on continued challenges.

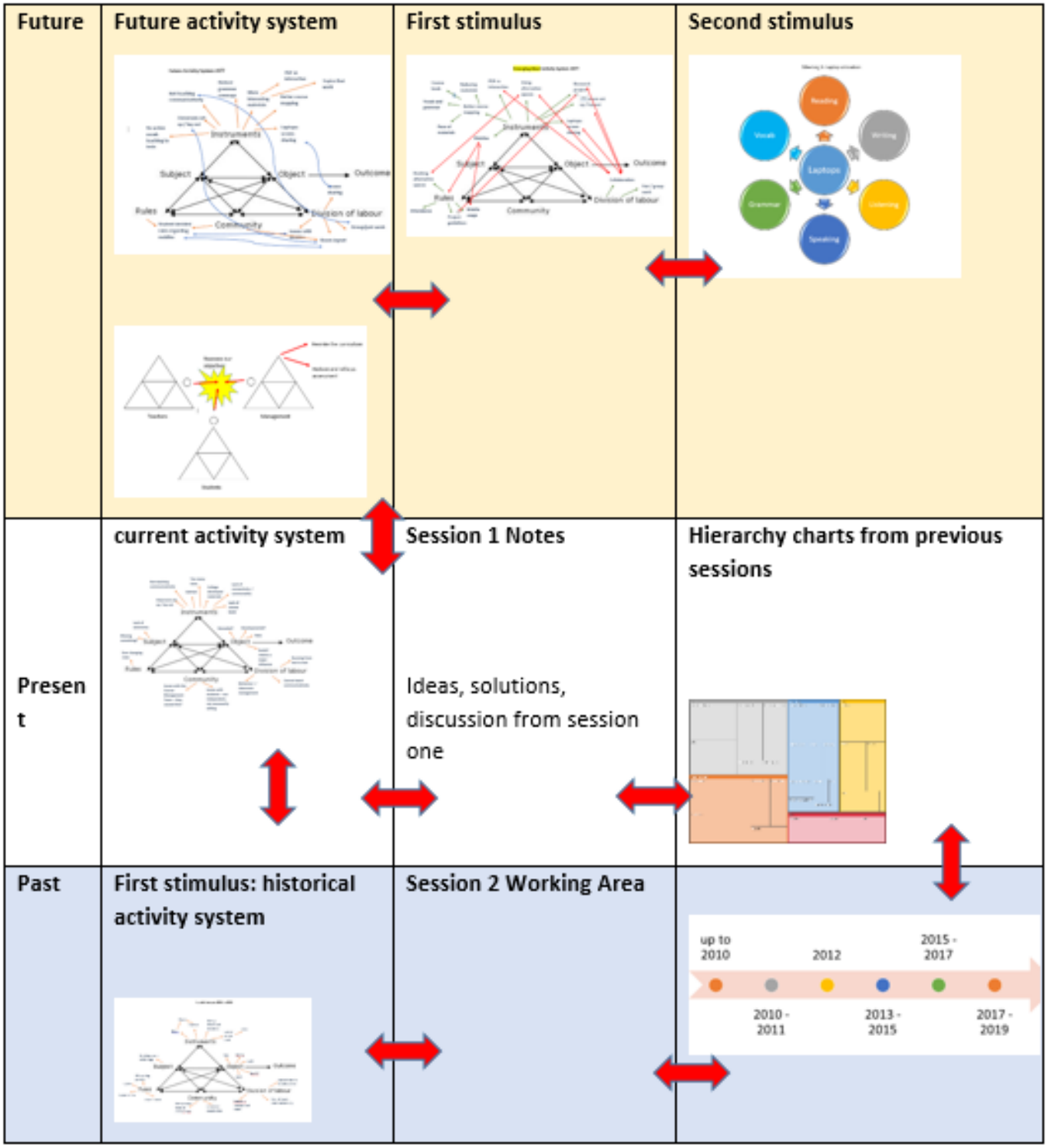
main issue – the participants readily gave up their time but did not readily embrace the language of Activity Theory or the Change Laboratory, preferring to use their own familiar terminology. The second issue concerns time. This has been a massive undertaking for the researcher-interventionist. To transcribe and plan sessions in a short two-week window, given other commitments, has been a major challenge. However, the findings, and the potential concrete changes that may result, have made the hard work and commitment worthwhile.

5. Findings: New models of activity and subsequent contradictions

The Change Laboratory was able to identify a number of contradictions and their historical antecedents. These fall into four main areas:

- Issues with the tools in use.
- Issues with the nature of the course.
- Issues with participant attitudes.
- Issues with neighbouring systems.

Figure 7. Completed surfaces



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These contradictions are not described or discussed in detail in this paper, and I will focus instead on attempts to provide solutions. It is not enough to simply describe and interpret the world. The point is to change it – this is the aim of the Change Laboratory. Having identified these potential causes of failure and attrition, the Change Laboratory sought to propose and model solutions, where possible, leading eventually to a future model of activity. Attempts to apply new models of activity often lead to further contradictions. This is expected, and even desirable. I will briefly summarise these solutions before moving on to describe the subsequent contradictions.

5.1 Solutions

A number of solutions were proposed and modelled. Some were only proposed, while others are emerging. These are summarized in Table 4.

The introduction of new models proposed by these solutions leads to actual and potential contradictions.

5.2 Issues with the tools in use

The participants proposed and modelled a number of solutions related to issues with the tools in use.

5.2.1 Interactive materials vs simple documents

In order to use devices effectively, interactive material such as games and other applications works best with self-study in this context. However, the khallas[2] mentality can occur. Students click mechanically until they find the correct answer rather than engage with the task. Learning does not occur. For example,

> Teacher 6: [with interactive materials] you know if it's multiple choices, you know, click, click, click, click tell me the password

Similarly, overuse of a popular application leads to application fatigue. What is exciting today loses its lustre if overused. This is reported particularly for online quiz platforms. In one case, even the background music is a source of conflict, for example,

> Teacher 2: [that background music} Oh, it does drive you mad, doesn't it?

