

## Using Change Laboratory Methodology in Initial Teacher Education

Kellie Tobin  
Deakin University

*Abstract: Initial Teacher Education remains the focus of policy reform and research in Australia with the broad aim of improving the quality of pre-service teacher education. There remains dispute about limited evidence justifying ongoing reforms, particularly in relation to gaps in understanding how providers and schools work collaboratively in the joint activity of ITE. This paper argues for the potential of Change Laboratory (CL) methodology in contemporary educational research. The research examined the implementation of CL methodology in an Australian ITE program. Participants included 13 school-based and university-based educators. Participants were required to co-design a unit of work for an ITE course. Drawing on Cultural Historical Activity Theory (Engeström, 2001), this research investigated how a university and school worked across organisational boundaries. Findings identify an alignment of theory and practice, where the CL methodology enables participants to work in new ways supporting a collaborative approach in the preparation of teachers for the workforce.*

**Key terms:** Initial Teacher Education, Change Laboratory methodology, Co-design

### Background

Initial Teacher Education (ITE) programs within Australia are experiencing increased pressure to systematically strengthen the quality of teaching in schools to improve the outcomes of students (Diamond et al, 2017). The enduring nature of this focus is evidenced by continual review into Australian ITE. Yet so often in governmental reviews and media critiques (QITER, Department of Education, Skills, and Employment, 2022), the activity of ITE provision has been assumed to be predominately the responsibility of the university (Aspland, 2016; Loudon, 2008; O'Donoghue & Moore, 2019), with limited attention being given to the provision of quality ITE as a co-production activity involving university and schools. The enactment of ITE curriculum reform into educational practice, is scarce amongst scholars and research; yet researchers have maintained that teacher educators play a critical role of curriculum developers (Luneberg, Denerink & Korthagen, 2014; Smith, 2005). Research on ITE curriculum collaboration highlights very little alignment of theoretical perspectives or process of organisational change needed to support it. Conversely, it would be more productive for ITE to be conceptualised as a co-production activity of ITE providers and schools where this boundary-crossing activity could be made more visible to both parties involved.

Partnerships between schools and universities have been consistently identified as a strategy for preparing and supporting better teachers (Burn et al, 2021; Coler et al. 2022, QITER, Department of Education, Skills, and Employment, 2022). Reports and research

literature continue to argue that we need to strengthen partnerships between schools and universities to better improve teacher preparation and student learning outcomes.

The focus in this research was the beginning phases of co-design and co-development of an ITE literacy and numeracy unit of work in a Masters ITE course. By understanding how academics, teachers and school leaders work across their organisational boundaries this study can begin to reconceptualise and understand the alignment of the school and university systems, which has conventionally remained in (and mediated through) the domain of the university activity system. The intention of this paper is not to focus on the outcome of the co-designed activity, the curriculum, rather to position CL methodology as a critical methodology for interventionist research in education.

Thus, the research questions include:

1. How participants and the researcher in the school and university activity systems collaborate to co-design and construct ITE curriculum design.
2. How can the application of CHAT to ITE course design transform our understanding of school/university partnerships, while engaging with a CL methodology in ITE.

This research examined school and university partnerships as a mechanism for further exploration and intervention through co-designing a unit of work for ITE. To do this, this study draws on CHAT (Engeström & Sannino, 2010) to provide the theoretical lens required to attempt to change existing institutional practices. CHAT was chosen because it enables an opportunity to describe the history and culture within activity systems. Third generation CHAT (Engeström, 2006) comprehensively explores two or more interacting activity systems, an essential component of this study.

This paper outlines ITE in the Australian context including policy and ITE curriculum design, positioning the critical need for an innovative approach to teacher preparation and the need for intervention. Then, the paper specifically focuses on the CHAT intervention and the use of a CL methodology. Key characteristics of the CL intervention are presented, including the required toolkit to facilitate a CL intervention in ITE, the research design and enactment of a CL between schools and University. In the last part of the paper, the findings and concluding remarks are presented.

### **Initial Teacher Education: The Australian Context**

Teacher preparation is currently one of the most pressing and contemporary issues in the field of education internationally. Emphasis on how best to prepare teachers, the quality of ITE programs including, curriculum content, the design and delivery of professional experience, and how to assess developing teacher effectiveness are frequently at the fore of policy agendas globally (Canrinus et al, 2019; O'Donoghue & Moore, 2019). Recently, the Australian government's Minister for Education and Youth, Alan Tudge MP had launched yet another review into ITE with the key ambition to lifting Australian school standards. Announced, were two key questions: (i) how to attract and select high-quality candidates into the teaching profession and (ii) how to prepare them to become effective teachers. (QITER, Department of Education, Skills and Employment, 2022)

These central governmental review questions were outlined to include areas of specific interest, including (i) what more can we do to ensure ITE curriculum is evidence based and all future teachers are equipped to implement evidence-based teaching practices? And (ii) How can leading teachers, principals and schools play a greater role in supporting the development of ITE students (2022)?

