A systematic review of the literature on change laboratory interventions: Lessons from Africa

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Abstract

Change laboratories (CLs) are formative problem-solving initiatives that have been used extensively in Europe but have only recently been applied in African contexts. This review thus offers an original insight into their use and value in African contexts. The laboratories are classified into partial, classic, or augmented varieties—all of which are shown to assist participants learning to work with pressing local problems. Some CLs have expanded their remit to addressing grand societal challenges, such as sustainable practices and responses to climate change, which are particularly pressing issues on the continent. Our findings suggest that CL work in Africa, besides contributing overall to understanding the efficacy of the CL methodology, may also be taking a leading role in addressing some of the grand challenges affecting societies, globally.

Introduction: Why change laboratory interventions in Africa?

The 21st century has witnessed escalations in the challenges—many of which are crises—confronting people and the planet: poverty, food security, conflict, climate change, and global pandemic. Communities and organisations across the globe are addressing these challenges in different ways with varying degrees of success. Change laboratories (CLs) are formative interventions aimed at identifying and potentially resolving often intractable problems in working life, educational institutions, communities, and social movements (Engeström & Sannino, 2021; Virkkunen & Newnham, 2013). By posing possible solutions, CLs attempt to go beyond immediate actions to more deep-seated structural changes in the communities that participants are involved in.

Many studies on CLs have appeared since the first interventions took place in Finland in the 1990s (Engeström et al., 1996). Included in these studies are CL interventions on the African continent. A systematic review of the literature on CL interventions in the varied and diverse African contexts has, however, not been undertaken. Thus, much of the knowledge produced in the process of CL interventions in African contexts could be lost or undervalued. The authors of this paper critically review the research literature on CL interventions in diverse African contexts and fields with a view to understanding how the challenges confronting communities, organisations, and the environment that they live and work in, have been addressed and, in some cases, alleviated. This paper can thus be seen as a response to the broader research question: "How do we address the challenges and embrace the opportunities facing education in South Africa today and in the future?" This critical review of the literature on CLs in Africa seeks to address these broader issues, guided by the focused research question: "What can we learn from CL interventions in Southern Africa that could assist us in addressing current and future challenges?"

## Cultural historical activity theory and change laboratories

In cultural historical activity theory (CHAT), learning is a collective, tool-mediated, active, and object-orientated endeavour. But the collective usually represents different viewpoints and interests and is thus multivoiced. All such endeavours are riven with difficulties that are manifestations of historically accumulated and systematic contradictions. Understanding and working with these contradictions supports actors in developing new learning (Engeström, 2001). Learning in CHAT can be modelled using the activity system in Figure 1, in which all elements act in concert to support or inhibit learning and development.

The top half of Figure 1 highlights that subjects (the primary group of actors involved in an activity) are focused on something that needs to be done in the hope that some form of desirable outcome will emerge—the object of the activity. In working on this object, subjects/actors draw on a variety of material and conceptual tools drawn from the surrounding culture (such as language, protocols, ideas, or models; Foot, 2014). Engeström

(2001) stressed that this Vygotskian (1997) first generation of CHAT was revolutionary in that it highlighted the agentic role of actors in utilising mediating cultural artefacts to learn. However, later work of Leontiev (1981) suggested that observed actions of learning are part of a larger, more socially significant activity, leading Engeström (2001) to develop the model of the activity system to represent second-generation CHAT. Here, significant others in the community mediate subjects' learning and development through articulating rules and divisions of labour within the activity as a whole.