It is therefore important to

> Teacher 5: [you have to] mix it up

2 Khallas is Arabic for finished

Table 4. Summary of solutions

Contradictions	Solutions	Status
Issues with the tools in use	Effective Device UsageInteractive material for self-study and discrete pointsAvoid over-use of one applicationUse simple documents where deeper learning is requiredExploit the teacher as more-knowledgeable other	Proposed and modelled
	Different Devices, Different PurposesExploit laptops for writing (discussion boards etc.)Let students set rules for mobilesUse mobiles as a second deviceIntroduce paper as a novelty	Proposed and modelled
	Space, Deployment and PedagogyEmploy alternative room layoutsMaximise pair and group workClose laptops when giving instructionsShare laptops in different constellations of students (device deployment 1:2, 1:4 etc.)Use alternative spaces on campus, e.g. library, café, etc.	Proposed and modelled
Issues with the nature of the course	Redesign the curriculumMove from being a remedial course to a developmental oneGet teachers to design the courseRelate assessments to course content	Proposed and modelled
Issues with participant attitudes	Create new subject making activity systemConcentrate on pedagogy rather than just technical skills	Emerging, not proposed
Issues with neighbouring systems	Not directly addressed	Emerging, not proposed

The participants found more learning occurs when simple text documents are used. A PDF, for example, forces students to engage with the material and reintroduces the concept of teacher as more knowledgeable other. Rather than guide on the side there is room for the sage on the stage. A simple PDF or Word document can be worked with in much the same way as a piece of paper, for example highlighting and annotating, and could perhaps therefore be a more effective teaching tool.

> Teacher 6: With a Word document at least we can go over each question together rather than seeing they've been given the answers to everything straight away.
>
> All: Yeah

5.2.2 Different devices for different purposes

Another solution suggests that different devices can have different purposes. Mobile phones are a major source of conflict that divide the subjects. One solution proposed and modelled is to use mobiles as a second classroom device. Students can record voice notes to complete tasks, for example,

> Teacher 8: They upload it to Blackboard…and then we can listen to it together. That worked quite well and they really liked it

Students can also use mobile phone cameras to script and create short dialogues. Cultural issues prevent students filming each other, so they use puppets instead. For example,

> Teacher 7: They can script dialogue…and they have like stick puppets and they get the stick puppets to talk to each other and they film that

This is an excellent example of emerging new practice, shown in Figure 8.

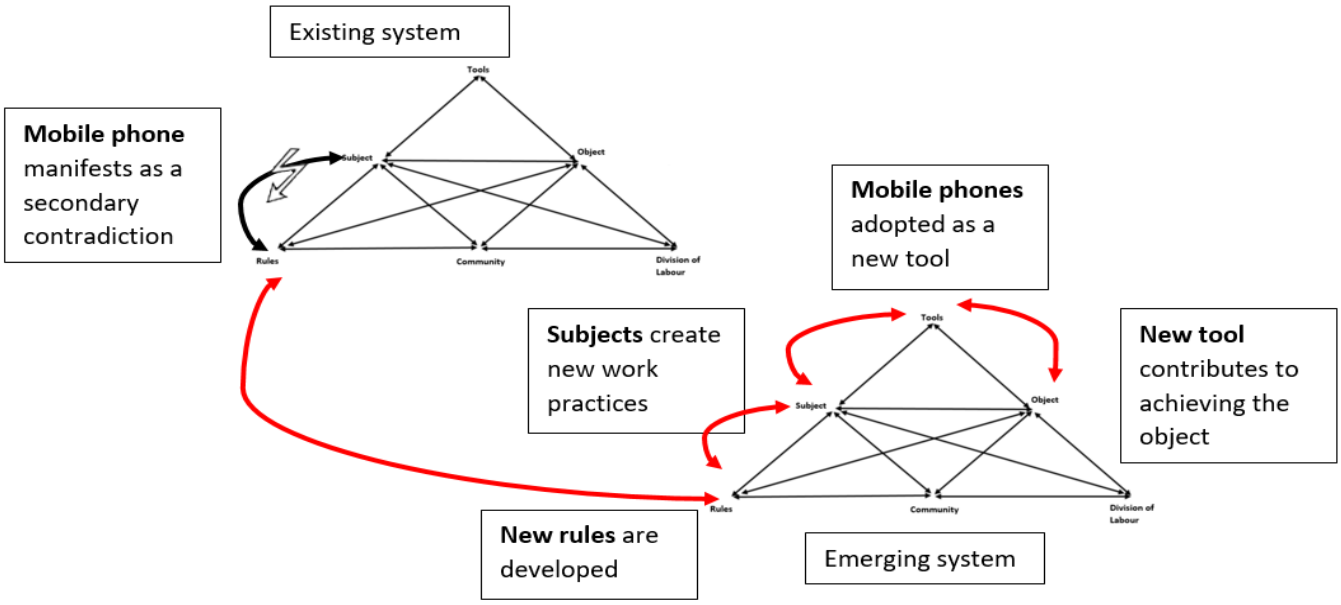
However, this solution was not universally popular among the participants, and is likely to manifest as multiple quaternary contradictions with the wider group of teachers over their use and rules concerning this.

5.2.3 A return to paper

Participants also suggest introducing paper occasionally to change the class dynamic away from screens. For example,

> Teacher 2: Because you get up, walkabout, and there's also the illusion of fun with…they like it when you give them a bit of paper, they think they're gonna do something fun.

Figure 8. Adoption of mobiles as a classroom device



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However, this is likely to cause a quaternary contradiction with the wider community. Parents who have bought expensive laptops expect these to be utilized, and other stakeholders touting the paperless environment are likely to be resistant.

5.2.4 Pair and group work

Pair and small group work are central features of Communicative Language Teaching and participants recognized the traditional set up of classrooms hindered this. Alternative layouts were modelled. Two examples are shown in Figure 9.

However, other teachers, cleaners and students rearrange the desks back into rows at every opportunity. Classrooms are used by other teachers and students, and as a consequence,

> Teacher 2: We've had them in nice groups and they all just get moved back.