Historically, federal and state governments have focused their attention on critiquing ITE education. Arguments and debates on the quality of teacher preparation are not unique to

the Australian context and are representative of a global discourse about ITE (Diamond et al, 2017). ITE providers, teacher employers, and schools must share a commitment to improve ITE and work in partnership to achieve strong graduate and student outcomes.

### **Partnerships, Policy, and Research Responses to Australian ITE**

Reform and review of ITE in Australia argues the critical need for a fresh and innovative approach in the preparation of preservice teachers including the complete overhaul of the way in which school and university-based systems align (QITER, Department of Education, Skills and Employment, 2022). Despite the body of work seeking to raise the importance of quality school and university partnerships, regulators, politicians and ITE providers continue to discuss the extent to which university-based and school-based teacher educators have a shared understanding of what constitutes quality teaching and how this can be best integrated into preservice teacher learning experiences (TEMAG, 2015, QITER, Department of Education, Skills and Employment, 2022).

Partnerships between schools and universities have been consistently identified as a strategy for preparing and supporting better teachers (Burn et al, 2021; Coler et al. 2022; QITER, Department of Education, Skills, and Employment, 2022). This research conceptualises partnership activity more rigorously through a boundary crossing lens, thus providing an opportunity for the co-production nature of ITE provision to become more of a visible and subsequently more deliberative process.

While the field of ITE has been heavily researched and regulated, there remains limited agreement about what constitutes substantive evidence supporting system-wide improvement in ITE? Literature and commentary continue to position ITE as troublesome and heavily scrutinised. Examples of this can be seen in critiques by Darling-Hammond, 2017; Gore, 2021; Kacaniku, 2022. Establishing how and why ITE has become such a political issue the implications for changes can be highlighted and critiqued. Particularly in the Australian context where schools' education provision remains the jurisdiction of the states, yet higher education provision is controlled by the federal government who may seek to influence schools' education through ITE provision. There is an increased need for a more transformative research approach into the problems of ITE.

### **Positioning CHAT – A Socio Cultural Perspective**

This study aimed to move away from single learning variables while looking more carefully at whole systems and the interactions and boundaries within and between these systems. CHAT formed the theoretical framework for the purpose of this study while recognising that the school and university activity system are increasingly interconnected and interdependent. CHAT theorises participants' collective interaction over time. In the case of this research this is captured in the formative intervention CL process.

Established firmly within a socio-cultural approach to education, CHAT stems from Vygotsky's (1978) and Leontiev's (1978) concepts of object-oriented action where learning is not simply located at the level of the individual, rather learning occurs within a system/s where the subjects act upon an object of the activity.

Based on Yrjö Engeström's Third-Generation CHAT (1987), a common thread among the diverse uses of this theoretical lens is the focus on learning through social interaction. According to Wardekker (2000), CHAT theory provides a third view of the learning process between research and practice and can aspire to bridge the gap between the

two. Of relevance, Wardekker suggests that the introduction of dialogue between researcher and the practitioner is change-inducing. What becomes apparent is that any research involving human participants in a sense becomes an intervention. Simply stated, CHAT is about learning and change in a collaborative context and for this reason a central component of the study.

### CHAT and The Activity System

ITE is recognised as a process of learning that occurs in multiple activity systems of collaborating academics, students, teachers, and policy makers. This study was devised to allow teachers, school leaders and academics a structured opportunity to collaborate, review, improve, and co-design a literacy and numeracy ITE unit of work in a master’s course. Of interest here, is the interplay between the elements of the two activity systems (school and university). Wilson (2014, p. 20) highlights the significance of CHAT and activity system analysis in teacher education as equipping researchers with a methodological framework for analysing educational activity in practice. Importantly, in turn, we can better understand the differing motives (often unacknowledged) that are brought to an activity by the various participants.

More recently CHAT has examined the opportunities for learning created when two different activity systems meet and overlap (Engeström, 2001). The method of systems analysis has grown in popularity (Akkerman & Meijer, 2011; Tsui, 2007) with the aim of mapping complex interactions from qualitative data sets. As illustrated in Figure 1, the structural components of activity systems in Engeström’s work include subject, object, instruments, community and relationships and outcome.