Figure 1
An activity system as a CHAT unit of analysis (adapted from Engeström, 2001)
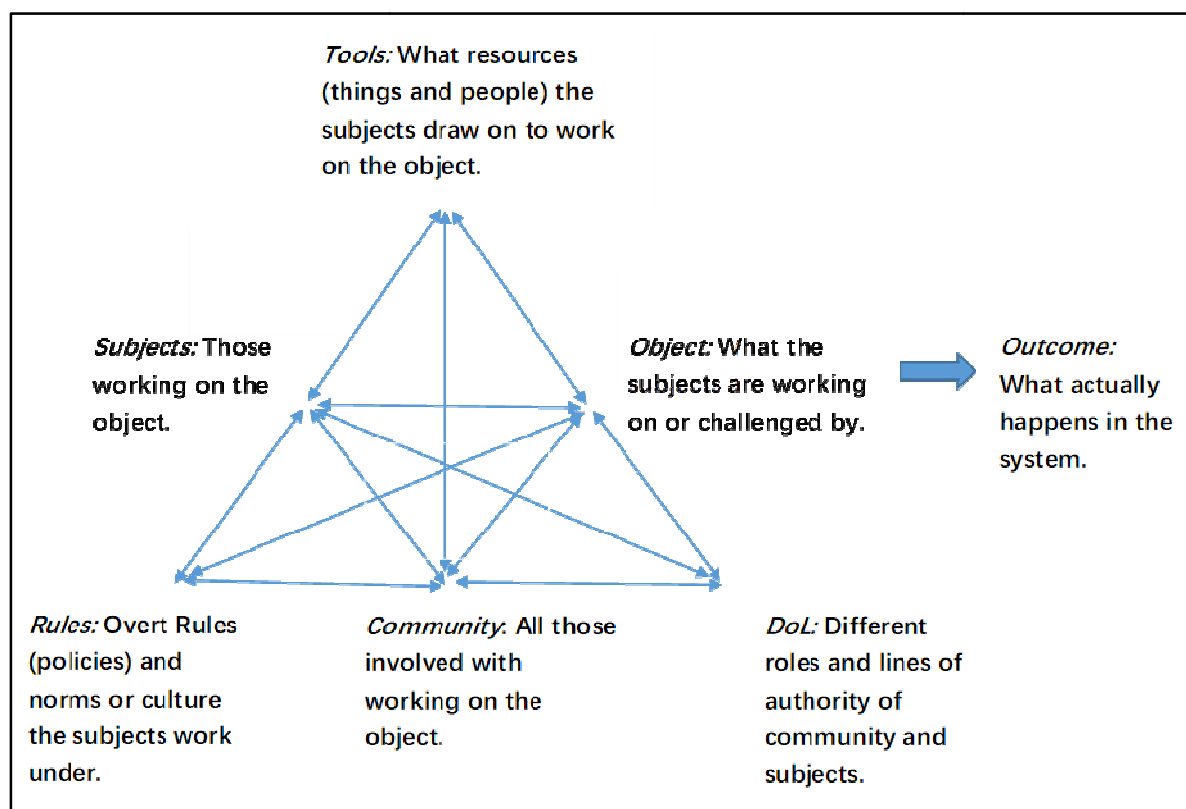
Later CHAT research revealed that contradictions may exist between activity systems that are separated by having different subjects and objects, but often have to coordinate around partially shared objects. This prompted Engeström (2001) to propose a third generation of CHAT modelled with, minimally, two interacting activity systems. More recent work by Engeström and Sannino (2021) modelled a more expansive and heterogeneous unit of analysis, representing an emerging fourth generation of CHAT consisting of multilevel activity systems that coalesce around some of the grand challenges confronting society. For example, the unit of analysis in confronting homelessness in Finland is constituted by the partially separate but interlocking systems of nation, city, nongovernmental organisation, and homeless communities.

The CL draws on the collective wisdom of those who have to confront and work with problems that may be experienced as "paralysing conflicts" (Engeström et al., 2022, p.1). It differs from other similar interventions in that participants are invited to take a theoretically

informed series of learning actions that aim at generating an expansive learning cycle (Sannino et al., 2016). And, the CL participants themselves decide on the particular directions that the intervention will take, with the prescribed learning actions serving to enable participant agency (Bligh & Flood, 2015).

The expansive cycle begins with collective manifestations of difficulties and conflicts as actors question the current situation (Learning Action 1, in Figure 2). Actors are then supplied with secondary stimuli, for example, the activity system triangle (Figure 1), which assists them in understanding difficulties as systematic contradictions that have accumulated over time. This is labelled as "historical" and "actual-empirical analysis" (Action 2, in Figure 2). Alternatively, actors may create their own secondary stimuli. Double stimulation (Sannino & Engeström, 2017) is typically followed by analysis and the collective generation of new visions in an attempt to resolve these contradictions. This is referred to as "modelling the new solution" which is the third learning action, as shown in Figure 2. These initial abstract visions are then collectively transformed into more concrete and relational courses of action that better address difficulties encountered through thought experiments, piloting, and actual implementation (Learning Actions 4–7, in Figure 2).

Figure 2
Expansive learning cycle (adapted from Engeström, 2001).
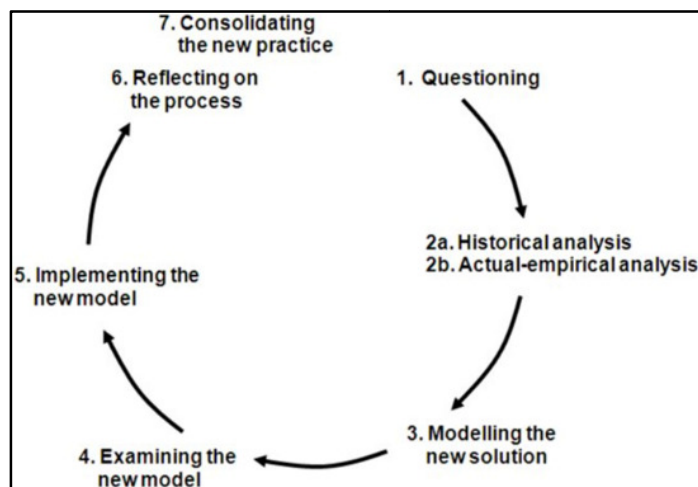
As with CLs more generally, CL interventionist work in Africa requires that participants commit time and energy to engaging in successive workshops if there are to be productive outcomes (Virkkunen & Newnham, 2013). Ensuring such commitment is often enhanced where participants themselves request assistance in dealing with difficulties, or where facilitators can institute sufficient background material to provoke a needs state among participants. However, commitment alone may be insufficient where tacit cultural rules of engagement and divisions of labour favour more top-down decision making in organisations. Such constraining hierarchies may operate within boundary crossing CLs or manifest where emerging possibilities for new forms of work developed in the CL come up against institutional structures. Such constraints are not peculiar to Africa, and Virkkunen & Newnham (2013) advocated continuous dialogue between those in the more protected space of the CL, and institutional or other management bodies and field experts. A further