> Teacher 7: Because we don't have our own classrooms

This is a tertiary contradiction between attempts to apply a new model and a quaternary contradiction between activity systems.

5.2.5 Device deployment

To facilitate pair and group work, faculty also deploy devices differently. Laptops are shared between pairs (1:2) or between small groups (1:3 or 1:4) to facilitate communication.

> Teacher 4: Two girls sharing one laptop and it works. Yeah, they were both into it. They were both communicating a lot and there were better results.

However, students in this context do not naturally work well together, for example,

> Teacher 3: If you group them, you would have people left out

And

> Teacher 6: Some of them don't seem to care about the person sitting next to them and not have any interaction

This is manifesting as a quaternary contradiction over division of labour.

5.2.6 Alternative spaces.

In addition, the participants have experimented with using alternative spaces to engage students. For example, teachers have tried to book learning spaces in the library and other common areas. These attempts have stalled – college rules state such spaces must be booked, but no system exists for teachers to book them. This manifests as a Kafkaesque quaternary contradiction.

In summary, attempts to propose and model solutions to issues with the tools in use have met with some success but have also seen further contradictions emerge. These are summarized in Figure 10.

Figure 10 also reinforces that the current activity system is part of a complex network of interrelated systems.

Figure 9. Alternative layouts

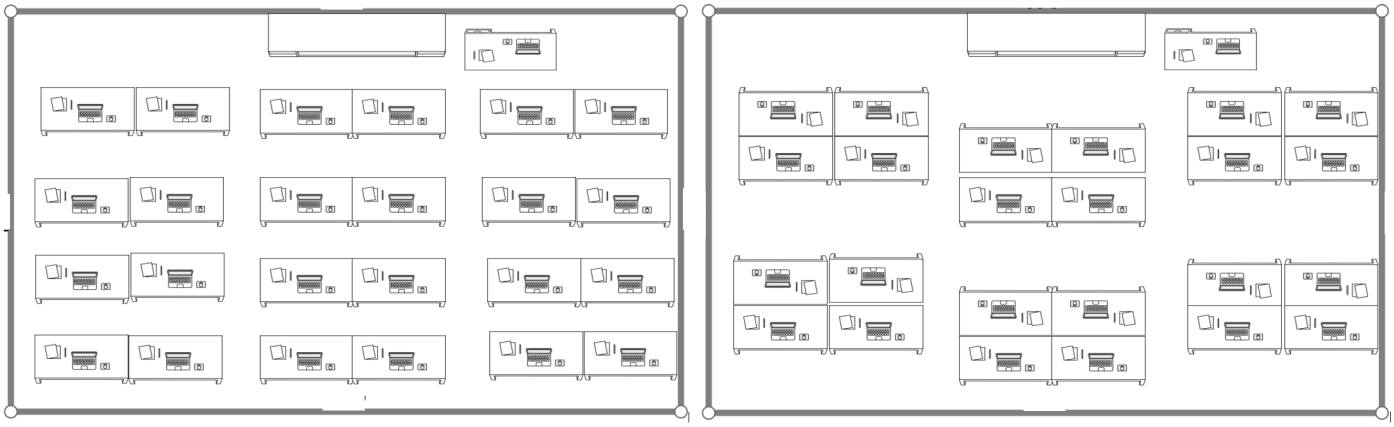
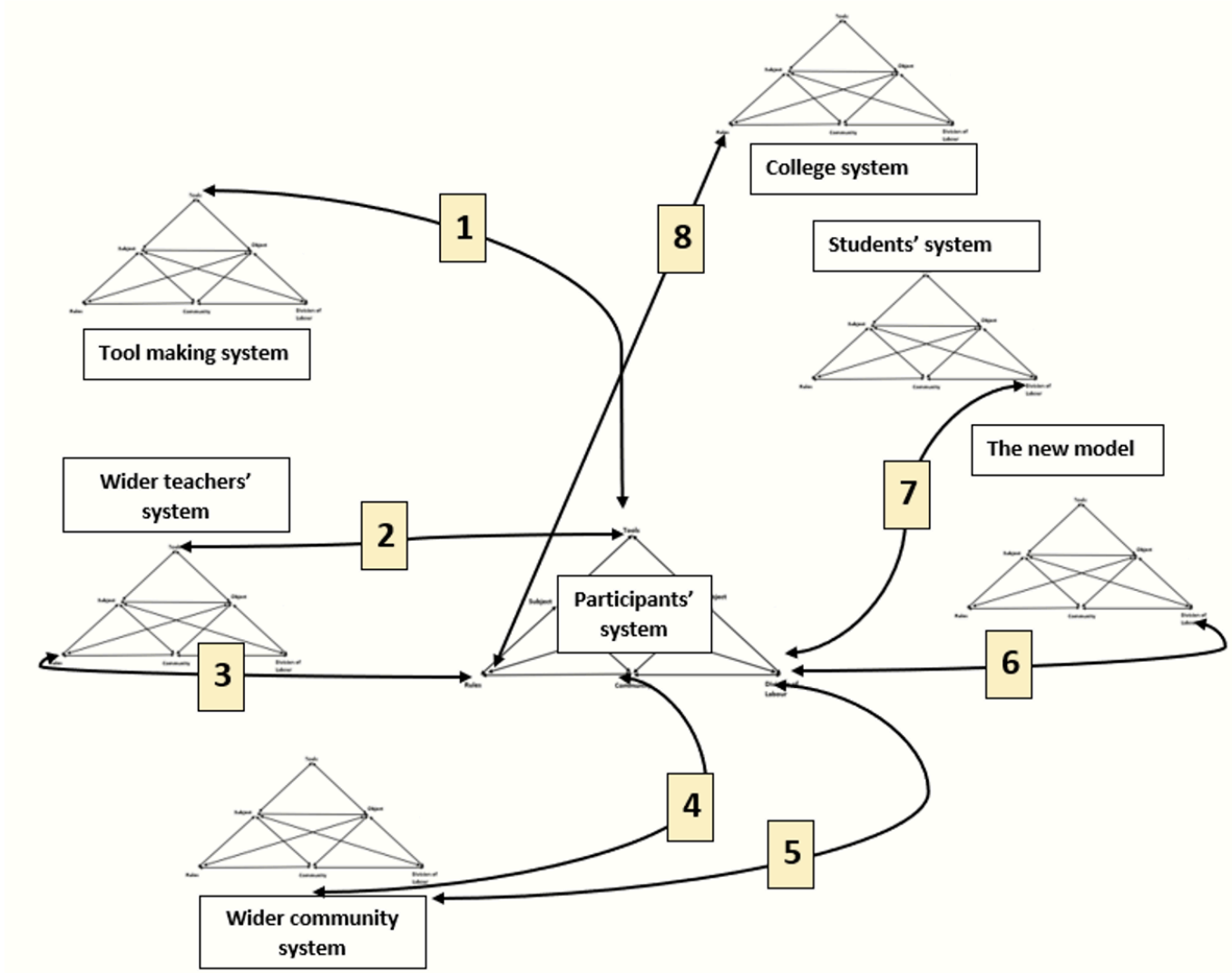