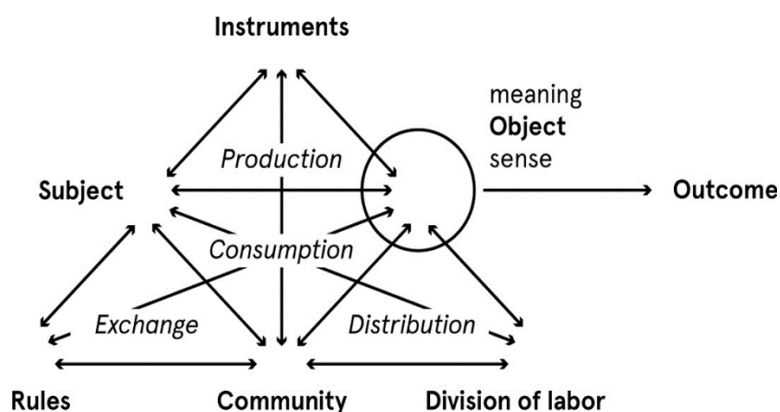
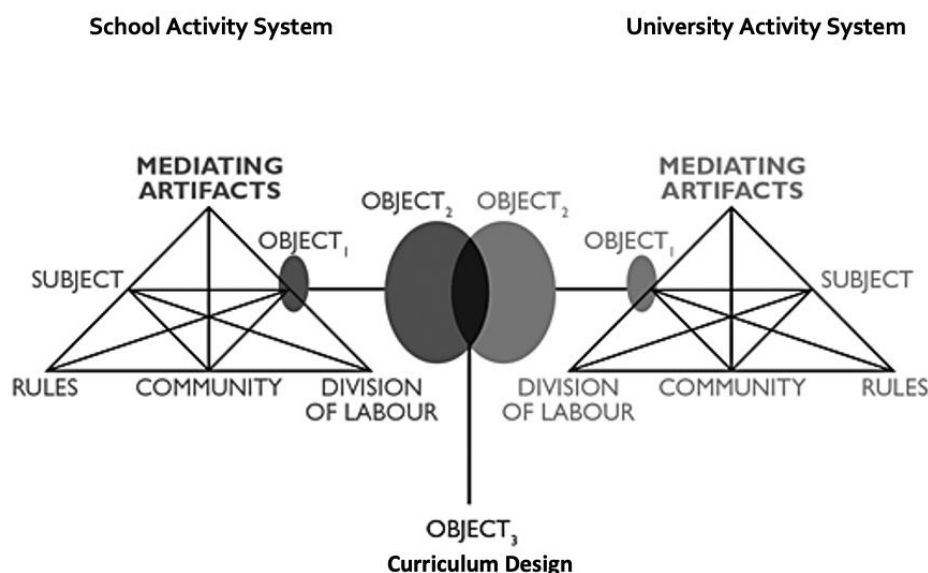


Figure 1. The structure of a human activity system (Engeström, 2018, p. 14)

Activity systems engage people in solving problems or making or designing something. These systems may be as small as individuals working together to complex large scale organizations with hundreds of employees. Each activity system is ingrained with its own history and culture evolving over extended periods of time. Often these two activity systems are expected to work together but don’t necessarily do so successfully. This can be because of differences in the object or other elements within the systems.

The concept of activity system analysis allows the opportunity to further explore the complex relationships between people, mediating artefacts and behaviours (Engeström et al., 2020). Wilson (2014) provides insight into the use of CHAT in teacher education through the following example. A class teacher (subject) wishing to improve pupils’ achievement (object)

within a particular school (community) might want to introduce a new strategy for learning (tool). Depending on the management structure within the school (division of labour), the teacher may be constrained on the basis that the new idea is seen as deviating from implicit norms (rules) or encouraged if the attitude within the school is to support innovation (also an implicit rule). More recently and of significance to this paper, CHAT has examined the opportunities for learning created when two different activity systems meet and overlap (Engeström, 2001), represented in the figure 2.



**Figure 2.** Two interacting activity systems representative of the interacting school and university activity system using the CHAT model as defined by Engeström (2001, p. 57).

The interplay between activity systems has an essential role in this present study. Activity systems are not fixed or stagnant; they're systems of continual change and development that vary as individuals and actions within the system shift. Often exposed in CHAT research are the tensions/contradictions that arise when these systems meet.

Closely linked with CHAT, the CL is an intervention-research methodology that enables participants to work closely with the research interventionist to challenge existing ways of activity and conventional wisdom to reconceptualise activity and organisations.

### Research Design and Change Laboratory Methodology

The CL as a theoretical method in this paper aims to reveal the systemic causes of the problems experienced by teachers, academics and school leaders when working in ITE, and to collaboratively re-design and re-conceptualise a new form of curriculum and ultimately the school and university partnership. The interventionist supports and facilitates the work community in its learning by presenting and organising data that mirrors the problematic aspects of historic and current practices in ITE.

Underpinning this research was an attempt to implement a formative intervention characterised by process-oriented research, which is radically different from linear interventions characterised by variable-based research (Engeström, 2018). CL methodology was used as a tool for collaboratively transforming the way the two participant schools and a university worked together.

Consideration was given to the research design and methodology for this study to ensure it did not use a static model, the focus enabled an examination of the partnership and activity systems over time. Ethnographic and discursive studies of work-related activity in education are increasingly dominant in recent years. Action research, conversation analysis and ethnomethodology have been developed. However, an interesting question continues to arise: “What difference do these studies make in practice?” (Engeström, 2018 p.20). A key methodological theme in this inquiry explores how CHAT-informed research facilitates boundary crossing in a school and university partnership. CHAT, methodologically, is a form of action-oriented research that stresses the integration of basic theoretical work with empirical-practical engagement. This methodology involved attempting to intervene within another activity system to support expansive learning (Virkkunen & Newnham, 2013). It intended to empower participants, foster collaboration and be mindful of historicity and culture across activity systems.

