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Twenty-five years of change laboratories in schools: a critical and formative review

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ABSTRACT

Transformation, learning and research come together in educational action research. Change Laboratories (CLs) are a distinctive approach to action research grounded in Cultural-Historical Activity Theory (CHAT). CLs seek to go beyond technical change, oriented instead to systemic and ideologically driven transformation. However, there have been few reviews of CL research, none focused on education. This paper reports a review of 55 studies using CLs or sibling approaches involving schools. It finds that CLs have been applied to diverse problems including pedagogical practice development, initial teacher education and collaboration across school boundaries. Wider issues of equity, inclusion and justice are present but not ubiquitous in this work. Theoretical references focus on expansive learning, activity systems and double stimulation, with growing use of wider concepts from within and beyond CHAT, including Southern and Indigenous epistemologies. Critical reflection of these findings informs seven fronts for future development in CLs to strengthen their contribution to educational action research: participation, beyond-technical change, enduring change, epistemic justice, addressing grand challenges, resistance, and reporting.

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Change laboratory; activity theory; school; Vygotsky

Introduction

Educational action research aims to fold change into research itself, placing teachers at the centre of the process (Bradbury, Lewis, and Embury 2019; Manfra 2019). It is a key instrument for diverse forms of change in and around schools. Often developing practical solutions to the problems teachers face in the classroom (Messikh 2020) action research can go beyond fostering teachers' agency to deliver wider organisational change (Somekh 2009), addressing relationships between schools and universities, workplaces and communities. Many regard actions research as transformative, emancipatory or political rather than simply technically changing agendas (Bradbury, Lewis, and Embury 2019; Hendricks 2019; Kemmis, McTaggart, and Nixon 2019; Noffke 2009).

As a paradigm-shifting approach, action research must be flexible and open to diverse methodological modalities and is not defined by any one educational or social theory

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(Keiny and Orland-Barak 2009). The theory is crucial to meet the demands for both practical relevance and rigour (Bradbury, Lewis, and Embury 2019; Ellis et al. 2015; Gutiérrez and Penuel 2014; Somekh 2009; Stringer 2019). Change Laboratories (CLs) are a form of action research, distinctive through their theoretical grounding in Cultural-Historical Activity Theory (CHAT; Sannino, Engeström, and Lemos 2016), which brings with it an explicit political agenda around inclusion, equity and justice.

A CL involves a series of workshops where one or more researchers collaborate with a group of participants. Prior to a CL, data are collected relating to the research site(s), called mirror data because they are used to help participants see themselves and reflect critically upon their work. Workshops typically involve participants seated in a semi-circle so that they can see a suite of screens or boards (called surfaces; see below). These capture aspects of past, present and future, orienting participants to historical developments, the status quo, and desired alternatives. CLs use a blend of elements familiar to participants from their own practices, theoretical elements introduced by researchers, and elements developed by participants in the process (Daniels 2008; Morselli 2019; Virkkunen and Newnham 2013).

CLs are usually video- or audio-recorded, so they can be critically reviewed in subsequent sessions and for transcription and analysis. At the start neither researchers nor participants know precisely what the focus of change or outcome will be, hence they are termed 'formative interventions' (Sannino, Engeström, and Lemos 2016). The fact that the problem is defined by participants rather than researchers is important (Penuel 2014). CLs may involve groups of diverse sizes, and a series of workshops may range in number and duration.

Grounded in the work of Vygotksy, CHAT is a growing influence in educational thinking. CLs emerged through a strand of CHAT whose early development centred on expansive learning and activity systems (Engeström 2007, 2015). They have been used in diverse disciplines including education, health care, community development and agriculture (Virkkunen and Newnham 2013; Winberg, Garraway, and Wright 2023). CLs aim to foster participants' learning and agency as they create and implement new conceptual and practical tools that enable them to master their collective activity and has been described as a path breaker due to its strong and distinctive theoretical basis, this (Virkkunen and Newnham 2013).

CLs have spread since the first school-based CL in a Finnish school in 1998 (Engeström et al., 2002a). However, they remain a niche and overlooked approach, arguably a symptom of wider marginalisation of action research (Manfra 2019). To date, only one review of CL research has been published, focusing on their application across diverse fields in Africa (Winberg, Garraway, and Wright 2023).

The absence of reviews in this work hampers critical discernment of the contribution they make to wider agendas of educational action research and constrains their further development in this regard. This review enables action researchers to make better informed decisions regarding the use of CLs by elucidating the kinds of problems they may orient to, their conceptual and concrete features, and pointing to possible challenges and limitations. This offers different insights compared to existing 'how to' literature (e.g. Morselli 2019; Virkkunen and Newnham 2013). The questions driving the review were:

- When and where have CLs in schools been conducted?

- What kinds of schools have they been involved in?
- What have the key design and theoretical aspects been?
- What outcomes and limitations have been reported?
- What are the key fronts for development for future CLs that will strengthen their contribution to educational action research more widely?

These questions diverge from systematic reviews that synthesise findings in relation to a single research question (Page et al., 2021). Effect measures, risk bias and synthesis methods are not relevant given the qualitative nature of this review and the nature of CL research.

Action research, CHAT and change laboratories

The relationship between theory and action research is contested. The literature on action research in general refers to theoretical underpinnings (related to forms of knowledge, reflection, etc.), theoretical interests (as starting points), and theoretical notes (ideas emerging in analysis) (Feldman et al., 2018; Stringer and Aragón 2020). There are different positions in relation to emphasise on action research using or developing personal theory or practical knowledge, critical social theory aiming for emancipation, and theories of reflective practice (see Ellis 2011). Certain theories – such as theories of learning – can be used as analytical framings to help action researchers interpret data. CHAT has been used in this way (e.g. Darwin 2011; Feldman and Weiss 2010; Somekh and Nissen 2011, Stuart et al., 2021; Zhang and Wang 2024).

There has been disagreement among CHAT researchers about the relationship between CHAT and action research. Somekh and Nissen (2011) recount Yrjö Engeström's argument that action research is not a coherent method and not a viable substitute for a methodology genuinely built on CHAT, in contrast to Anna Stetsenko, who pointed to the close relationship between Kurt Lewin (foundational in action research) and Lev Vygotsky (foundational in CHAT). Proponents of CHAT as distinct from action research argue that CHAT's critical theorising is a groundbreaking feature that avoids a slip into pragmatic functionalism where research is identified with practice and against theory, concerned with improving practice rather than producing knowledge (see Ellis 2011; Somekh and Nissen 2011). This review regards CLs as a distinctive approach where action is being taken with participants, and where particular theoretical underpinnings shape the process, epistemic and practical outcomes.

Ellis (2011) identified common ground between CHAT and action research as an evolving, optimistic commitment to progress. CLs and action research more widely share a basis for supporting participants to develop new knowledge that addresses relevant practice challenges, rather than implementing a pre-determined idea and measuring its effects (Edwards 2000; Postholm 2020). Action research provides a space for teachers to discuss their work, introduce and develop their own ideas, implement them, and reflect on the process. CLs provide a specific set of tools and approaches to do so, focusing on systemic contradictions (Sannino, Engeström, and Lahikainen 2016; Thorgeirsdottir 2018). However, CLs involve much more than the use of particular CHAT concepts in action research-like studies. Their methodological features reflect theoretical underpinnings in relation to notions of learning, development and change. Key

underpinnings and linked features will now be introduced: expansive learning, activity system, contradictions, double stimulation and germ cells.