Figure 10. Summary of contradictions linked to solutions to issues with the tools in use



Key:

1. Quaternary contradiction related to PDFs vs interactive material
2. Quaternary contradiction related to mobiles as a second device
3. Quaternary contradiction related to rules of mobile use in class
4. Quaternary contradiction related to using paper in class
5. Quaternary contradiction related to resistance to implementing new classroom layouts
6. Tertiary contradiction related to implementing new classroom layouts
7. Quaternary contradiction related to pair and group work
8. Quaternary contradiction related to booking alternative spaces on campus

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5.3 Issues with the nature of the course

While issues with the tools in use have seen solutions proposed and also modelled, issues with the nature of the course have remained at the proposition stage only. The participants propose a complete redesign of the course, along with its assessments. This redesign would likely mean conflict with the management activity system, manifesting as a quaternary contradiction shown in Figure 11.

However, if redesign were to take place on the participants' terms reconciliation between these two activity systems might begin.

5.4 Issues with participant attitudes

Where the participant attitudes are concerned the solutions have been technology based with paper as an exception, but Teacher 3 expressed a strong preference for paper in almost every session. See Table 5.

Figure 11. Quaternary contradiction over course redesign

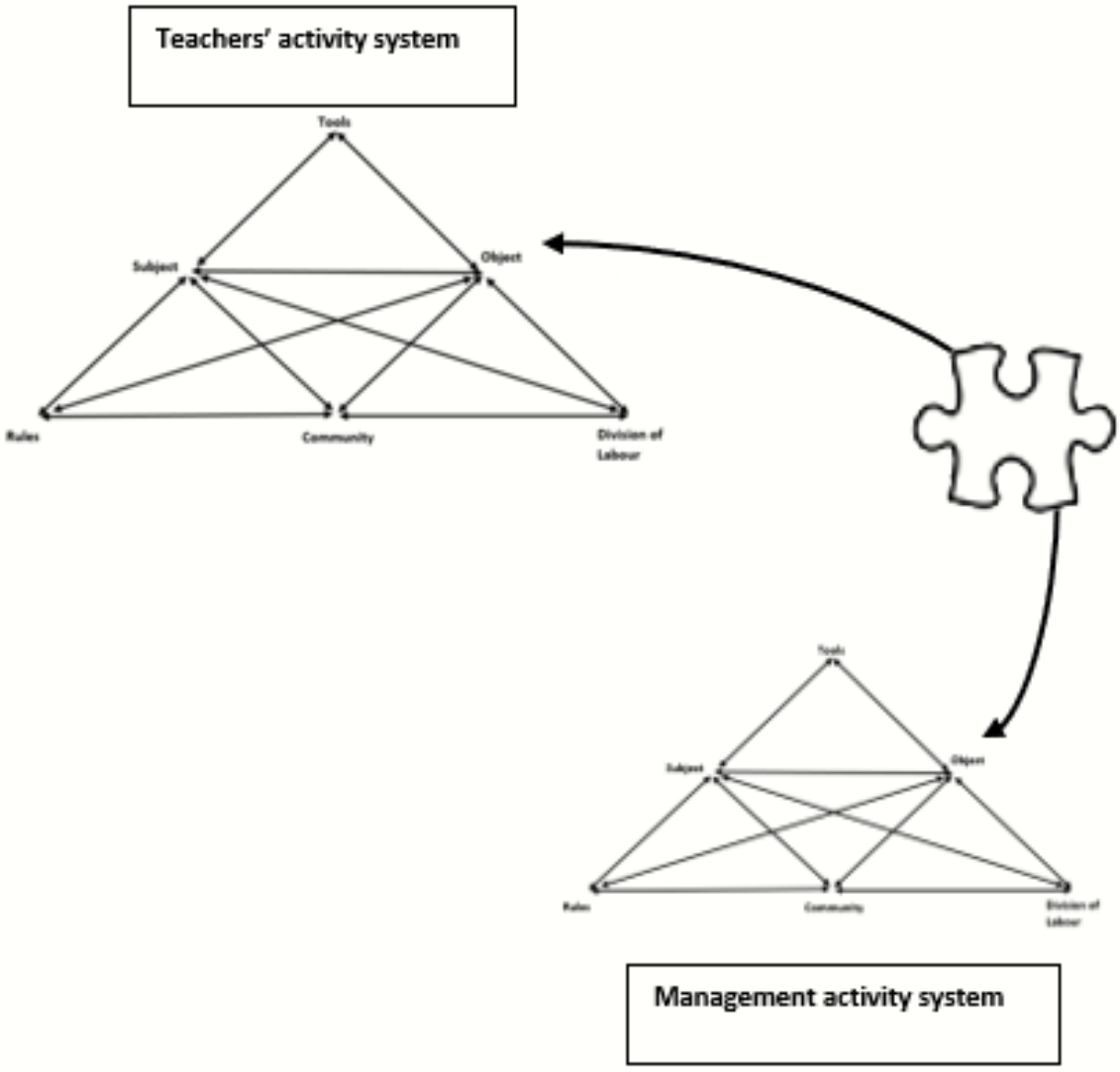

Table 5. Preference for paper

Meeting 1	I really love traditional paper.
Meeting 2	And we couldn't have papers…we were threatened not to use paper
Meeting 3	…they're still not learning the key skills that we were supposed to teach them. Like, for example, scanning, skimming, you can't do that on screen, or the writing. Their hand-writing is terrible. And we're making it worse, basically, with the laptop.
Meeting 4	I find it very nice to have a paper and a pen
Meeting 5	I like papers.
Meeting 6	they had a paper in front of them, which is good

This is a small study, and one cannot generalize that this one participant's feelings is generalizable to the teaching community as a whole, but it cannot be ignored. There are likely to be a number of teachers who agree with this participant. The solution lies in the neighbouring subject making activity system. We need to train teachers why to use technology and how to use it *effectively*. This represents a return to pedagogy not just in teaching but also training. See Figure 12.