### Assumptions of the CL

The difference between the CL intervention and other change interventions is the relationship between individual learning and the development of a collaborative joined-up activity. As a formative intervention it involves sequential cycles, eight to ten sessions on average, where participants critically examine existing practice identifying and formulating any tensions and contradictions withing the activity (Englund, 2018). Through the process of historically analysing contradictions and tensions participants and the researcher can search for the core source of the problem and co-design new ways of thinking and working (Virkkunen & Newnham, 2013). This CL process of analysing and solving contradictions traditionally follows a cyclical process based on Engeström’s theory of expansive learning (Engeström, 2001).

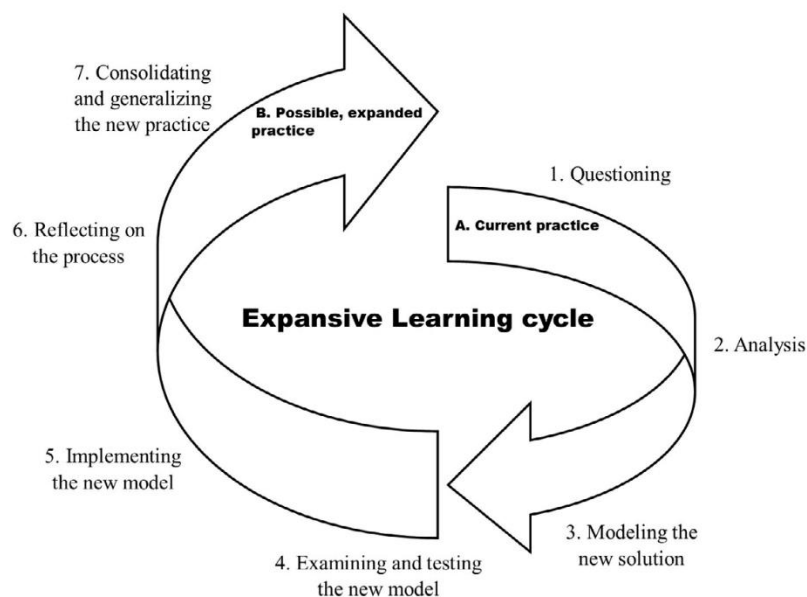


Figure 3. The Expansive Learning Cycle. Adapted from Engeström and Sannino (2010).

The logic of this co-design and expansive learning process aligned with the research aims and objectives; because of this, the researcher was able to confidently dismiss alternative methodological approaches.

### **The CL Toolkit**

The CL intervention moves beyond the implementation of seeking a solution to a problem or change of practice. It also aims to knowingly build practitioners' collaborative, transformative agency and motivation related to a reconceptualisation of the activity and its future development (Virkkunen & Newnham, 2013, p. 10). To do this, the CL methodology has a toolkit that includes tools to support engagement in collaboration, active participation, and the development of practice. These tools are supported by mediating artefacts from the involved activity systems that require engaging with past practice and conflict to facilitate future collaboration. Traditionally, CL sessions are facilitated in the same physical space where representatives of the activity systems share an object of development, in the case of this research the co-design of ITE curriculum.

### **The Co-Design Method using a CL Approach**

The co-design and analysis of the CL intervention is supported by artefacts and stimuli that represent the work activity (Virkkunen & Newnham, 2013, p. 15). The positioning of participants is a considered approach to enable sharing and opportunities to cooperatively reflect, process ideas and analyse the activity. Virkkunen and Newnham (2013) argue that by designing the work activities using the 3 x 3 surface model the work activity is represented using different levels of abstraction and systemic integration (p. 15). The CL intervention here, like many others before it, divided the task and sessions representative of the past, present, and future of the activity. These were structured into three longer sessions rather than the traditional 8-10 shorter CL sessions. Session one required participants to analyse past practices, curriculum design/outcomes and inherent problems in ITE; Session two reviewed current practice, curriculum design and the school/university partnership, and Session three considered the future of the activity including a new way forward. The CL groups were in the same room collaborating in a round table format. The surfaces included an interactive whiteboard, used to present mirror data and to develop ideas and tools as part of the intervention.

An overview of the CL sessions, tools, and contents includes.