constraint may be the emergence of deep-seated discord amongst the CL participants, which underlines the importance of the facilitator in orientating participants towards an enhanced, historically based understanding of such tensions (Engeström & Sannino, 2011).

Finally, there is the constraint of how much can be achieved by participants in a single series of six to 12 CL workshops when dealing with multi-faceted and complex societal problems. Engeström and Sannino (2021) suggested that such complex issues may require a web of interconnected, cross-referencing third- or fourth-generation CLs occurring simultaneously if achievable and sustainable resolutions are to be designed and implemented.

Methodology of the critical review of the literature on change laboratories in Africa

In common with a systematic review, a critical review presents a "synthesis of a variety of literatures, identifies knowledge that is well established, highlights gaps in understanding, and provides some guidance regarding what remains to be understood" (Eva, 2008, p. 853). A critical review is particularly apposite when scholars hold different views, as tends to be the case in the contexts of development and change. The distinctiveness of a critical review is that the results "should give a new perspective of an old problem, rather than simply paraphrasing what all other researchers and scholars in the field have shown or said in the past" (Eva, 2008, p. 853).

Firstly, we followed the revised PRISMA[1] methodology (Figure 3) that comprises three steps: 1) identification of the studies through a transparent and replicable search strategy, 2) screening of the studies for duplications and for relevance to the topic, and 3) checking the eligibility of the data extracted for inclusion in the review against justifiable quality criteria (Page et al., 2021).

Identification

The search strategy involved selecting appropriate search terms and testing them via pilot searches. The search terms "change laboratory" and "Africa" did not yield relevant studies. To yield meaningful results, these terms had to be used in conjunction with "activity theory." The research terms "change laboratory" and "activity theory" and "Africa" were used consistently for all searches. Seven academic databases and one meta-database (SCOPUS) were searched. The records found were then cross-checked in nine individual journals. Two additional articles were recommended by colleagues who were experts in the CL methodology. Table 1 provides a schematic representation of the search strategy.

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1   Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Table 1
The search strategy

Search terms	Databases searched	Cross-checked in
"change laboratory" and "activity theory" and "Africa"	Elsevier	*Learning, Culture and Social Interaction*
	Emerald	*Journal of Workplace Learning*
	Multidisciplinary Digital Publishing Institute (MDPI)	*Sustainability*
	Sabinet African Journals	*South African Journal of Environmental Education*
		Education as Change
	SCOPUS	*Pedagogy, Culture & Society*
	Springer	*International Review of Education*
	Taylor & Francis	*Mind, Culture, and Activity*
	Wiley	*Clinical Education*
JOURNALS NOT IN ACADEMIC DATABASES		
Search terms	**Source**	**Where published**
n/a	Colleague (expert)	*International Journal of Management and Applied Science*
n/a	Colleague (expert)	*International Journal of Social Science and Human Research*

The databases of Elsevier, Emerald, Springer, Taylor & Francis, and Wiley are well-known and respected databases, as is Scopus in which most of the studies were indexed. Sabinet African Journals provides a searchable collection of full-text African electronic journals on its platform. This database identified many studies in African journals and books, many of which were indexed in Scopus. The Multidisciplinary Digital Publishing Institute (MDPI) provides a somewhat controversial database; it appeared on Beall's[2] (2012) list, but was subsequently excluded (Oviedo-García, 2021). Journals found through searching the MDPI platform included publications such as *Sustainability*, which is indexed in Scopus, SCIE, and SSCI (Web of Science), GEOBASE, GeoRef, Inspec, AGRIS, RePEc, CAPlus/SciFinder, and so forth.

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2   Beall's List of Potential Predatory Journals and Publishers (https://beallslist.net/)