Contradictions would likely emerge if this revised training model is adopted.

5.5 A future model

By combining the solutions and subsequent new models of activity it is possible to arrive at a proposed future model (Figure 13). This model is *proposed*. Time and development – and the solving of further contradictions as they occur – would be necessary in order to make this a concrete activity system. This model focusses on the state-of-the-actual and aims to make tangible differences to teaching and learning, and consequently increase student success. That must remain the aim of any change.

This new model is the result of the solutions proposed and also those *emerging* less directly. It must also be reiterated that this is an emerging system and is not a final, definitive activity system. While the solutions relate to ELT the ideas and principles should be applicable to other laptop-mediated classroom environments.

Figure 12. Effective teacher training

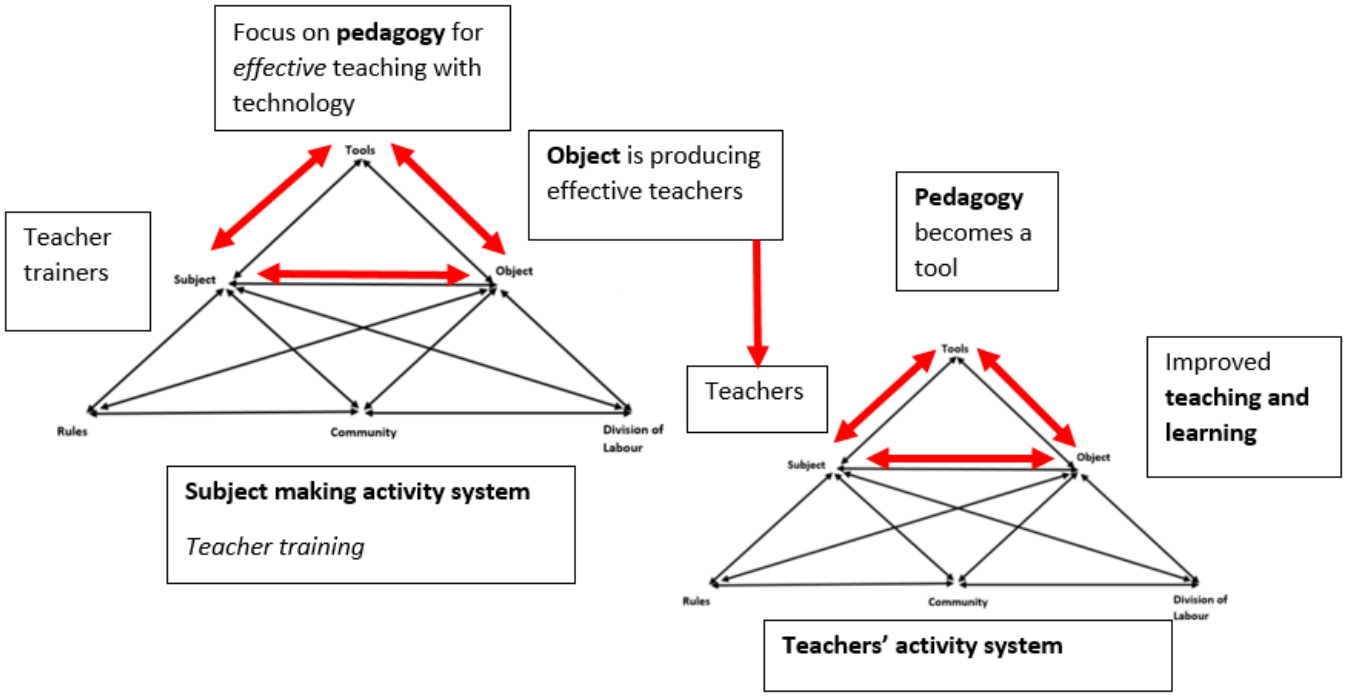

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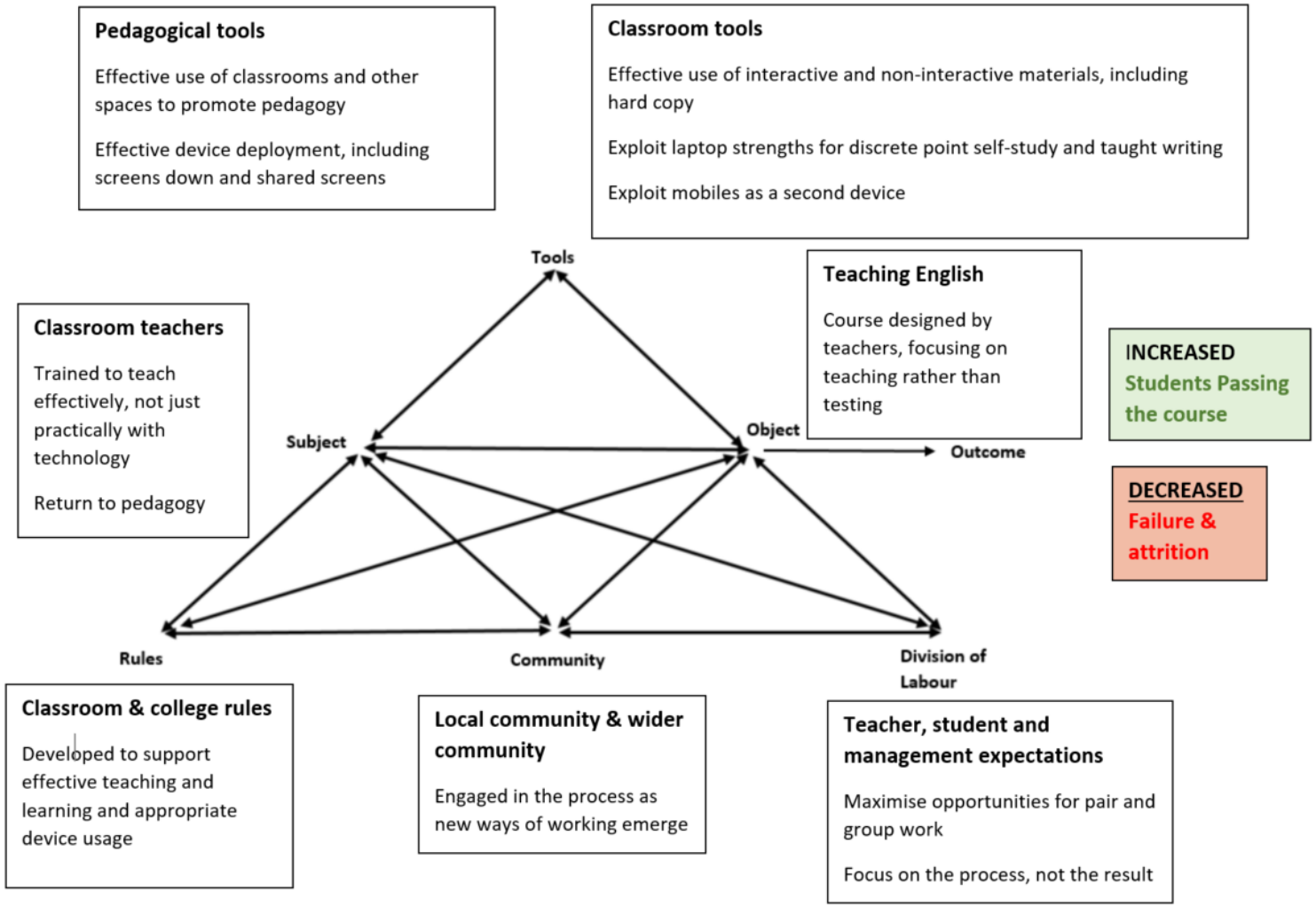
Figure 13. The future model



5.6 Contradictions within the Change Laboratory

Over the course of the Change Laboratory a number of contradictions emerged within the methodology itself. These might be specific to this particular context, but three are worth noting.