Expansive learning refers to learning what is not yet there (Engeström 2015, 2016, 2022). It involves the creation of new knowledge and practices and is a matter of qualitative transformation of at the level of collective activity rather than individual action. Expansive learning depends on reformulating problems and creating new tools for engaging with them and has been articulated in terms of an ideal-typical cycle: questioning, analysis, modelling, testing, implementing, reflecting, and consolidating/generalising. CL workshops are designed to facilitate this cycle, expecting a non-linear and messy process. This echoes McNiff and Whitehead's (2006) action reflection cycle (observe, reflect, act, evaluate, modify, move in new directions) but has a very different theoretical basis, and the practical conduct of a CL is distinct (Thorgeirsdottir 2018).

A cycle of expansive learning may be understood as a collective journey through the zone of proximal development of an activity (Engeström 2015, 2022). Activity in CLs is understood in relation to the *activity system*. Vygotsky focused on mediated action – how an individual subject works on an object (problem) using mediating tools or signs. The activity system expands this to a model of collective activity that incorporates rules (formal rules, procedures as well as cultural norms), community (wider stakeholders) and division of labour (different roles). The second generation of CHAT focuses on one activity system, the third generation on interactions between several, and the fourth on heterogeneous coalescing cycles of expansive learning at different levels (Engeström and Sannino 2021).

Assistance from others is crucial in enabling teachers to become agents of change (Bognar 2011). CLs focus this assistance on historical and systemic analysis that gets to the roots of problems. A key feature of a CL is to help participants identify contradictions within their activity system, or between activity systems. These are historically accumulated structural contradictions, not just tensions or problems (Daniels 2008; Engeström 2015). Such contradictions are a driving force for change. They may arise as inner contradictions within constituents of an activity system, between elements of one system, or between systems.

CLs use the principle of *double stimulation*, the essence of which involves placing people in a situation in which a problem is identified (using first stimuli), and then providing (or co-creating) tools to solve the problem (second stimuli; Daniels 2008; Morselli 2019; Virkkunen and Newnham 2013). Mirror data are used as a primary stimulus, helping participants question the status quo and recognise problems of practice. Videotaped work situations, problematic cases, institutional data and feedbacks from stakeholders are shown during CLs on the first of three surfaces. Second stimuli help participants analyse problems and develop new models. These include theoretical representations of the activity system and four-field diagrams that define the zone of proximal development for the relevant activity. These are shown on a second surface, alongside participant-generated models and visions for change. The third surface captures ideas and tools referred to by participants. The three surfaces work at different levels of abstraction: the lowest being mirror data, the middle being ideas and diagrams developed by participants, and the highest being theoretical representations such as the activity system (Morselli 2019).

The fourth key concept is that of the *germ cell*. A germ cell is an abstract idea which carries the foundational contradiction of the whole system and the seeds for

transcending that contradiction. The germ cell is actionable, a starting point that can be translated into concrete practical applications – a process referred to as ascent from the abstract to the concrete (Engeström 2020). Further theoretical and methodological aspects of CLs are extensively detailed elsewhere in the literature (e.g. Engeström, Sannino, and Virkkunen 2014; Morselli 2019; Virkkunen and Newnham 2013; Yamazumi 2021; and in French: Lemonie, Grosstephan, and Tomas 2021; Valence 2021).

Botha (2017) argues that the CL approach, where new concepts and artefacts are collectively developed to realise desired change, offers advantages for an action research agenda of radical educational transformation (Bradbury, Lewis, and Embury 2019; Manfra 2019). However, researchers considering CLs might query whether laborious, prescriptive features undermine feasibility and flexibility that are crucial to action research (McMahon and Jefford 2009). Substantive practitioner shaping of the practical focus and research process are key characteristics of action research (Bradbury, Lewis, and Embury 2019; Posch 2019). While the former aligns quite obviously with CLs, the latter is less clear given the specific processes and material forms that CLs typically take.

Vygotsky's project strived for equality, inclusion and emancipation. Recent developments in CHAT similarly reject the status quo and seek radical alternatives (Engeström and Sannino 2021). However, CLs might be regarded as having a relatively narrow Globally Northern epistemic basis. Researchers might also question whether CLs require a conceptual insularity that hinders engaging with wider ideas. Criticality in action research can refer to grassroots work with marginalised people as well as to knowledge of democracy and epistemic justice through recognition of Indigenous knowledges and knowledges from the Global South (Feldman 2023). This is described in Stringer, Dick, and Whitehead (2019) as crossing abyssal lines through a perspective that embraces epistemological traditions from the South and East. Abyssal lines are epistemic divides where what is on the other side is seen as beyond reach (Santos 2014). Connections between CLs and other theories are the focus of the discussion below.

Search strategy

Figure 1 summarises the search process. Using PRISMA guidelines (Page et al., 2021), 'record' is a title or abstract indexed in a database, website or reference list, 'report' is a document supplying information about a study (e.g. journal article), and 'study' is an investigation with a defined group of participants, intervention and outcomes. Ninety-seven records of 55 studies were included in this review.

Eight databases were searched, using Boolean 'Activity Theory' AND 'school', 'Change Laboratory' AND 'school', 'Change Lab' AND 'school', and 'formative intervention' AND 'school'. The databases were as follows: EBSCO Academic Search Complete, EBSCO Education Research Complete, ProQuest Education, Clarivate Web of Science, Scopus, Sage Journals, Informit Humanities & Social Sciences Collection, and Wiley. Figure 1 shows 978 records identified from these databases were screened to 81 for detailed review, with further 15 sources from snowballing and pers. comm. with Yrjö Engeström (who

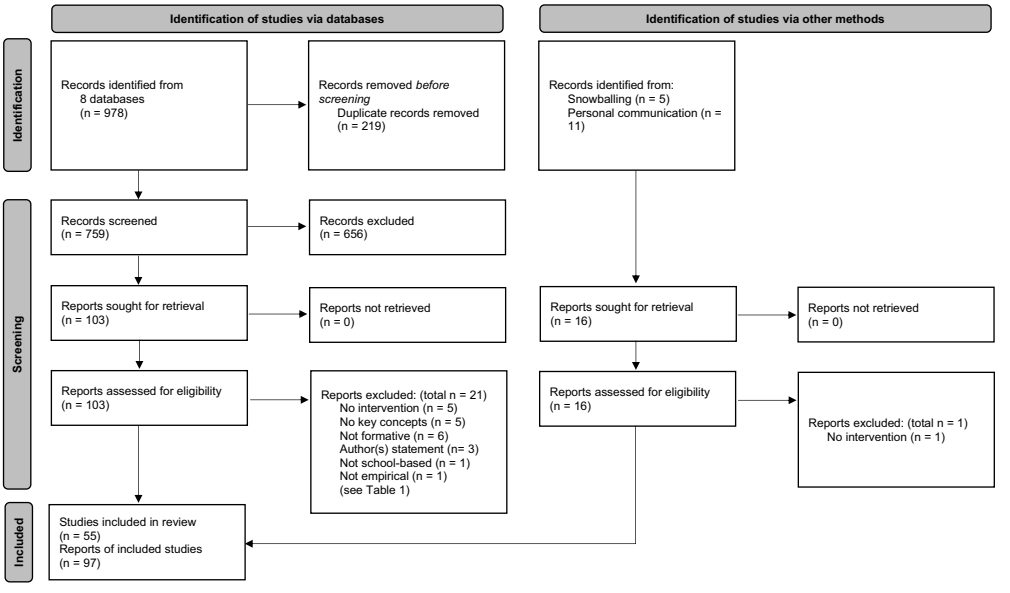

Figure 1. Identification and screening process.

maintains a database of CL studies). The review includes studies published in or before 2023.