Screening

The search terms found 92 studies that all used the terms "change laboratory" and "activity theory" and "Africa." However, not all studies described a CL intervention. Titles and abstracts were not helpful in judging a study's relevance to the research question. For this reason, it was necessary to read all articles, chapters, reports, and conference proceedings to determine their eligibility for inclusion in the study. Reasons for exclusion were based on the extent to which studies had engaged with the expansive learning cycle of the CL. For example, some studies made only a passing reference to CLs; several articles did not report on a CL intervention, instead they offered an analysis or a description of other forms of collaborative research; other articles did not report on an actual CL intervention; and some articles repeated the same CL intervention (either a duplicate or a very similar study). Some studies were excluded because the CL intervention did not take place on the African continent. We also excluded master's and doctoral studies because there tended to be publications linked to the postgraduate study.
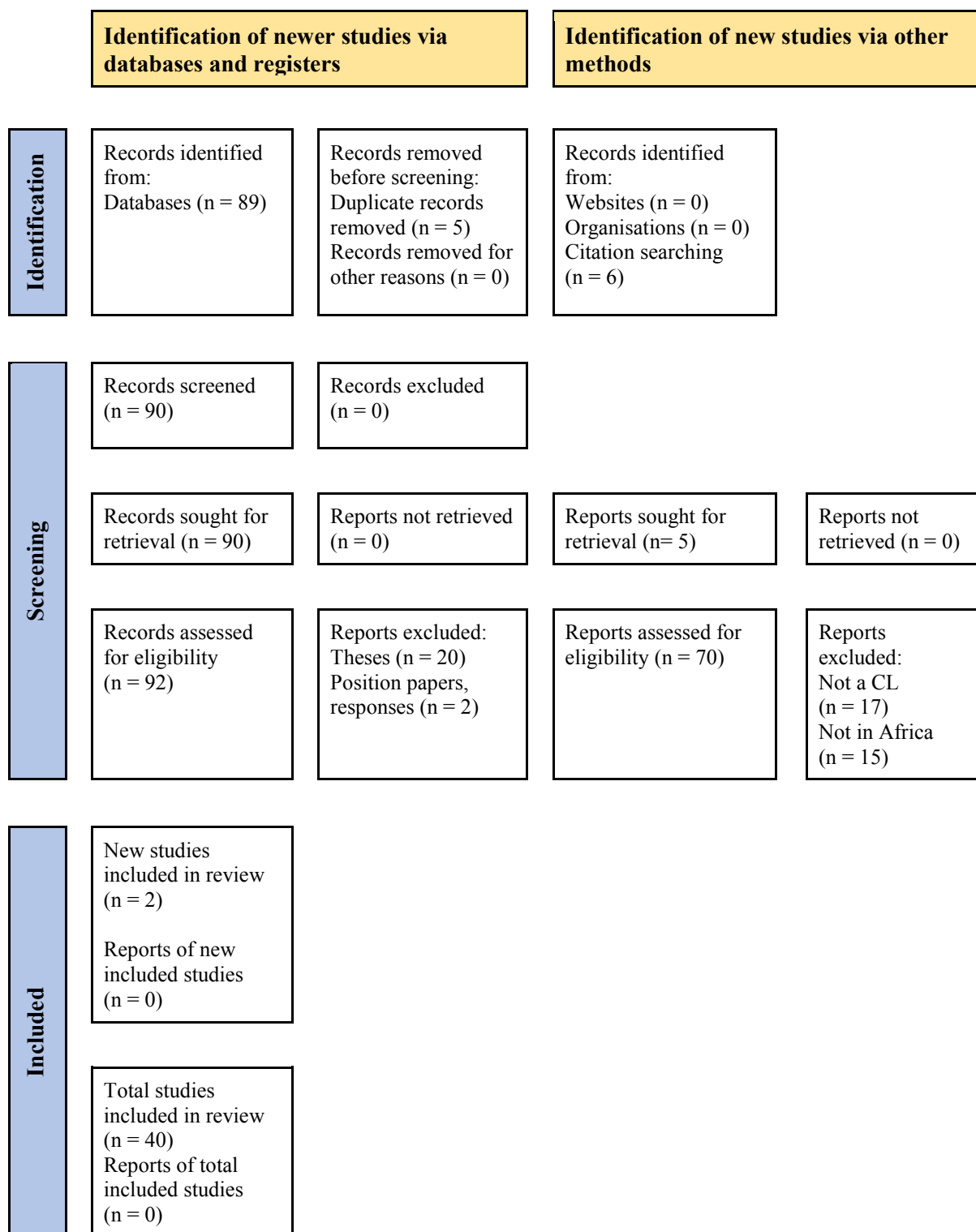
Inclusion

Following screening, 70 studies remained in the database. All these were reread and screened using quality criteria with the intention of including only empirical research studies and research-based evaluation studies. Thus, articles that were position papers, reviews, opinions, shorter than two pages, or lacking a methodology section were excluded. Sources relevant to research studies on the implementation of the CL methodology on the African continent were selected. Following screening, an initial database of 40 articles, books, book chapters, and conference proceedings were identified for inclusion.

The critical review methodology

After the systematic review process, we followed an adapted PRISMA methodology for critically reviewing the literature, which requires a critical analysis of the data extracted (Evans et al., 2012). It is the last step, the critical analysis of the studies that distinguishes a critical review from a systematic review. In a critical review, the data extracted are coded and thematically analysed, drawing on a theoretical framework (in this case CHAT/expansive learning) to provide new perspectives and theoretically informed insights into the studies reviewed.