CL Session	Contents	Mirror Material	Tools and applied methods of collaboration
1	Presentation of the CL approach. Exploration of past practices/problems in ITE. Historical analysis of the Literacy and Numeracy unit with specific focus on Unit Learning Outcomes. Problematising literacy and numeracy curriculum development' identifying past rules, objects, and the division of labour across activity systems.	Stimulus questions for reflection and discussion on past practice. Exploring how Higher Education (HE) curriculum has been developed in the past. Look at past unit guides in HE School/University analysis; how have these systems worked historically?	Master of Applied Learning and Teaching (MALT) literacy and numeracy existing unit of work CL intervention model Stimulus questions Outline of the Master of Applied Learning and Teaching (MALT) course Applied group work
2	Questioning AITSL standards and teaching needs Consideration of current learning environments Current activity systems: how do they align with school improvement? Developing a new model for curriculum development in ITE How can we work in the future?	Presentation of current unit development practice Review/evaluation of the existing unit, the present situation Review of workshop one; presentation of learnings, tensions, and contradictions	AITSL Standards PowerPoint presentation Applied group work Unit Learning outcomes and activities
3	Designing a new literacy and numeracy unit in HE News ways of working together; joined-up approaches Co-designing solutions Reflections & CL workshops	Re-cap of the CL process Re-designing the unit Introducing new ways of learning	PowerPoint presentation CL process; the model Applied group work

**Table 1. Overview of the CL sessions, tools, and contents**

### CL Participants

The research included 13 CL participants, eight school teachers and five university-based teacher educators. Participants were recruited using a purposive sampling approach. Creswell and Plano Clark (2011) outline purposeful sampling involves identifying and selecting participants or groups of participants that are especially knowledgeable about or experienced with a phenomenon of interest. The research involved participants reconceptualising a Literacy and Numeracy unit of work in HE, for this reason participants were actively sought as educators with literacy and numeracy expertise and pedagogy. The participants ranged in experience, with some working in the profession for over 30 years. Those that were early career educators had experience from one to five years in education. Three of the participants were principals in schools. Participants remained the same in each CL session for the duration of the study, with each group immersed in three, three-hour CL sessions.



### **Preparing the CL Process: The CL Artefact and ITE Unit of Work**

The preparatory phase of the CL process involved selecting the ITE unit of work requiring transformation. This unit of work became the central artefact to the collaborative CL sessions. CL interventions typically involve a pilot unit of an activity that needs major transformation (Virkkunen & Newnham, 2013, p. 15). As part of the CL preparation, the researcher was given access to the existing Literacy and Numeracy unit outline used in the Master of Applied Learning and Teaching (MALT) course for the previous four years.

The aims of this unit were to enable students to understand contemporary research informing the improvement of young peoples' literacy and numeracy engagement, including the methods of research and approaches to school data collection.

Historically curriculum design and development in HE is positioned within the university sector. This was the case for the unit used in this study. It had been designed, developed, and delivered by university-based educators, as is the case for many units of study in HE. The decision to use an artefact focused on literacy and numeracy as central to the CL was purposeful and selective. It is evident, over the past few decades, that education systems are finding it increasingly difficult to provide a learning environment whereby students experience success (Meeks et al., 2014). OECD data (2013) found that basic literacy and numeracy skills were in decline, impacting more desirable and well-paid employment pathways and opportunities (OECD, 2013). So, for the CL intervention, it made sense that this was to be the unit of focus and the key artefact for co-design. Policy makers, school leaders, and HE course leaders need to work collaboratively to ensure pre-service teacher programs, learning and practice are contemporary and evidence based. The CL methodologically intervenes on traditional ITE practices and curriculum development in HE by allowing participants to meet and collaboratively consider a solution to the problem; the use of the literacy and numeracy unit of work in the MALT course was central to the CL sessions.

### **Recording Critical CL Events: Context and Data Collection**

An important component of the CL is recording collaborative events during each of the sessions. Methodologically, video recordings form an important role in the CL process. Video offers a 'microscope' for an in-depth study of the on-going production of situated social order. They are typically used to record all the actions and dialogue that occur between participants. The research interventionist often reviews the recordings prior to subsequent sessions overviewing critical happenings and occurrences. These are often positioned as dilemmas, conflicts, and tensions in the working practices of team members (Daniels et al, 2010, p. 109). Video recordings, photographs, stories, and narrative accounts are used as mirror data in the CL process (Engeström, 2007).

For this research, the CL sessions were video-recorded and audio-recorded with a small audio device positioned at the centre of each round table. The use of video and audio devices were identified early in the research when participants were invited into the study. Confidentiality of participants was important and for this reason the participants are de-identified in all visuals and text. The methodology of video analysis is ever increasing in qualitative research studies that explore social actions and interactions. Conversation analysis continues to emerge as one of the most valuable actions in the in-depth analysis of audio-visual recordings.

Observational data was collated to further support the CL sessions while providing an opportunity to view the sessions through an additional lens. According to Creswell (2011),

the observer is often involved in the research that is being observed, as was the case here in the CL sessions. At times there was often a merging of the role as an interventionist, facilitator, and observer. An effective qualitative observer is one that can fluidly shift between these roles in settings. Along with the reflective notes the researcher audio-recorded their thoughts and reflections following each of the CL sessions. These were later used to assist with establishing the mirror material/data and subsequent CL sessions.