Eligibility criteria

Table 1 summarises the eligibility criteria for this review. Criterion 2 is based on features identified in the literature as central to CLs (see above), broader than the criterion linked to the cycle of expansive learning used by Winberg, Garraway, and

Table 1. Summary of eligibility criteria.

Criterion	Inclusion	Exclusion
1. School-based	Active participation of people from: kindergarten, primary/elementary school, middle/lower secondary school, high/upper secondary school, college and vocational education part of mainstream schooling up to age 18	Early childhood, pre-school, tertiary education, university, medical school; pre-university preparatory institutions
2. Key concepts	Explicit reference to at least one of: activity system(s) and contradictions, double stimulation, expansive learning, germ cell/ascent from the abstract to the concrete	No explicit reference to any of these
3. Empirical	Involves collection and analysis of data	No collection and analysis of data
4. Intervention as part of study	Involves implementation of new aspect of practice	Retrospective analysis of change not instigated by researchers
5. Intervention as formative	Intervention is not known at outset, co-developed with participants	Intervention is pre-determined
6. Intervention approach	Change Laboratory or alternative approach where authors explicitly trace roots in and/or features in common with Change Laboratory	Fifth Dimension, Clinic of Activity or Organization Workshop; formative intervention where authors explicitly distance the approach from Change Laboratory

Wright (2023). Through criterion 6, several sibling approaches were included: Laboratory of Educational Change, Learning Lab, Indigenous Learning Lab, Change Workshop, and Change Room.

Dissertations, theses, conference proceedings and online project reports were included alongside journal articles, books and book chapters. No exclusions were based on the language of publication. Snowballing through reference lists identified studies in French, Spanish, Portuguese and Swedish. Details of these were verified using translation software and contact with the authors. Publications in languages other than English or by publishers in the Global South are less likely to be included in the databases used – a limitation of this review. Nonetheless, 97 reports of 55 studies suffice to detect trends, and it is the largest suite of CLs considered in a single review; Winberg, Garraway, and Wright (2023) reviewed 40 reports.

Table 2 gives key information about the 55 studies, listed by the year data collection began. This locates studies more precisely in historical context because some reports were published 10 years or more after the intervention itself.

Patterns and trends in change laboratory research in schools

The 55 studies were analysed to detect patterns and trends. Findings are presented relating to date and location, methodological details, research foci, theoretical references, and outcomes. Commentaries are interwoven into this section.

Date and location

Table 3 groups the studies into five-year periods, and Table 4 lists the countries where CL interventions happened.

CL studies in schools have become more common over the past 25 years. They have been conducted in 24 countries, with the geographical distribution reflecting areas where there are strong CHAT traditions. This growth reflects an appetite among researchers for theoretically informed action research, and the spread of CHAT. Table 4 suggests a relatively thin global spread with a few clusters that might constitute a critical mass; 18 studies were the only instance found in that country. This presents a challenge to researchers and potentially limits the uptake of research findings beyond research sites.

Sites, participants and intervention duration

Table 5 details samples and intervention duration. A large range in sample size was found: study #27 had 3 participants, while #31 had 66. Nearly three quarters (73%) had between 10 and 30 participants. This suggests that CL studies skew towards larger groups of participants than typical action research studies. Thirty studies were involved between 6 and 10 workshops, while 19 had 5 or fewer workshops (Table 5). While some studies involve considerably more than this, the findings cluster toward more feasible numbers. CLs have tended to focus on one school, with relatively few involving more than one school site. This echo trends in action research more widely, where the strength of the approach lies in close attunement to contextual factors. Some CLs have been conducted across multiple school sites, reflective of developments in CHAT relating to interactions

Table 2. Overview of 55 change laboratories and sibling approaches in or involving schools.

#	Year*	References**	School sites; Country	Intervention named as	Substantive Focus
1	1998	Engeström, Engeström, and Suntio (2002a) Sannino (2008) Sannino, Engeström, and Lemos (2016)	Middle school in disadvantaged urban area; Finland	Change Lab	Organisation of schooling; Year 9 project; teacher construction of student
2	2000	Engeström, Engeström, and Suntio (2002b) Rainio and Hofmann (2021)	Middle school in disadvantaged urban area; Finland	Change Lab	Use of ICT in instruction
3	2002*	Quintos, Civil, and Bratton (2019)	K-12 school; USA	Formative Intervention	Partnership with parents in mathematics
4	2005	Virkkunen et al. (2012) Virkkunen and Newnham (2013) Engeström, Sannino, and Virkkunen (2014)	Senior secondary school, boarding school, many orphans; Botswana	Change Lab	Teachers' categorisation of students (as colonial legacy)
5	2006	Virkkunen (2010)	State school for children with disabilities; Finland	Change Lab	Professional collaboration of specialists
6	2007	Hauge, Norenes, and Vedøy (2014)	Secondary school with history of success; Norway	DWR	School leadership
7	2005	Meyers (2007)	6 metropolitan secondary schools; USA	DWR	School library programs
8	2007*	Daniels et al. (2007) Edwards et al. (2009) Edwards (2010)	Local Education Authorities; UK	DWR	Professional learning across boundaries; for young people at risk
9	2008*	Davies, Howes, and Farrell (2008)	6 secondary schools; UK	Action research	Teachers working with educational psychologists
10	2009	Thorgeirsdottir (2018)	Upper secondary school; Iceland	Change Room	Pedagogical development
11	2010*	Sannino (2010)	Secondary school; Italy	Change Lab	Assessment practices
12	2011	Barma et al. (2017)	Secondary school; Canada	Change Lab	Student engagement; school-work relationships
13	2011	M. F. Lemos and Engeström (2018) M. Lemos and Liberali (2019) M. Lemos (2017)	Multiple schools in urban area, including favela; Brazil	Change Lab	Educational management
14	2012	Lapshin, Ivanova, and Chernish (2015)	School of Self-Determination; Russia	Change Lab	Reorganisation of school
15	2012	Afacan et al. (2021) Bal, Afacan, et al. (2021)	Primary (urban working class), middle (urban) and secondary (racially and economically minoritized) schools; USA	Learning Lab	Racial disproportionality in school discipline

(*Continued*)

Table 2. (Continued).