The following information was collected for the critical review: the country or countries in Africa in which the CL took place, the broad field (such as agriculture, community development, education, or health care), the problem or research question that drove the study, and the motivation for the CL intervention. We also identified the outcomes that the study achieved (e.g. collective and transformative agency, new practices, or institutional change), as well as those factors that enabled or constrained the CL process and outcomes. Paying attention to commonalities across studies, the researchers jointly coded and analysed the studies, finally producing a synthesis of the findings. The literature was managed in an Excel database.

Figure 3
PRISMA flow chart for the critical review of the literature (Page et al., 2021)

Identification of newer studies via databases and registers

Identification of new studies via other methods

Identification

Records identified from:
Databases (n = 89)

Records removed before screening:
Duplicate records removed (n = 5)
Records removed for other reasons (n = 0)

Records identified from:
Websites (n = 0)
Organisations (n = 0)
Citation searching (n = 6)

Screening

Records screened (n = 90)

Records excluded (n = 0)

Records sought for retrieval (n = 90)

Reports not retrieved (n = 0)

Reports sought for retrieval (n= 5)

Reports not retrieved (n = 0)

Records assessed for eligibility (n = 92)

Reports excluded:
Theses (n = 20)
Position papers, responses (n = 2)

Reports assessed for eligibility (n = 70)

Reports excluded:
Not a CL (n = 17)
Not in Africa (n = 15)

Included

New studies included in review (n = 2)

Reports of new included studies (n = 0)

Total studies included in review (n = 40)
Reports of total included studies (n = 0)

The authors engaged in an iterative process of identifying emergent themes by consensus. The studies were clustered into three categories: 1) studies that were partial CLs (i.e. they did not report on, or complete, all the steps of an expansive learning cycle), 2) studies that were classic CLs (i.e. they followed all steps of the expansive learning cycle and included consideration of the principles of double stimulation and ascending from the abstract to the

concrete) and 3) studies that adapted the CL methodology by augmenting it with additional research methods.

Findings from the critical review of the literature

All included studies took place in one or more African countries or, in the case of multinational studies of CL interventions (e.g. Botha, 2014), included an African country. In terms of geographic distribution, the database included 22 studies from South Africa, eight from Zimbabwe, five from Botswana, two each from Namibia, Malawi, and Ethiopia, and one each from Mozambique, Ghana, and Tanzania (some studies covered more than one country). In terms of the research context in which the CLs were conducted, there were 23 CL interventions in educational contexts, 11 interventions in agriculture, six in community development, two in health care, and one in an industry setting (some studies crossed over between health, agriculture, and community development).

We present the findings in terms of the three broad types of CL interventions that we identified: 1) partial CLs, 2) classic CLs, and 3) augmented CLs. In a sense, all CLs are adaptations. As Virkkunen and Newnham pointed out, "the Change Laboratory is not a standardised method that could be followed as if following an algorithm" (2013, p. xix). While recognising that all CL interventions respond to their contexts, there were some that more closely followed the methodology outlined by Virkkunen and Newnham (2013), while others made more extensive changes to this traditional approach.

Partial change laboratories

Fifteen studies reported on an incomplete, or only part of a, CL intervention. The studies attempted to involve participants in the expansive learning cycle and did substantive work in this regard, as opposed to those who might have held an initial meeting or gathered background data towards starting a CL but had not yet embarked on any of the stages. Reasons for not completing an intervention were many and varied. In some cases, there was an enthusiastic start to the CL intervention but time constraints and workloads meant that participants could not commit to the process (e.g. Garraway & Winberg, 2019). More often, there was a breakdown in communication (Dippenaar et al., 2022), non-engagement (Grant & Kajee, 2020), a lack of interest or apathy (Selaolo & Lotriet, 2014), or discord among participants (Chikunda et al., 2017). The root causes of these conflicts and miscommunications were deep-seated and often related to historically accumulated tensions within and across activity systems, such as between education and work (Garraway & Winberg, 2019), or between traditional agricultural practice and new approaches (Chineka & Yasukawa, 2021). Sometimes traditional practices (such as a rote-learning school culture) were deeply ingrained and resisted all attempts at intervention (Lautenbach, 2011). In some cases, the complex social dynamics were overwhelming (Masara, 2010). In other cases, there was limited knowledge or expertise regarding proposed new practices, for example, in water management, and thus a lack of capacity to advise or guide participants in implementing the desired changes (Pesanayi & Weaver, 2016). Some participants felt that there was a need for

a better, more holistic intervention (van der Riet, 2008) and, sometimes, blind spots obscured understandings of how collaborative work might contribute to problem-solving (Voogt et al., 2015).

Classic change laboratory interventions

There were 22 interventions that we classified as classic CLs. These interventions addressed sustainable farming practices, safe waste disposal, and educational provision across different levels and fields. The first published study of a CL in Africa was Mukute's (2009) article on a CL intervention to increase sustainable crop production and produce income for a local community in Zimbabwe. The Botswana Expansive School Transformation project, a collaboration between University of Botswana and University of Helsinki, was conducted roughly at the same time (from 2007 to 2012). Its intention was to facilitate expansive school transformation through information and communication technologies (Engeström et al., 2014; Virkkunen et al., 2012).