Firstly, Engeström (1996) advocates the use of a scribe to make notes and record the meeting. However, this effectively excluded one participant from the discussion, so was dropped from Session 3 onwards. This manifests as a primary contradiction in the rules. Secondly, the participants were reluctant to use the language of Activity Theory when discussing the contradictions and creating models. This is not a major problem as the researcher-interventionist can apply the theory in analysis, but nevertheless this manifests as a secondary contradiction between subjects and tools. Finally, a Change Laboratory is a massive undertaking for one researcher-interventionist. To gather mirror data, transcribe and design subsequent sessions is a major commitment and a potentially prohibitive amount of work. This manifests as a primary contradiction in the division of labour. These are mapped to the activity system in Figure 14.

The findings will now be discussed.

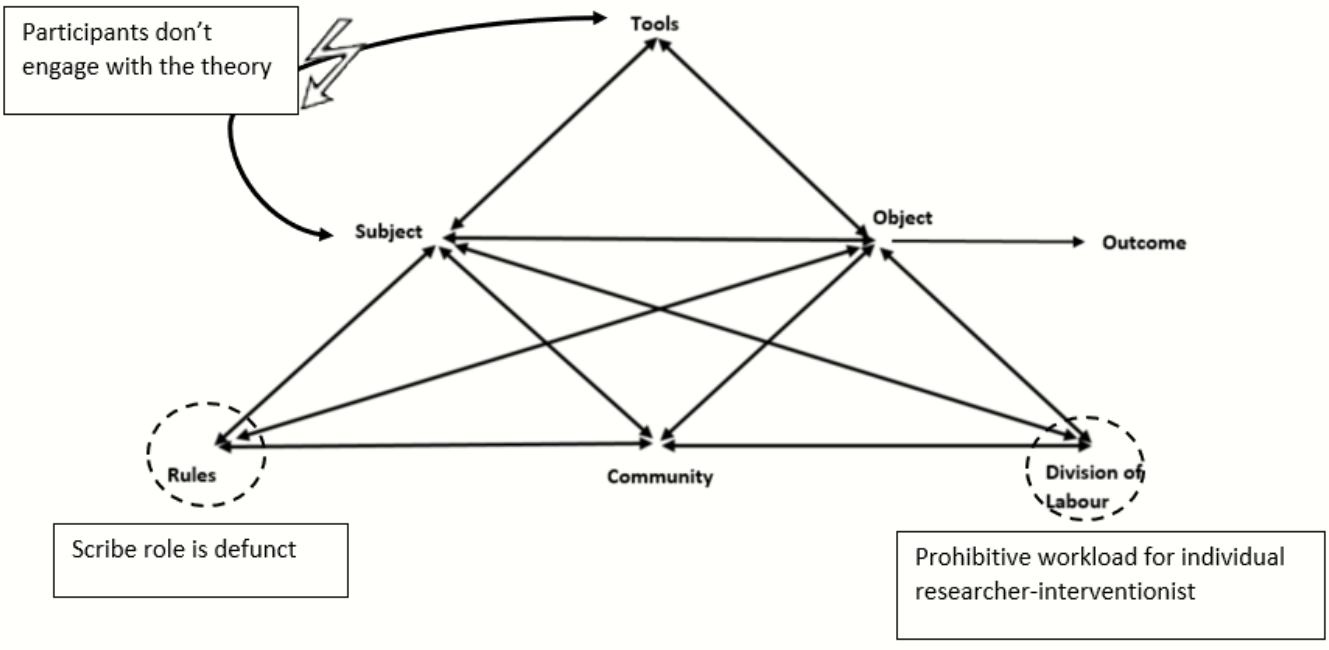
6. Discussion

The English preparatory course is clearly in 'the vanguard' (Levy, 1997, p. 3) of computers in education, with laptop-mediated technology rich Smart classrooms. Yet this state-of-the-art environment sees large numbers of students failing, a situation this Change Laboratory has sought to address. The principles of CHAT applied through the Change Laboratory methodology have highlighted a complex combination of contradictions that may be contributing to student failure and attrition.