#	Year*	References**	School sites; Country	Intervention named as	Substantive Focus
		Cakir et al. (2022)			
16	2012*	Douglas (2012)	Primary school, advantaged area; UK	Change Lab	Initial teacher education
17	2014	Eriksson et al. (2018)	School for deaf children (*p*-10); Sweden	Change Lab	Parent involvement and student inclusion
18	2014	Morrison et al. (2019)	Secondary school, urban area; Norway	Design experiment/Change Lab	Young people's agency (outside school) and use of ICT
19	2014	Cenci et al. (2020) Cenci, Vilas BôBôAs, and Damiani (2020)	Primary school; Brazil	Formative Intervention inspired by Change Lab	Inclusion of students with disabilities
20	2014*	Naghieh, THompson, and Montgomery (2014)	2 urban secondary schools with high disadvantage; 2 rural schools; UK	Change Lab	Wellbeing, teacher burnout
21	2015	Chang (2021) Chang, Martínez-Roldán, and Torres-Guzmán (2020) Chang, Martínez-Roldán, and Torres-Guzmán (2021)	Primary school; USA	Change Lab	Bilingual teacher learning, culturally responsive teaching
22	2015	Deslandes, Barma, and Beaumier (2020)	Primary school; Canada	Change Lab	Parental involvement in literacy
23	2015	Hyrkkö and Kajamaa (2021) Kajamaa and Hyrkkö (2022)	Primary school Innovative in initial teacher education; Finland	Change Lab	Distributed creativity and teacher professional learning
24	2015	Jarvoll (2018)	Primary school; Norway	Change Lab	Motivation in mathematics using ICT
25	2015	Morselli (2019) Morselli and Marcelli (2021) Morselli (2021)	Secondary technical school; Italy	Change Lab	Course change to reverse declining participation
26	2015	Silva-Macaia et al. (2020)	Primary school urban area; Brazil	Change Lab	Teacher illness and absenteeism
27	2016	Augustsson (2021)	Upper secondary school; Sweden	Change Lab	Teacher learning (environmental education)
28	2016	Deslandes and Barma (2018)	Primary school in disadvantaged area; Canada	Change Lab	Teacher-parent collaboration around homework
29	2017	Hopwood et al. (2023)	K-12 school disadvantaged urban area; Nepal	Change Lab	Pedagogical development for inclusion
30	2017	Pattison (2000)	Primary school in disadvantaged inner city; UK	Change Lab	Whole-school reading pedagogy
31	2017	Wei, Lee, and Chung (2022)	Primary school; China	Formative Intervention	Practical knowledge of PSTs
32	2017	Bhurekeni (2021)	Cluster of primary schools; Zimbabwe	Formative intervention	Afrofilic Philosophy for children
33	2017*	Batane (2017)	Primary boarding school in rural area; Botswana	Change Lab	Reducing drop-out
34	2017*	Botha (2017)	Secondary school in black township; South Africa	Change Lab	Remaking educational practices to build trust and openness
35	2017*		Secondary school; Zimbabwe	Change Lab	

(*Continued*)

Table 2. (Continued).

#	Year*	References**	School sites; Country	Intervention named as	Substantive Focus
		Chikunda, Chikunda, and Castro (2017)			Gender responsivity in STEM initial teacher education
36	2018	Barma et al. (2021)	Private urban secondary school and public suburban secondary school; Canada	Change Lab	Adolescent mental health, cannabis use
37	2018	Diao et al. (2022)	Primary suburban and secondary schools with migrant families; China	Change Lab	Teacher research as professional development
38	2018	Nykänen, Kurki, and Airila (2022)	Upper secondary vocational school; Finland	Change Workshop	Partnership between vocational school and workplace
39	2018*	Kornelaki and Plakitsi (2018)	Primary school; Greece	Change Lab	Science education, engagement
40	2018*	Mbelani (2018)	Secondary school; South Africa	Change Lab	Teacher learning about visual literacy
41	2019	Kaup and Brooks (2022)	Primary school; Denmark	Change Lab	Mathematical thinking
42	2019	Postholm, Klemp, and Nordbotn (2023)	Primary school; Norway	Change Lab	School-university cooperation in initial teacher education
43	2019	Spante, Varga, and Carlsson (2021)	Middle school, rural area; Sweden	Change Lab	Boys' low achievement
44	2019	Yamazumi (2021)	Primary school; Japan	Change Lab	Teacher professional learning
45	2019	Bal and Bird Bear (2023) Ko et al. (2023) Ko et al. (2022) Bal et al. (2021)	Secondary rural school with Indigenous population; USA	Indigenous Learning Lab	School behaviour support system; Indigenous sovereignty
46	2019*	Jakhelln and Postholm (2022)	Primary and lower secondary schools; Norway	Change Lab	School-university cooperation in initial teacher education
47	2020	Engeström et al. (2023a) Engeström et al. (2023b)	Secondary school; Finland	Change Lab	Adolescent future-making, agency outside school
48	2020	Yamazumi (2022)	Primary school; Japan	Formative Intervention	Mathematical thinking
49	2020*	Postholm (2020)	Middle school; Norway	Change Lab	Teacher professional development
50	2021*	Kandjengo (2021)	Secondary school; Namibia	Change Lab	Student leadership
51	2021*	Moden et al. (2021)	Secondary school;Sweden	Change Lab	Intelligent tutoring system in secondary mathematics
52	2021*	Lemonie et al. (2021)	Primary Education Networks; France	Change Lab, contributions from Clinic of Activity	Professional collaboration across network to reduce social inequalities
53	2023*	Salloum and BouJaoude (2023)	2 K-12 private schools; Lebanon	Change Lab	Multilingual science education
54	2023*	Filipiak (2023)	Primary schools; Poland	Laboratory of Educational Change	Teacher professional learning for bottom-up school change
55	2023*	Tresserras and Querol (2023)	Kindergarten, Primary and Secondary school teachers; Spain	Formative intervention, contributions from Clinic of Activity	Teacher reflective practice to promote plurilingualism

*Year based on year of publication where dates of fieldwork not provided.
**A maximum of three references per study are provided here, giving the most recent; further references to studies #8, 13, 15, 25 and 45 can be found in the publications listed.

Table 3. Number of change laboratory studies 1998–2023.

Five-Year Time period	Number of studies	Study references (Table 2)
1998–2002	3	1–3
2003–2007	5	4–8
2008–2012	8	9–16
2013–2017	19	17–35
2018–2023	20	36–55
Total	**55**	
(Year of intervention not provided)*	(18)	

*Where the year of intervention was not provided, studies were categorised by year of publication as this is the latest possible year in which the intervention could have taken place.

Table 4. Number of change laboratory studies in particular countries.

Countries	Number of studies per country
Finland, Norway	6
United States of America	5
Canada, Sweden, United Kingdom	4
Brazil	3
Botswana, China, Denmark, Greece, Iceland, Italy, Japan, Lebanon, Namibia, Nepal, Poland, Russia, South Africa, Spain, Zimbabwe	1

Table 5. Methodological details of change laboratories.