CL interventions in the agricultural sector were confronted with many challenges, in particular, participants' divided loyalties between traditional and new farming methods. Emerging transformative and collective agency were evident in how participants began to build on the knowledge that had been developed over generations while simultaneously extending their knowledge through co-developing solutions to new challenges. The outcomes of an intervention that included primary school teachers, learners, farmers, and extension workers, saw the emergence of transformative agency in the forms of participants' enhanced abilities to take on new roles and identities as communicators, planners, and negotiators (Mukute, 2009). Transformative agency strengthened over time and enabled new practices. In a related study, CL participants comprising organic farmers and organic farming specialists (thus a more homogenous group than the hybrid group of the first intervention) addressed the demands of sustainable farming practices in a context of poverty and water scarcity (Mukute & Lotz-Sisitka, 2010). In this study, the competing pressures of farming for profit versus farming for sustainability were revealed. A more advanced, coordinated system involving all organic farmers in the province was envisioned and, in a follow-up study, a second CL was implemented, with the members of the new organic farmers' organisations as participants (Mukute et al., 2018). The district organic associations were determined to tackle climate change, water scarcity, and food security—and to build solidarity and confront "unproductive local norms" (Mukute et al., 2018, p. 229).

Jalasi (2020) reported on a CL intervention to change traditional cooking practices in a village in Malawi in the interests of environment protection and resource sustainability. Traditional domestic cooking requires charcoal in quantities that lead to deforestation. Due to a lack of structural change at higher levels, key processes had been ignored or were absent, so there had been a limited uptake of prior interventions. Contradictions existed between the charcoal (that was readily available, familiar, and affordable) and the new cooking fuels (that were more expensive and presented unknown challenges). Through the expansive learning cycle, as participants and community members expressed their views and ideas for improving

the design of cooking pots for local needs, new possibilities were envisioned. Individual agency became collective as participants envisioned future alternative practices.

A CL in health care was implemented to address the "disjunctures between legislated healthcare risk waste management requirements and actual professional practices" in a South African municipality (Masilela & Olvitt, 2020, p. 182). Participants comprised healthcare workers and their managers, environmental health practitioners, and waste inspectors. There was poor coordination across the three groups, and a lack of knowledge on the safe disposal of medical waste. Through collaborative learning, the groups were able to focus on a boundary object of better sharing of knowledge. To this end, local forums were established and educational interventions undertaken.

Many classic CL interventions were undertaken within schools. A key priority in modernising primary education in Botswana for economic and social development was the introduction of information and communication technologies through a developmental, intercultural, and international CL intervention (Engeström et al., 2014). Participants comprised schoolteachers and university-based teacher educators. Initial workshops failed owing to different perceptions of the object and the means of achieving it. The project was then scaled down to three schools. The CL intervention was intended to empower primary school teachers to take collective actions to manage and accomplish change. Contradictions were evident between the traditional authoritarian, top-down management practices and the bottom-up priorities. There was a strong culture of deferring to existing departmental authority, strict regulations, and assigned roles. The eventual impacts after expansive learning cycles in the three schools were diverse. Transformative ideas emerged such as resource sharing, and an understanding that the disruption of old patterns holds the seeds of future change.

Virkkunen et al. (2012) established a CL intervention in a secondary school in Botswana to change the practice of categorising "single science" learners as lesser than their "double and triple science" peers. Such categorisations had led to stigmatisation and demotivation and consequently, high failure rates amongst single science students. Teachers identified the contradiction as the result of poor alignment between their own training and the realities of teaching students with social and learning challenges. They also saw the need for policy change given that the policies had led to and exacerbated double and triple science students' unfair stigmatisation of their single science peers. The teachers recognised the need to adopt a more empathetic, dialectical, and sensitive approach to supporting single science students and jointly finding ways to enhance their learning.

Batane (2017) implemented a CL intervention to address attrition in a primary boarding school in Botswana. Over the course of the CL workshops, the overloaded curriculum and other negative impacts on learners' and teachers' time were identified as key contradictions in the system. Batane concluded that "a more autonomous environment which can accommodate unique needs of learners in the context [could] reduce the rate of students' dropout from school" (2017, p. 79).