An activity system develops historically, and the preparatory course is no different. The 'battle cries and costumes of our ancestors' (Marx, 1852/1979, pp. 103-104) are still heard today, and current issues 'can only be understood against their own history' (Engeström, 2001, p. 136). The Change Laboratory identified a number of historical contradictions that manifest currently in four areas:

- Issues with the tools in use.
- Issues with the nature and object of the course.
- Issues between the subjects.
- Issues with the neighbouring activity systems of students and management.

Figure 14. Contradictions within the Change Laboratory



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Activity Theory and the Change Laboratory methodology have allowed for the identification and classification of historical contradictions and their current manifestations. Without identifying the problems, it is impossible to apply solutions.

6.1 RQ1: What contradictions occur within the process of expansive learning as the participants attempt to apply solutions?

The proposed solutions, rather than the contradictions they seek to resolve, are the focus of this paper. It is worth mentioning that participants were able to propose *and model* solutions where they had most agency – in the classroom. The fact that other solutions remain unmodelled points back to the fractured nature of the teacher-management relationship and the challenges of lack of agency (Englund & Price, 2018).

Contradictions are both expected and desirable when attempting to implement Engeström's fifth principle of expansive learning (Engeström, 2001). Mirror data is designed to highlight contradictions, which are then resolved, yet this resolution leads to further contradictions as new models of activity are attempted. This Change Laboratory has been no different.

While some research cites the benefits of devices in ESL (Grimes & Warschauer, 2008; Park & Warschauer, 2016) and for UAE students (Mokhtar et al., 2009; Raddawi & Bilikozen, 2018; Tubaishat & Bataineh, 2009) the contradictions manifesting in *issues with the tools in use* suggest a less positive impact. Devices are ubiquitous (Cook & Das, 2012) but this is not translating into successful learning. The proposed and modelled solutions to *issues with the tools in use* provoke a number of contradictions. The assertion that simple text documents allows teachers to return to the scaffolding role of more-knowledgeable other (Vygotsky, 1978; Wood et al., 1976) represents a return to pedagogy and the palette of modern ELT (Larsen-Freeman, 2012; Rodgers, 2001) but will conflict with those creating interactive materials even though the *khallas mentality* and *application fatigue* suggest sustained or effective usage of such materials is indeed low (Blume, 2020; García Botero et al., 2019; Loewen et al., 2019). *Occasional* use of paper will likely clash with those who favour a paperless environment or have bought expensive devices, although the participants are not in favour of bans and recognise the reality that devices are here to stay. Similarly, adopting mobile phones as second devices caused a rift between the participants and will likely do so among the wider teaching community, yet the reality is they are in class already. We should accept this (Marinagi et al., 2013). This is perhaps evidence of an anti-device backlash (Fried, 2008). Devices are a distraction (Awwad et al., 2013; Genena et al., 2019; Miles, 2019) but the subjects remain divided on how to manage this.

Solutions proposing new classroom layouts and different constellations (Andersson et al., 2016) of students are designed to maximise opportunities for pair and group work. This facilitates language learning (Dobao, 2012; Dobao, 2014a, 2014b; Dobao & Blum, 2013) and shared meaning construction through dialogue (Swain, 2000, 2006), a return to communicative language teaching (Richards, Jack, et al., 2001; Richards, 2005; Richards & Rodgers, 2014). Similarly, usage of alternative college spaces can distance classes from traditional, non-communicative rows of tables. However, this is already causing contradictions as teachers and students are conditioned to traditional layouts, students are resistant to pair work and systems for booking spaces do not exist. These contradictions are an opportunity rather than an obstacle. If identified, solutions can be proposed, and with more time resolution will be possible.

As we have seen, *issues with the nature of the course* require complete restructure, and the issues with management (Di Napoli & Clement, 2014) and lack of agency (Englund & Price, 2018; Vähäsantanen et al., 2020) combined with lack of tenure (Garrett, 2009) contribute to a challenging quaternary contradiction that lacks obvious resolution. Teachers have perhaps lost the meaning of their activity. The long shadow of the behaviourist focus on individual learning (Berns et al., 2016) is clashing with the reality of trying to teach communicatively in face to face laptop-mediated classrooms. This is an area outside the plurality of current CALL research (Tafazoli et al., 2019) and deserving of further investigation.

A final solution relating to *issues between the subjects* again returns to pedagogy. Training has focussed on practical usage of technology (Cavanaugh et al., 2013b; Cavanaugh et al., 2013a; Hargis et al., 2014) and has not always been favourably received (Donaghue, 2015). The proposed creation of new *subject making* activity system is not radical and is achieveable and deserves further attention.

No solutions to *issues with neighbouring activity systems* were proposed or modelled. A complete overhaul of the system would likely be needed. Teachers may be more professional (Hyland, 2019) but lack the security of tenure (Garrett, 2009) and are thus unlikely to challenge the status quo. Teachers lack agency (Vähäsantanen et al., 2020) and are clearly in conflict with authority (Di Napoli & Clement,

2014). The gulf between teachers and management is worrying and worthy of further investigation.

The proposed future model remains tentative, and would need time - and further, as yet unidentifed, contradictions would need to be overcome. This new model would sit within a revised network of related systems, shown in Figure 15.