Aspect of research design	Range (number of interventions)
Sample size*	<10 participants (13)
(Information not provided)	10–15 participants (17)
	16–30 participants (19)
	> 30 participants (5)
	(7)
Number of schools involved	1 school (40)
(Information not provided)	2 schools (2)
	3 schools (2)
	4 schools (1)
	6 schools (2)
	Unspecified number in network, cluster or district (4)
	(4)
Intervention duration	<1 month (4)
(Information not provided)	1 to 2 months (3)
	3 to 6 months (13)
	7 to 12 months (13)
	> 12 months (12)
	(10)
Number of workshops**	<6 sessions (19)
(Information not provided)	6–10 sessions (30)
	11–15 sessions (8)
	> 15 sessions (6)
	(5)

*Some studies involved more than one Change Lab with different samples, hence the total number of interventions is 60 not 54.

**Where studies had more than one site or intervention, the number of workshops per site or intervention is given.

between multiple activity systems (the third generation, Engeström and Sannino 2021). This also applies to studies involving one school and other sites such as workplaces or universities.

CLs can function on varying timeframes. Intervention duration between the first and last workshops varied considerably (Table 5) from 2 days (#40) to 2 years (#9); 41 studies involved interventions of 2 months or longer.

CLs have been conducted across the full range of schooling, with over 70% of the studies either in primary or secondary schools (Table 6). Overwhelmingly, these have been mainstream schools; two involved special schools (#5, 17). Given the importance of critical approaches in action research more generally (Feldman 2023) and links between CHAT and educational equality and justice, it is important to consider the kinds of schools involved. Thirteen studies worked with schools in inner cities, informal townships/favelas, areas with migrant populations, and rural or remote areas in the Global South, thus targeting what Feldman (2023) would term grassroots or marginalised communities. However, most studies were not in such contexts, and did not address issues explicitly linked to the socioeconomic and cultural circumstances of the schools involved. Without diminishing the contribution such studies make to pedagogical development and school change, these findings suggest the critical thread may be weaker than could be expected. However, it is important to examine the substantive foci of studies before drawing a wider conclusion in this regard.

Given the importance of participation in action research, questions about who has been involved in CLs are crucial. Table 7 shows 34 studies involved teachers, as expected in a school-based context. That 17 studies involved school leaders or administrators speak

Table 6. Kinds of schools involved in change laboratories.

Kind of school	Number of studies
Primary/elementary	19
Middle/lower secondary	5
Secondary/high (including upper secondary and vocational)	19
K-12	4
Primary and middle/lower secondary	2
Special schools for students with disability	2
*Schools identified as serving disadvantaged communities	13
*Schools identified as successful, innovative or oversubscribed	5
* Private sector schools	2
(Information not provided)	(1)

*Additional classifications that spread across those relating to school stage.

Table 7. Kinds of participants involved in change laboratories.

Kind of participant	Number of studies
Teachers only	20
Students only	4
Parents only	1
Teachers and other professionals	11
Teachers and community/parents	3
Any teachers involved	34
Any students involved	7
Any parents involved	4
Any pre-service teachers involved	6
Any teacher educators involved	3
Any leaders/administrators involved	17

to the orientation of CLs towards systemic change, which often depends on support and action from people with managerial responsibility (this is also where resistance may be met, discussed below). The involvement of other professionals (11 studies) included school librarians, allied health groups (counsellors, nurses), union representatives, industry, and government. Nine studies included pre-service teachers, teacher educators, or both.

The much lower involvement of students (seven studies), and the even smaller number of studies involving parents and the wider community (4) are striking findings. Students are, after all, the primary stakeholders in educational action research, and the need for greater inclusion of students in action research more generally has been noted (Bradbury, Lewis, and Embury 2019). The lower involvement of students has implications concerning knowledge democracy (Feldman 2023) as it limits the epistemic basis for the expansive learning that CLs foster.

Substantive foci and wider issues

Noffke (2009) differentiates action research focused on narrow aspects of classroom work from studies connected to larger social visions and movements. Teachers' classroom practices have been the most common focus of school-based CLs (Table 8), echoing educational action research more widely (Manfra 2019; Messikh 2020). Teachers' practices beyond the classroom have been studied, including their work with health professionals, workplaces, universities and parents. Such boundary-crossing has been addressed at institutional levels, but the focus has tended to remain on particular aspects of schooling (subjects, skills, behaviour, technology, assessments, etc.). Comparatively, few CLs explicitly sought to reorganise schooling as a whole.

Bradbury, Lewis, and Embury (2019) argue quality in action research rests on significance, i.e. meaning and relevance beyond immediate context, contributing to people and communities flourishing. Table 9 categorises studies according to wider issues to which they are explicitly linked. Reflecting the pattern in Table 5, the most common issue was teacher professional learning. Twelve studies explicitly addressed issues of inclusion and social inequality, including racism, gender, migrant students and those at risk of exclusion.

Table 8. Substantive foci of change laboratories.

Substantive focus	Number of studies
Teachers' or student teachers' classroom practices	28
Teachers' work with others	6
Institutional collaboration	5
Re-organisation of schooling	4
Other: teacher wellbeing, student leadership, parental involvement, young people's agency, library programs	12

Table 9. Wider issues linked to change laboratory foci.

Wider issues	Number of studies
Teacher professional learning/practice development	22
Inclusion, social inequality	12
School reform	6
Other: Learner voice, youth futures, student health, sustainability etc.	15

This reveals a critical thread not evident from details of the schools involved themselves. The findings demonstrate the breadth of applicability of CLs.

Theoretical reference points

The theoretical reference points in CL studies are crucial, given how theory is central to what distinguishes them as an approach to action research. The studies were analysed in terms of explicit reference to the four key concepts discussed above (expansive learning, activity system, double stimulation, and germ cell). The analysis also identified other theoretical referents within and beyond CHAT. Findings are presented in Table 10. Not all theoretical influences on the design, conduct and thinking behind CLs are reported in compact published forms such as journal articles, so caution is needed when interpreting the absence of explicit reference.

Table 10 shows that expansive learning and systemic contradictions form the theoretical backbone of most CLs in schools; 42 studies drew on both. Reflecting the number of schools involved (Table 5), most drew on second-generation CHAT, looking at contradictions within an activity system; those investigating boundary-crossing between schools and other institutions drew on the third generation, and one (#52) referred to the more complex fourth generation (Engeström and Sannino 2021). Table 10 shows that conceptual developments in relation to double stimulation regard have broadly been reflected in CLs, with more recent studies referring to Sannino's (2015, 2022) transformative agency by double stimulation (TADS) framework. The comparatively infrequent mention of germ cells and their ascent from the abstract to the concrete is striking given that these concepts are central to CHAT and CLs. It is unclear why these concepts are so rarely drawn on or reported.

Table 11 shows that the studies reviewed were not limited to these concepts. CLs are becoming more reflective of wider ideas and developments in CHAT, especially concepts related to boundary-crossing (see Tables 5, 8, 10) and Edwards (2017) concepts of relational agency, relational expertise and common knowledge. Winberg, Garraway, and Wright (2023) identified two African studies that drew on theory beyond CHAT (critical realism and Ubuntu philosophy), classifying them as 'augmented' CLs. Table 11 shows that diverse ideas from other sources have been

Table 10. Key theoretical reference points in change laboratories.