### Data Analysis Method

The concept of intervention and this study being intervention research was always at the foreground of the researcher’s approach when analysing and presenting the data findings. The interventionist comes between the actor’s actions so that the activity can find a new direction. In human life, individuals and groups constantly intervene in each other’s activities trying to change their course in one way or other, sometimes succeeding, sometimes not. However, the term intervention is usually reserved for the application of specifically planned forms and methods of intervening (Virkkunen, 2013, p. 4).

To analyse the data, it was important the researcher was able to represent the many voices, actions, and embodied experiences of the participants. The end results of a CL study are not predetermined by the researcher interventionist. These outcomes are, in fact, designed by the participants as they explore expansive solutions to developmental contradictions in their activity systems (Virkkunen & Newnham, 2013).

Type of Data	Number of Sources
Change Laboratory Sessions	3 Sessions (18 hours in total x 2 groups)
Participant individual interviews	10
Research interventionist reflective recordings	4
Observational data	9
Other data; Unit Guide	1
AITSL Standards	1
Correspondence with participants	13
School and University curriculum planning documents	4
School Improvement Plan	2
Mirror material and artefacts	9

**Table 2: Types of data**

With CL methodology relatively new in education (1990s) there are few consistent methods of analysis. This research involved a spiralling approach to the data and the steps undertaken to describe, classify, code, and interpret it.

Data collection and analysis occur simultaneously throughout the duration of the study. Gathering data occurs early in the CL process. The CL begins with a detailed discussion of mirror data that identifies and demonstrates challenging and problematic aspects of the activity (Virkkunen & Newnham, 2013). Participants in this research explored problems in ITE more broadly to begin with. They were presented with stimulus questions in CL session one to facilitate discussion related to systemic problems across activity systems. Participants used ideas, tools, and mirror material to identify problems in ITE and how they have impacted curriculum design and development. Throughout the CL process, participants and the research-interventionist continually analysed data past and present to address tensions and contradictions. By analysing these inner contradictions, the systemic nature of the activity can be further understood and discussed. After each CL session the researcher

reviewed the recorded material to help guide the stimulus materials in preparation for following sessions.

### **Evaluating and Analysing the CL Process**

Following the CL process all recorded sessions were transcribed. This included over 18 hours of collaboration between participants and the research interventionist. Having the transcribed CL sessions enabled the researcher to move between the recorded vision and text. As part of this spiralling process the next loop involved uploading the data into NVivo (1997), the more detailed process of coding the data then commenced. This process involved three levels of analysis: Open Coding, Axial coding, and selective coding (Strauss & Corbin, 1990). In the initial stages the data was continually reviewed, comparing CL groups, and questioning what was and was not understood. This systematic process enabled the examination of the CL sessions in whole, then in parts. It was first understood the two CL groups were separate, the analysis then moved towards comparing them. Categories or codes began to emerge, as the researcher began to move towards the next step of axial coding. This step enabled the researcher to piece together the data and make connections between the codes. It was in the final selective coding stages, that the CL analysis became more refined and rigorous. Aligned with a CHAT lens of analysis the researcher was able to selectively identify codes related to the research question and findings.

The data analysis phase engaged a technique of triangulation, whereby the researcher draws upon various methods of data collection. Triangulation aligns data collected through various methods, primarily to enhance the validity and trustworthiness of the findings. The analysis of the CL sessions incorporated, semi-structured participant interviews, observational data, CL recordings and interventionist reflective recordings. This analysis enabled the researcher to evaluate CHAT and CL methodology as a tool for co-constructing new knowledge in ITE course design and partnership. This was explored through the CL participants, their ways of thinking and acting, and their emerging transformative agency.

### **Overview of Results**

The CL excerpts illustrate firstly an understanding of how participants conceptualized the co-design process and how this evolved in the CL sessions. These excerpts focus on the CL methodology more specifically in response to the research question. ‘How can the application of CHAT to ITE course design transform our understanding of school/university partnerships?’ Evidence of how the activity systems, the school and university, first presented to the study are revealed, highlighting that the object (the curriculum, in the case of this research) initially begins as an un-reflected piece of raw material that moves to a collectively meaningful object co-constructed by the interacting activity systems (Engeström, 2018). The CL provides participants with new ways of thinking, working, and collaborating in ITE through the CL methodology. The excerpts begin with participants drawing upon their own historical and cultural experiences of the single activity systems in which they operate.