6.2 RQ2: What contradictions occur within the Change Laboratory methodology that are not related to expansive learning?

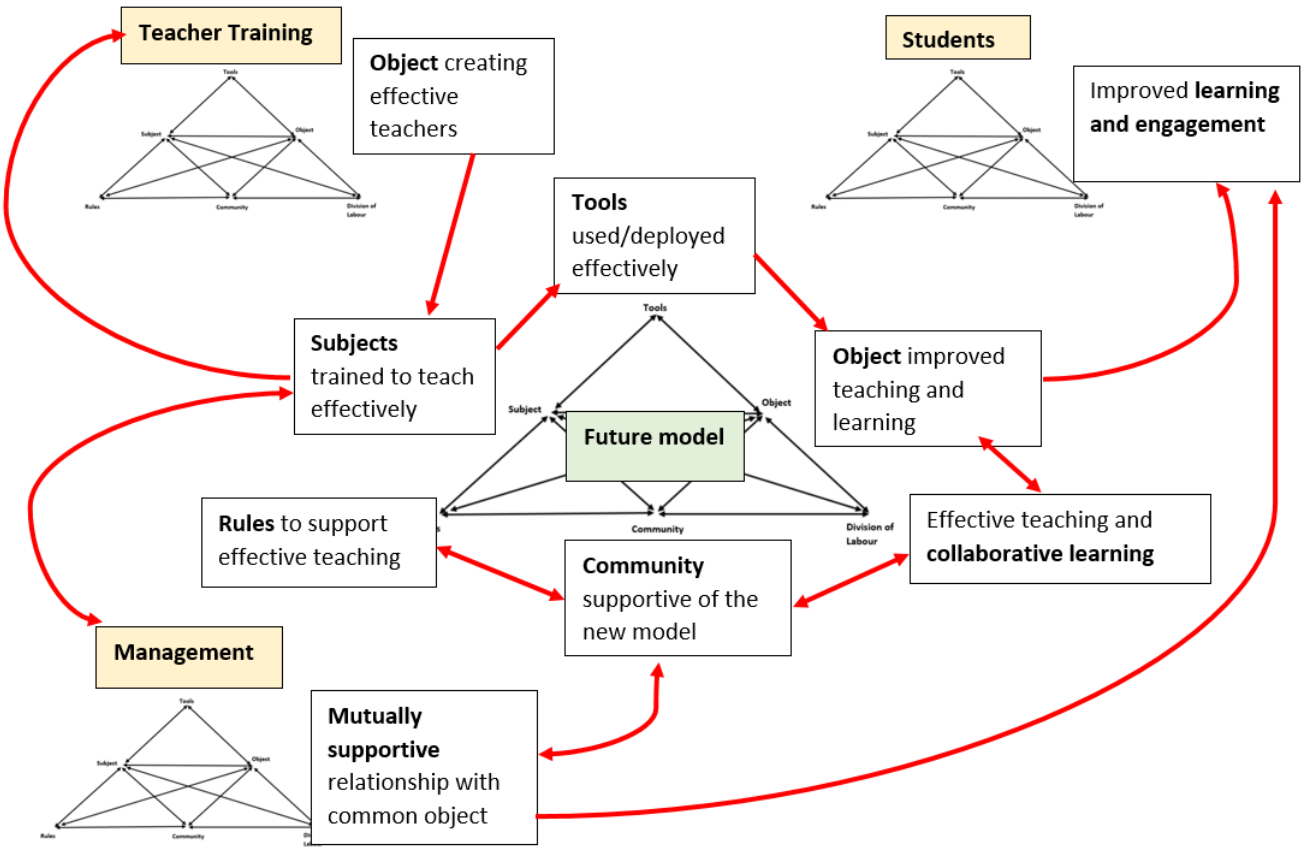
Contradictions are both expected and desired within a Change Laboratory. I identified three that manifested within this particular Change Laboratory that may not be related to expansive learning.

Firstly, the role of a single researcher-interventionist is huge. The voluminous data (Bligh & Flood, 2015) and the reality of transcribing, analyzing and preparing subsequent sessions suggest that a Change Laboratory may be more manageable undertaken as a team to allow for more effective division of labour. Secondly, the role of scribe was found to be redundant in this context, but may prove more necessary in other Change Laboratories. Finally, the participants' unwillingness to engage wholly with the theory is not unusual (Montoro, 2016) and reflects perhaps the disconnect between researchers and teachers in ELT (Copland et al., 2020; Medgyes, 2017).

6.3 Summary

To state that a Change Laboratory worked or did not work is oversimplification. Participant agency means results are neither predictable nor guaranteed in what is effectively a local pilot unit (Bligh & Flood, 2015; Garraway, 2020). However, changes have been modelled at the sharp end of classroom teaching where the participants are able to make meaningful changes. Systemic change requires a broader, more multi-voiced group and more powerful allies in the management activity system. Contradictions have been identified, and solutions proposed to the problem of failure and attrition. These changes would need time to solidify and become concrete, and only then could the effect on student learning be truly judged.

Figure 15. A proposed future network



7. Conclusion

This project has taken place in a highly specific context yet is also situated in the broader fields of technology enhanced learning and Activity Theory-based research. The approach has been critical but not dystopian and has been rooted in CHAT at all stages. The findings are state of the actual, yet the proposed future model points towards a realistic state of the art that concentrates on effective device usage and returns to pedagogy and the role of the teacher.

Change Laboratories are rare in ELT, and rarer still in the MENA region. This paper takes care to describe the methodology in detail and does not focus solely on the outcome. It also contributes to insider Change Laboratory research. While there are challenges for a single researcher-interventionist, the insider is able to facilitate the process, particularly in areas such as participant selection, mirror data collection and in provoking discussion into the historical nature of contradictions. At the same time, future research would benefit from the inclusion of outsider researchers to assist both in analysing the data, strengthening objectivity and observing the reality of power dynamics as they exist between insider researcher and subject peers.

This paper has focussed on the contradictions occurring within the process of expansive learning and modelling of new practices as the participants sought to propose and model solutions to the issues identified during the intervention. Further research and intervention are needed to make these new practices concrete and to develop a new network of interrelated activity systems. However, this must not lose sight of the overarching goal of improved teaching and learning in laptop-mediated ELT classrooms, and ultimately the success of our students.

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