Theoretical reference(s)	Number of studies
Expansive learning	48
Contradictions within or between activity systems	47
(2nd generation, within a system)*	(33)
(3rd generation, between systems)	(13)
(4th generation, complex constellations at multiple levels)	(1)
Double stimulation	33
(mirror data and auxiliary stimuli)	(16)
(agency as breaking away)	(5)
(earlier notion of transformative agency)**	(7)
(recent TADS framework)**	(5)
Germ cell and ascent from abstract to concrete	14

*Refers to generations of CHAT described by Engeström and Sannino (2021); the first generation predates Change Labs and does not include systemic analysis.

**The earlier notion was based on expressions of agency that broadly paralleled expansive learning actions; the recent TADS (transformative agency by double stimulation) framework refers explicitly to conflicts of motives (see Engeström and Sannino 2021; Kaup and Brooks 2022; Sannino 2015, 2020).

Table 11. Wider theoretical referents within and beyond CHAT.

Theoretical references	Example studies (# from Table 2)
Other CHAT concepts	
Boundary crossing/boundary objects	5, 8, 12, 22, 40, 42, 46, 53
Relational agency, common knowledge, relational expertise	8, 14, 21, 22, 25, 30, 42
Internalisation and externalisation	13, 24, 28
D-analysis	8, 33, 42
Co-configuration, collaboration	1, 8
Experience	11
Stabilising/possibility knowledge	4
Creative chains of activities	13
Concepts from beyond CHAT	
Indigenous and African epistemologies	32, 34, 45
Critical pedagogy, dialogue as tool for change (Freire)	3, 18
Myth (Barthes)	2
Figured worlds (Holland)	8
Practical knowledge (Dewey)	31
Power and control (classification, framing; Bernstein)	8
Power and hegemony (Gramsci)	52
Distributed creativity	23
Self-efficacy	38
Visual literacy and multi-modality	40
Realistic learning	55

folded into school-based CLs around the world, suggesting an openness that is not apparent in texts focusing on the theoretical foundations and conduct of CLs. Given concerns around epistemic justice and knowledge democracy in action research (Feldman 2023), it is promising to see CLs engaging with Indigenous knowledges and knowledges from the Global South. Abyssal lines (Santos 2014) have been crossed in CLs, strengthening their contribution to social change (Stringer, Dick, and Whitehead 2019).

Mirror data and stimuli

Double stimulation is a common feature of CLs (see Table 10). What first and second stimuli have been used? While video recordings are mentioned as preferable in the literature (Virkkunen and Newnham 2013), Table 12 shows that these have been far less commonly used than interviews, artefacts, and observations. This perhaps reflects the ethical and logistical challenges of video work. The general success of studies using alternative forms of mirror data suggests that these still prompt appropriate questioning and problem posing. While standard practice involves multiple forms of mirror data, 20 studies relied solely on one source, suggesting that leaner approaches do not necessarily compromise this crucial initial stimulus function. A wide variety of other mirror data listed in Table 12 show that these methods are evolving and being enriched over time.

It is surprising that only 22 studies made explicit reference to the use of activity system representations as secondary stimuli (Table 12), given how central they are to CLs. Since its inception, the CL tradition has encouraged and incorporated diverse emergent artefacts *alongside* theoretical representations, and Table 12 shows these to be reflected in the reviewed studies. It is worth noting the low number (9) of studies referring to four-field diagrams as secondary stimuli. These play an important role in helping participants

Table 12. First and second stimuli in change laboratories.

Stimuli	Number of studies
First stimulus (mirror data)	
• Interviews	19
• Artefacts (policy documents, work samples, lesson plans)	16
• Observations	13
• Video recordings of practice	10
• Surveys	9
• Existing quantitative data (e.g. student outcomes)	7
• Other: autobiographical accounts (#11, 27, 55), disturbance diaries (#3, 21), representations of school history produced for the change lab (#14, 26), 'window' data from other schools (#16), an equity walk-through (#15), questions and comments posted to a blackboard (#19), participant-produced activity system diagrams (#21) and prior research (#39, 53)	13
(Information not provided)	(9)
Second stimulus (auxiliary stimulus)	
• Activity system & participant models/visions	22
• Participant models/visions (without activity system)	12
• Four-field diagrams mapping ZPD	9
• Summaries from prior Change Lab workshops	5
• Other: participant presentations (#10) or narratives (#54), maps of cultural responsiveness (#15), ideas from other theories (e.g. concepts of literacy, (#40), lesson plans (#53); research literature (#55)	5
(Information not provided)	(13)

determine the direction of their collective development (ZPD). This suggests that a key tool may have been overlooked in many studies, for reasons that are not immediately apparent, unless their use was omitted from published material.

Key outcomes and limitations

CLs aim to secure meaningful concrete change. Table 13 maps outcomes in relation to six broad categories. The most reported outcomes of new pedagogic practices include how teachers or student teachers teach in classrooms, new learning activities, units of study or forms of assessment. This echoes Winberg, Garraway, and Wright (2023) African review findings. Other outcomes related to the new forms of collaboration included new ways of professionals at the same school worked together (#5, 7, 19, 43) or with people from other workplaces (#38), health and social services (#8, 36), and universities (#13, 16, 23, 29, 31, 39, 42, 46, 54). The new institutional frameworks include behavioural support systems (#15), structures for policy review (#20), processes for ongoing improvement (#6, 43), and leadership frameworks (#6, 34, 50). Outcomes categorised as new concepts of education included shifts in the object of teachers' activity (#1, 48), visions of de-encapsulated classrooms (#2, 47), new ways of understanding students (#4), and new concepts of educational management (#13). One study empowered parents to help with their

Table 13. Key outcomes of change laboratories in schools.

Broad kind of outcome	Number of studies
New pedagogic practices	29
New forms of collaboration between professionals or institutions	12
New institutional frameworks	7
New concepts of education	6
New kinds of parental involvement	3

children's literacy (#22), while another briefly succeeded in involving parents as collective decision-makers (see below; #3).

Tracing developments in activity systems over the medium- and long-term was noted by Ellis (2011) as a lacuna in CHAT formative interventions. The long tail of CLs remains a key concern (Sannino, Engeström, and Lahikainen 2016; Winberg, Garraway, and Wright 2023). Sustaining change beyond the intervention was explicitly mentioned in eight studies (#1, 4, 13, 23, 25, 29, 43, 54), providing evidence that CLs can foster lasting change. Three of these (#4, 13, 54) new initiatives were formalised at relevant levels of government. Spreading from the original school site(s) to others was documented in studies #29 and 54. In study #43 CL processes were taken up by schools as continuing means to foster collective culture and school improvement on diverse lines. Downstream impacts of changes resulting from CLs were much less reported. This may be a key reason to undertake research, but it takes months or years to gestate and thus be beyond the scope of many studies. A notable exception is study #33 where changes in classroom practice were linked to evidence of improvements in children's learning and behaviour.