A CL intervention in a secondary school directly addressed leadership in schools where cultural norms discouraged learners from voicing their views (Grant, 2020). School managers assumed that adults, not learners, should lead, thus existing learner leadership in schools had become an extension of adult control and monitoring. In a rural, north Namibian secondary school, a CL intervention—referred to in the study as a "Leadership Club"—was introduced and functioned over 10 months. The Leadership Club offered a safe space for senior learners to discover their agency as school leaders. The intervention encountered multiple conflicts and contradictions and went through many iterations in attempts to shift agency from the school principal to the group of learners. Over time, transformative collective agency did emerge. Kandjengo and Shikalepo's (2021) CL intervention built on Grant's (2020) study to implement change laboratory workshops to improve learner leadership in a primary school in Namibia. Those authors explained that the change laboratory's "principle of multivoicedness might not possibly manifest itself well in an African country such as Namibia, where children are taught to listen and are discouraged from questioning their elders" (Kandjengo & Shikalepo, 2021, pp. 3590). They therefore decided "to conduct Change Laboratory workshops with the Learner Representative Council members only and excluded teachers, to avoid cultural influence" (Kandjengo & Shikalepo, 2021, p. 3590). The authors described the learners' emergent transformative agency as developing over processes of "questioning and critiquing the practice of learner leadership development in the school," attempting "to trace the history of learner leadership development," and engage in "modelling new solutions" with regard to the inclusion of learner leaders in maintaining school discipline, foregrounding learners' voices, and facilitating learner leadership development (Kandjengo & Shikalepo, 2021, p. 3596).

In-service teacher development is a challenge in South Africa, an issue that Mbelani's (2018) study addressed. The specific problem identified was that in spite of many previous interventions, visual literacy continued to be elusive. Visual literacy involves the development of competences needed to understand a combination of linguistic, visual, audio, gestural, and spatial design elements. The intervention succeeding in opening "a dialogical space in which participants took initiatives to develop their visual literacy and reconfigure the multi-layers of interpreting" visual texts (Mbelani, 2018, p. 82).

A cluster of studies on CL interventions in higher education identified contradictions arising from management-driven requirements for research outputs (in addition to teaching and other targets), usually within a rule-bound, managerialist culture that promotes quantity over quality. Trotter et al.'s (2014) study of the Library and Information Department at the University of Botswana raised the issues of continuing heavy teaching loads, academic administration, and other duties that mitigated against research activities, and research dissemination in particular, as did the conservative and restrictive institutional rules and policies. Although staff were encouraged to take on consultancy work, this rarely resulted in research outputs and instead, took up time that otherwise could have been used for research and publication. The new idea that emerged from the intervention was a research quality assurance workflow process.

Studies of CL interventions in South African universities of technology similarly foregrounded conflicts around who makes decisions, for whom, and on what basis. These concerns arose against the backdrop of academics struggling with the many demands placed upon them: teaching, researching, publishing, obtaining doctoral qualifications, and so on. In one institution, the significant move from a craft focus to a more academic focus was epitomised by the university's inclusion of compulsory general education modules in all undergraduate programmes (Garraway et al., 2019). This intervention enabled academics to conceptualise a new, "expanded professional graduate" (Garraway et al., 2019, p. 130). The new concept was presented at the university's institutional forum[3] and was strongly supported as a new possibility for future strategic planning. In a comparison of three CL interventions at two universities, Garraway (2021) examined how academics came to understand and potentially overcome their problems—or at least begin to formulate new strategies for the university—through expansive learning cycles.

A common problem in professional and vocational education is the extent to which students receive adequate training and development from workplace mentors. This was the focus of a CL intervention in a university's emergency medical care department. Participants included the head of department (who played a dual role as facilitator and group member), four skills facilitators, and the workshop facilitator (Garraway & Christopher, 2020). The skills facilitators were employed at the university but had recently worked as paramedics, so constituted a boundary grouping between the university and the world of work. The process foregrounded the clinical skills facilitators' multiple roles such as solving student placement and other problems besides being educators. As they put it, "We should be clinical firefighters . . . because what we do is put out fires. That is all I do, problem solving" (Garraway & Christopher, 2020, p. 205). Two cultures were evident in the mentoring activity system. Different knowledges and practices were employed by the workplaces and university (the latter sometimes in advance of work), and sometimes mentors were unwilling to perform educational roles. It was established through the CL that tools for better communication between work and university were required such as a blog site for sharing new ideas in emergency medical care, as well as the involvement of mentors in students' university-based practical training.

Augmented change laboratory methodologies

Three of the articles reported on CL interventions with augmented methodologies. These studies covered issues in organic farming (Mudokwani & Mukute, 2019), wetland management (Lindley & Lotz-Sisitka, 2019), and climate change (Vogel et al., 2021).

Lindley and Lotz-Sisitka (2019) reported on an adapted CL intervention in wetland management in South Africa. The intervention addressed wetland degradation caused by the paper industry. The participants comprised three units of the paper industry: foresters,

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3   In South Africa, all universities are required to establish an institutional forum, comprising managers, academics, and administrative staff, whose role is to advise the university council.

environmental scientists, and community outreach officers. The key problems identified were a lack of coordination across units and a general reluctance to learn about wetland management. Participants engaged in projects that promoted relational work and non-formal training. Some projects were successful and others less so. The authors considered an additional realist social theory analytical lens drawing from the work of Margaret Archer (1995) because it provided a way of understanding the underlying social structures and cultures that enable individual and corporate agency to emerge in CL initiatives (Lindley & Lotz-Sisitka, 2019).