*Female 3 (school-based): In my experience there hasn't really been any communication between universities and staff at schools other than those who co-ordinate or supervise pre-service teachers, so what's happening is all the work that they (PSTs) are doing at Uni was really a mystery to us.*

*Male 2 (school-based): It's always been that the schools work within the schools and the university works within the university. It's always been this kind of insulated environment.*

*Male 2 (school-based): Certainly, for more than three quarters of my long career (40 years) in schools I've had no involvement at all in curriculum design, even though I've had many student teachers in my school, mentored them and played a significant role in their development, I would've had no say and no opportunity to have input into how university courses were designed. If you'd had of asked why that was the case, my presumption was they wouldn't have been interested. There's always been that divide between.... (pause), this might not be politically correct, but I've felt in the past that universities felt like they've thought they know what teaching should be like and to some extent, especially in government schools and especially low SES government schools they probably look down on the quality of teaching. So why would they ask us for input into teaching in their courses. That may or may not be right thing to say but it was my view early on.*

The participants excerpts showed a range of viewpoints as to why they hadn't experienced partnership opportunities in the past, often with negative ideas or viewpoints relating to the university organisation. Had participants lacked the opportunity to partner and collaborate with curriculum in a structured and methodological way? Identified early were historical and cultural evidence of discontinuities and contradictions in the co-design and development process.

The CL sessions enabled collaborative discussion that reflected on historical and cultural examples of collaboration with schools, teachers, and leadership:

*Female 1 (university-based): I haven't done much of this in the context we are for this study, not with respect to a university unit. I wasn't sure what was going to happen there.*

Here the participant reflected on how they entered the CL process and the level of knowledge, history, and culture they embodied. Reference early in the CL process aligns closely to the singular activity systems and the way participants reflected on the communities they worked with to achieve their goals.

During CL sessions one and two, university-based and school-based educators, reflected on how the CL approach might differ to how they have worked in the past.

*Male 3 (University based): How it's different is probably the relational aspect to teaching is really privileged, whereas before it was this body of knowledge that was in a Unit Guide that then had readings and videos or experiences that the students (PSTs) were going through and it was really cognate rather than this work, it starts off with a partnership with real people conversing and sharing and from that partnership early on it was about 'how can we support your agenda in the school and the school'. It's a much more relational approach towards their understandings and what their agendas were and working with that and working with real people.*

*Female 2 (School-based): Having an established structure and curriculum samples and stimuli for the discussion was useful, we could have sat and talked all day about what was useful and not useful, but I'd say a structured CL framework to work though really helped. It was good to get insight into the perspectives that people were coming from, and it probably did highlight that the university and the school perspectives were quite varied and that we didn't understand each other's language immediately.*

These early perceptions of the systems as they present to the CL are significant in that they capture a series of assumptions, cultural and historical beliefs. The object of one's work and expertise in participating systems was initially problematised and began a process of transition. The CL provided an opportunity to analyse this transitional process and the ways in which the participants began to organise their understanding of what they are doing (Greeno, 2012, p. 311), subsequently impacting future CL sessions.

*Male 1 (school-based): there was one Academic, she had a Maths background and if you're a very experienced Maths person people don't mess with you, that's sort of how it came across, like 'you're an expert you're a highly intellectual individual and you teach teachers.' It was a bit of a barrier early on, so often when that person talked everyone else just sort of shut down and sometimes people would drift off and then when that person stopped talking people would chime back in again and keep going on that original pathway. That was a tension at the start. I wasn't expecting it, but we actually ended up sharing ideas and having a lot to talk about... honestly, I really wasn't expecting that early in the CL but I learnt a lot from her and I think she learnt a lot from me.*

Co-design is a process involving tensions between activity systems and even breakdowns, but what does this comprise when it involves participants' viewpoints and perspectives? The school-based participant in this example outlined how tensions manifest when a participant in one activity system exerts influence over the other; this is described as a perceived hierarchy by the participant, and interestingly it shifts and develops as the CL cycle progresses. The constructive overlap was not evident to begin, however the participant observed this shift, and in fact, they expressed learning a great deal from this relationship and collaboration.

Participants stressed the existing assumptions and historical constraints towards shared curriculum design and were able to understand with increasing clarity the school and university context including a stronger shared approach to ITE curriculum design:

*Female 1 (university-based): I think we were making assumptions, initially. Around what they (teacher educators) did in schools and what they did in universities.*

*Female 3 (school-based): I think that's one of the reasons we actually made good progress in the CL sessions, because we might say something and then somebody that sits in a school context says 'well this is what it would look like' and that means you can progress onto the next step here, because instead of thinking 'I wonder if that would really work' because you're just thinking very theoretically whereas you've got the real situation on hand.*

*Male 3 (school-based): I really like that, during our discussion we kind of built up this symbiotic relationship between the university and the school so it's not only thinking about 'how does the school help support the university and the students in the university but then how does the university then help support the school and the work that they're doing'.*

*Male 1 (school-based): In our CL group no one held their ego too high so it was just the fact that 'okay you don't agree with me that's fine, why, let's have a discussion'. I think there was a lot of changing of opinions throughout the whole thing, so I got the sense that throughout it there was a lot of people restructuring their understanding based on what they were getting from all the parties involved.*

Disturbances and tensions were evident and that participants were in a state of constant 'restructuring' of expertise and understandings, less hierarchical and more

collaborative. The school-based participants reinforced a developing agentive agency and reevaluation of their role in the CL sessions, noting teacher educators were able to provide innovative ways of practice ultimately resulting in the co-design of assessment and teaching and learning.