Not all CLs were successful. This echoes Winberg, Garraway, and Wright (2023) classification of 15 studies (of 40 reviewed) as 'partial' because the cycle of expansive learning could not be completed, citing time constraints, participant withdrawal, disengagement, disinterest, communication breakdowns, and discord. In the present review, three studies explicitly reported change attempts failing. Study #19 achieved transitional acts towards inclusion of students with disabilities but did not overcome underlying contradictions, noting these were historically entrenched and unlikely to be resolved in a single intervention. Study #26 sought to address teacher illness and absenteeism, but managers withdrew participation, significantly limiting change. An intelligent tutoring system was abandoned by teachers in study #51. Some studies secured brief changes, with practices returning to pre-intervention forms. In study #3, the district reverted to positioning parents as recipients of information rather than co-decision-makers; in #30 the organisation lost incentive to change, compounding a lack of collective adherence to the new model of teacher professional development.

Table 14 summarises the limitations mentioned in the reports analysed. Limitations referring to systemic features show that despite the intention of CL to address contradictions within or between activity systems, these can sometimes be immovable in a single intervention. Hierarchies, managerial and organisational power structures may remain embedded in the workshop process and restrict change (Nykänen, Kurki, and Airila 2022; Warmington 2011). Even if studies successfully address local systemic change, wider structural and cultural issues may remain in place (see #19, 29). This is something the fourth generation of CHAT is designed to address by working across multiple levels from specific institutions to wider political constellations (Engeström and Sannino 2021).

Table 14. Examples of limitations identified in change laboratories.

Limitation	Example studies (# from Table 2)
Systemic features limit scope or sustainability of change	33, 47, 53
Short timescale prevents deeper change	42
Underlying structural and cultural issues unchanged	19, 29
Interim publication prior to completion of expansive learning cycle	9, 28, 41, 45, 50
Challenges relating to participants' voice	37, 50
Small scale and lack of direct generalisability	7, 16, 34, 38

Resistance is expected in CLs and was evident at institutional levels (#8, 45) and among individual participants (#8, 11, 30, 43, 45, 51, 52). In some cases, resistance dissipated (#11, 37, 40), but in others, it curtailed the scope of change (#8), affecting those CLs that were not successful. Winberg, Garraway, and Wright (2023) echo Virkkunen and Newnham (2013) in identifying participant unwillingness, confusion and struggles when working towards divergent goals as key reasons why CLs may fail or remain partial.

Resistance and participant voice are salient given concerns around inclusion and epistemic justice in action research (Bradbury, Lewis, and Embury 2019; Feldman 2023). In study #37, disparities in participation created concerns that the voices of those who prefer listening and silence are squeezed out by others. The promotion of multi-voicedness in CLs is not always culturally straightforward: the general discouragement of children from questioning elders in Namibia was a reported challenge in study #50 (questioning being key to expansive learning). In study #46 the use of theory created epistemic distances and hierarchies between participants. Meaningful inclusion of diverse participants, including addressing the lack of students', parents' and community voices (see Table 7) is more than a matter of them accepting invitations to join a CL. This is a wider concern for educational action research, although the theoretical nature of CLs may present particular challenges in this regard.

Discussion: CLs and educational action research

CLs and their sibling approaches evidently deliver meaningful change in diverse aspects of schooling. They provide a theoretically grounded approach to support changes in teachers' practice. They do so in a way that addresses the difficulty of teachers acting alone as change agents, the tendency to hope that others will take the initiative for change or sense of powerlessness created by so often being on the receiving end of other people's visions (Bognar 2011; Bradbury, Lewis, and Embury 2019). The third and fourth generations of CHAT provide a basis to deal with complex relationships across professional and institutional boundaries. The review findings demonstrate their potential to meet the demands for both practical relevance and rigour (Ellis et al. 2015; Gutiérrez and Penuel 2014; Manfra 2019; Wei, Lee, and Chung 2022). This review also shows CLs varied in their specific forms while upholding underlying principles, indicating the flexibility that McMahon and Jefford (2009) identify as a key strength of action research. Findings show that CLs are more feasible, flexible and theoretically open than might be expected.

In critically considering the review findings, seven fronts for further development in school-based CL research will now be considered: participation; systemic rather than technical change; sustainability; epistemic justice; addressing grand challenges; resistance and affect; and reporting. These expand upon the directions for 'augmented' CLs identified by Winberg, Garraway, and Wright (2023).

CLs can enable meaningful participation of diverse stakeholders, though they have favoured teachers and school professionals over students, parents and communities. This finding echoes Bradbury, Lewis, and Embury (2019) concerns about student inclusion in action research. The ability of participants to contribute to and shape the research process is a key feature of action research (Posch 2019), and findings suggest that CLs are more open to participants shaping the process than might be expected. Participant-generated forms of mirror data are emerging (autobiographical

accounts, disturbance diaries, equity walk-throughs), and the standard workshop has been replaced with forms more organically embedded in participants' activity (e.g. #13, 47). However, the ability of participants to meaningfully contribute is not guaranteed. Exploring how diverse voices can be heard and how control over other aspects of the process might be further distributed without losing theoretical integrity is one productive front for future development.

There are widely held views that action research should go beyond personal, technical and professional concerns to address wider political transformation and emancipation (Bradbury, Lewis, and Embury 2019; Hendricks 2019; Kemmis, McTaggart, and Nixon 2019; Noffke 2009). This is core to the original intent of CLs (Virkkunen and Newnham 2013). Findings suggest that some school-based CL studies may be underpowered in this regard, producing technical changes in pedagogical practices (see Tables 8 and 9). This is frequently achieved in other approaches to action research (Messikh 2020). Analysis and resolution of systemic contradictions (see Table 10) gives such changes a deeper meaning because those contradictions meant that the new forms of practice were otherwise out of reach for practitioners. It is also important to note that such changes often go against the grain of neo-liberal managerialism or even capitalist forces that favour competition, selection and differentiation rather than collaboration and inclusion (Winberg, Garraway, and Wright 2023). Thus, the political dimension (Noffke 2009) may be stronger than appears on the surface. Nonetheless, a second front for future development concerns continues to steer CLs towards firmly embedding changes in intra- and inter-systemic dynamics while ensuring moral-ideological developments remain in focus (Engeström and Sannino 2021; Winberg, Garraway, and Wright 2023).

Can CLs deliver lasting change? They are not immune to practices reverting, resistance, or wider conditions that limit change. This does not indicate a fundamental flaw in CLs nor the failings of researchers to implement them properly. It is not clear from the reports of most studies analysed here that the changes were sustained in the long-term. CLs seek to strengthen sustainability by consolidating and embedding practices (the seventh step in the expansive learning cycle). However, as with action research more generally, long-term evidence that changes are sustained or of their downstream impacts is often beyond the study scope. Like much action research, CLs are not designed to be empirically generalisable but instead offer a transferable resonance where new models are used creatively as thinking tools, adapted by users to different contexts (Postholm, Klemp, and Nordbotn 2023). Even so, where follow-up happened, evidence pointed to sustained change and several instances of significant spread. Evidence of sustainability is patchy. It seems CLs do not guarantee lasting change but can create conditions for enduring initiatives that may be catalysts for ongoing change. A third front for ongoing work thus relates to exploring and evidencing the sustainability of change and how to buttress new models against reversion or subsequent institutional turbulence.

The diverse foci of these studies and their geographically dispersed nature are strengths, but there is little sense of cumulative practical change. While the theory has clearly been driven forward (e.g. new generations of CHAT, incorporation of new CHAT concepts, see Tables 10 and 11), it is not common for CLs to take outcomes from prior studies as a point of departure. More strongly building on existing CLs so that progression in practical change matches that in CHAT itself constitutes a fourth developmental front for CLs.

Feldman (2023) highlights criticality and epistemic justice as linked aspects of educational action research that warrant further attention, echoed by Stringer (2019) calls to cross abyssal lines and embrace non-Western epistemologies. CLs are promoted as a bottom-up approach that advances critical political agendas around equity, inclusion and justice (Botha 2017; Engeström and Sannino 2021). The review found clear currents of grassroot criticality, working with marginalised groups (Feldman 2023), although the body of studies overall tends more towards technical rather than deeper critical qualities. This is changing, and recent work under the Indigenous Learning Lab guise (Bal and Bird Bear 2023; Ko et al. 2022, 2023; #45) illustrates one leading edge of this fifth front, crossing abyssal lines by engaging with Indigenous communities and knowledges, demonstrating how CLs might move forward in relation to epistemic justice, incorporating Eastern and Southern epistemological traditions (Stringer, Dick, and Whitehead 2019). Wider evidence of theoretical openness in the conduct of CLs (Table 11) sets a promising precedent for progress on this front. This aligns with one of the key 'new visions' for (augmented) CLs identified by Winberg, Garraway, and Wright (2023).

Increasingly, action researchers are tackling grand challenges: deep-rooted, complex problems as they manifest in schools, as well as the power relations that can constrain or reverse change. Recent developments in the fourth generation of CHAT (Engeström and Sannino 2021) are promising on this front (Winberg, Garraway, and Wright 2023). Fourth-generation studies seek tackle associated with unwieldy complexity, having been exemplified in relation to work contributing to significant reductions in homelessness (Sannino 2020, 2022) but are not yet fully applied in relation to schools. Lemonie et al. (2021; #52) are beginning this work across education networks in France, confronting difficulties where power and hierarchy are not seen as problems but normal or even natural.

Teachers in action research commonly struggle to assume new roles and develop new identities, meeting resistance when ideas hit the ground (Bognar 2011). This has long been recognised in CLs participants' readiness to ideate but reluctance to implement (Daniels 2016; Engeström 2007) and was found to be an ongoing challenge by Winberg, Garraway, and Wright (2023). Issues of identity and participant experience have been seen as challenges to the cognitive orientation of CHAT (Daniels 2008, 2016; Daniels et al. 2007) noting the affective aspects of changing practices or schools must not be downplayed (Edwards et al. 2009). Sannino (2008) has taken up Vasilyuk's notion of experience to understand resistance in CLs but the need to address affect more thoroughly remains and appears key to tackling resistance that limits outcomes of some CLs.

A final front for future development concerns reporting, echoing a wider concern for dissemination of action research (Manfra 2019). Many aspects of the review were incomplete because information was not provided in published material. The word economy of journal articles makes exhaustive accounts difficult. Table 15 presents a suggested minimum reporting template for CLs. It is hoped that reporting covering the points identified in Table 15 will ensure more consistent communication of relevant historical, methodological and theoretical details, adding value to researchers wanting to learn from and adapt their resonant findings (Postholm, Klemp, and Nordbotn 2023), or implement a CL themselves.

Table 15. Suggested minimum reporting information for change laboratory studies.

Aspect of study	Minimum information
Contextual information	• Year/month of intervention commencement, finish and any follow up • Institution/institutions involved: number of sites; country; age range of students; public/private; students/community demographics (adapted as appropriate for non-school-based Change Labs)
Sample	Number and kind of participants
Data collection	• Mirror data: forms of data, timing of collection • Workshops: number, data capture (video, audio, photographs, etc.) • Follow-up: forms of data, timing of collection
Surfaces and stimuli*	• First stimuli: how mirror data were presented • Second stimuli: • Theory-based (activity systems, four-fields, etc.) • Participant-generated (emerging and final models, visions) • Other
Data analysis	• Identify relevant generation of CHAT as applicable • Use of central concepts as applicable (e.g. activity systems, expansive learning, double stimulation/agency, germ cell/ascent from abstract to concrete) • Use of wider CHAT concepts if applicable • Use of concepts from wider theory if applicable
Raw data	• Sufficient to provide readers with vicarious access to workshops (e.g. screenshots from video, quotations from transcripts, photographs of surfaces)
Outcomes and limitations	• Summary of concrete changes implemented • Evidence of embedding/consolidating in practice, subsequent reversion to past practices, or fragility in light of other changes • Evidence of generalisation (take-up in other aspects of the system, other systems) • Evidence from follow-up if applicable

*The following are noted as provided especially clear information on the stimuli used across Change Lab workshops: Augustsson (2021; Kaup and Brooks (2022); Pattison (2020); Salloum and BouJaoude (2023).
**Chang (2021) provides a very detailed account of the use of four-fields.

Conclusions

CLs are a growing, distinctive approach to action research in schools. They hold promise in bringing theoretical rigour and criticality to action research (Bradbury, Lewis, and Embury 2019; Ellis et al. 2015; Gutiérrez and Penuel 2014; Somekh 2009; Stringer 2019). However, despite the increasing uptake of CHAT, they have been overlooked in the already-marginalised area of action research (Manfra 2019). This paper offers novel and valuable contributions for a wider audience of researchers interested in using action research to foster positive, political or even paradigmatic change in diverse aspects of schooling (Keiny and Orland-Barak 2009; Noffke 2009).

For the first time, this review brings together 55 studies that have used CLs or sibling approaches in schools. Table 2 maps this body of work, offering a novel landscape view and signposts to relevant studies on specific topics. For those considering conducting a CL, the review goes beyond general principles by detailing variations that show how CLs have been adapted to diverse contexts and logistical constraints. It also addresses questions of why one might undertake a CL, offering insights into the substantive foci they might pursue, and the kinds of outcomes that may be expected though of course not guaranteed. The challenges that might be encountered have also been highlighted.

The review has found CLs to be adaptable, feasible methods that frequently secure meaningful change in teaching practices, institutional collaboration and other important aspects of schooling. CLs require a theoretical fluency with CHAT and cannot be reduced to a set of methodological procedures. Yet, they are theoretically open and may be

augmented by ideas from other theories. The seven fronts for development provide a compass to strengthen their impact and enhance their contribution to the wider agendas of educational action research. There is much to be learned through dialogue between CLs and other forms of action research around participation, beyond-technical change, enduring change, epistemic justice, grand challenges, and resistance. The fourth generation of CHAT orients attention towards the enactment of utopia (Engeström and Sannino 2021). Taking cues from recent work on the eradication of homelessness (Sannino 2020), and with aims for educational action research to be truly paradigm-changing (Keiny and Orland-Barak 2009; Manfra 2019) we should ask how CLs might pursue an equally radical, seemingly unthinkable but realisable vision in relation to schooling. This would live up to Bradbury, Lewis, and Embury (2019) notion of action research as transformation learning with a change agenda.

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