## Discussion

The contribution of the findings offers an adaptive organisational planning tool to move ITE curriculum development beyond discussion and problematisation towards a more fostered collective engagement across organisations. Notably, these CL methodological steps should not be taken mechanically, something learnt early in the study. To explain, this research intervention required participants to firstly reconceptualise the object of the institutional activity. The results highlight that co-design process across organisations was initially enabled with the introduction of supporting mirror materials and stimuli. The ITE unit of work used in this study is used as a mediating artifact that intervenes the current curricula design and development process. CL participants require an understanding of the collaborative nature of the research, an interest in its possibilities and outcomes, and knowledge of the challenges that may arise because of the intervention. The sequential CL sessions involve an investment of time and knowledge over a scheduled period during which CL participants are required to participate, collaborate, visualise, and document their collective thinking.

Initially it was revealed there was a lack of communication between the sectors in the early CL process, but also evidenced as a historical and cultural occurrence as identified by participants immersed in the field. Participants suggested they each have very little opportunity to involve the other in their daily work practice and consider many partnerships as very one-sided. When partnership activity is conceptualised more rigorously through a boundary crossing lens (Akkerman and Meijer, 2015) partnerships become reflective of the institutions and professionals concerned. Such a reconceptualising intervention included an opportunity for the co-production nature of ITE provision to become more of a visible and subsequently a more deliberative process.

The researcher observed the community and division of labour (Engeström, 2018) in this early stage of the CL as presenting with clear differing motives. Although participants suggested similarities associated with the object (curriculum) the way these can be developed was positioned as typically troublesome, and collectively participants recognised it as ineffective. Transformation of the object requires participants to come together and contest and understand it better. This narrative early in CL1 suggests a developing shared understanding and signifies a turning point in the co-design process. Whilst this research focused on the early stages of this methodological approach, the initial overview of results is promising.

This shared re-imagining suggests we need to provide greater opportunity for organisations to cross existing boundaries, encouraging opportunities for shared perspectives and a multi-voiced approach to ITE curriculum design and development. Quality teaching practices are required to contribute to the improvement of student learning outcomes (Burn et al, 2021). There are very few ITE studies that explore and enable such data-rich opportunities for change through a CL process.

These results showed the strength in co-designing curriculum in that it includes the perspectives of both the university-based educator and the school-based educator. This intervention provided opportunity to collectively review and co-construct a new and innovative model of curriculum development in ITE. However, while many people are now

using the discourse of co-design, it is uncommon for it to be conceptualised through a theoretically and methodologically informed strategy such as CL. Engeström's third-generation activity theory situates this research as part as an evolving activity system (Engeström, 1987, 2001).

The research approach differs from most studies in the field of ITE and curriculum design and has provided a rich source of information about the nature of the school and university partnerships. It has demonstrated how current ITE partnerships limit possibilities in the design and delivery of ITE and suggested that these boundaries can be overcome through more strategic partnerships. To explain further, this research draws on Dyson's (2005) assertion that historically, in teacher education, there has never been a shortage of recommendations or goodwill from teacher educators in the field; however, there has been a lack of insight into how to work across the boundary and what this might mean for ITE. This research created an innovative context that enabled participants to come together and co-design a unit of work in ITE.

When considering limitations this research was designed, in a sense, as a smaller scale study involving two activity systems: the school and university. While this approach enabled their exploration, it did not consider the broader stakeholders that are intertwined in ITE as discussed in the earlier context and literature. Therefore, this means that key stakeholders, like accreditation providers, and policy providers are not represented in this research: the findings only draw upon teachers and university-based educators in two activity systems.

### **Conclusion**

Engeström (2018) suggests that ambitious interventions require an ambitious theoretical lens. CHAT (Engeström, 1987) provided a theoretical framework for this research to occur. The results of the study highlighted that research participants had never been afforded the opportunity to collaborate and co-design curriculum in a cross-institutional way, even though some of them had been working for 40 years in the profession. Working collaboratively in partnership required participants to cross institutional boundaries to promote new forms of knowing and thinking.

Participants can connect the activity to their own histories, understandings, and ideas, therefore giving an opportunity to the object to be conceptualised differently. This approach differs from more traditional ways of developing the ITE curriculum; in essence, this experimental intervention provides an innovative opportunity to investigate the collaborative approach towards co-designing it. By its very nature it works to minimise existing organisational boundaries.

By engaging with a CHAT theoretical lens and CL methodological approach, organisational boundaries can be better understood, and steps developed to ensure these boundaries are identifiably shared. It is therefore recommended that a better conceptualisation of partnerships requires a theoretically informed approach and the consideration of a methodology that enables this.

The challenge is how this can be applied more broadly to ITE. CL has the potential for wider applicability in the field of education and organisational change. In this case, the findings have shown transformation of the object and consequently more shared activity systems when the problem is focused on curriculum design and development.

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