In Zimbabwe, a CL intervention in organic farming for improved livelihoods and sustainability was undertaken, initially with 18 farmers and later, 39 (Mudokwani & Mukute, 2019). The intervention intended to develop farmers' lifelong learning towards greater sustainability for community improvement. The authors' particular interest in the CL approach was in creating a safe space for thinking afresh to solve problems and to create new ideas. They drew on the African philosophy of ubuntu[4] to underpin the intervention, after which the reframed objectives became better cooperation, less competition, better linkages between production and marketing, and learning to work together towards a common goal.

Climate change is one of the major challenges facing African cities. The cities are responding by developing climate change action plans and adaptation and mitigation policies. Effectively mainstreaming climate change in city plans and operations, and moving from aspiration to implementation is complex. Multi-actor engagement, transdisciplinary knowledge interactions, co-designing, and sustained co-learning are often required in such planning and action contexts—and many interventions fail. Vogel et al. (2021) reflected on an adapted CL intervention for the city of Johannesburg in South Africa. Despite the size of the challenge, the study showed that "exploring the local context remains critical in understanding and surfacing tensions" (Vogel et al., 2021, p. 1) because ignoring such issues is likely to end in mere compliance and, potentially, maladaptation. The adaptation in this CL was the use of a cascade approach. Thus, rather than engaging all actors simultaneously, facilitators initially worked with a core group before expanding the circle of actors. Participants in the core group then served as facilitators for new groups. These facilitators had the "appropriate authority and passion" to "drive, coalesce, and potentially re-enthuse waning interest from within" (Vogel et al., 2021, p. 1). They were able to build on existing trust relationships and strengthen participation throughout the process. The authors reported that those factors were critical for both the implementation of the CL and the sustainability of its impacts.

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4   The term is an Nguni word (i.e. used in languages that are spoken in South Africa, Swaziland, and Zimbabwe). The term has various meanings, but at the heart of each definition is the connectedness that exists, or should exist, between people. It is sometimes translated as, "I am because we are," or "humanity towards others."

Current trends and new visions for change laboratories in the future

Virkkunen and Newnham (2013) suggested a number of reasons why CL might remain partial rather than engaging substantially with the expansive learning cycle. Firstly, there needs to be commitment from the participants to engage in a fairly lengthy and intense process to address a difficulty. Secondly, lack of communication between participants may hamper the process. Engeström (2008) suggested that participants often begin with an understanding of their separate goals but struggle to work cooperatively to realise a common object, and even to question what the nature of the object should be. Though disturbing and realigning roles towards a common object is a function of the CL, it may also lead to actors experiencing confusion and unwillingness to engage. Although the nature of the CL as a protected space is important, the CL may benefit from articulation with other expert or managerial bodies from time to time in order to address deadlocks.

The classic CL interventions supported learning new concepts, emerging collective agency, and the discovery of new practices. Most of the classic interventions occurred in a local setting and took place over a limited time period, although there were many variations across these dimensions. CLs that had a more singular focus, such as the interventions in schools and higher education institutions, manifested different kinds of contradictions from those experienced in the agricultural interventions, which had a more diverse focus. In educational interventions, the conflicts, dilemmas, and double-binds powered the process forward and demanded different learning actions as the expansive cycles were performed. Educational interventions saw shifts toward transformative collective agency—often against the vagaries of capitalism and managerialism.

The interventions led by Mukute and colleagues (2018) between 2009 and 2018 saw an evolution of practices over time within a single location, while the Improved Cook Stove intervention (Jalasi, 2020) stretched the spatial dimension (physically and metaphorically) from participants' homes and their physical environments to the spaces where policies were made.

CLs may often begin with the analytical tool of a single activity system but frequently evolve over time towards the inclusion of additional social systems from different sites articulated through a partially shared object. This socio-spatial and temporal evolution (Engeström, 2018) results in a more distributed but connected unit of analysis, typical of third-generation activity theory. Increasingly, particularly in the later classic change laboratory interventions, and more clearly in the adapted interventions, multi-directional expansions were evident. Several authors' reflections on classic change laboratory interventions acknowledged the need for adaptations beyond the usual (and some unusual) spatio-temporal adaptations. For example, Mukute et al. reflected on "the need for fourth-generation CHAT to address the complex social-ecological problems of today" (2018, pp. 229).

In Mudokwani & Mukute's (2019) study (which we have classified as an augmented change laboratory), the authors reflected on the *pedagogy of solidarity* that emerged over the process. Farmers within a region generally worked cooperatively, while a pedagogy of solidarity involved working relationally (i.e. working across differences), transformatively (i.e. working for change), and in creative solidarity (i.e. finding new ways of operating). These ways of working were found to be aligned with the African philosophy of ubuntu, as well as with elements of expansive learning. Both ubuntu and expansive learning are underpinned by ideals of working towards a shared object for the common good. Mudokwani and Mukute believed that common goals could be achieved through a focus on a pedagogy of solidarity that was aligned to *umwe* (2019) or oneness (a part of the ubuntu philosophy) to enable working productively across differences. What emerged over time, was the questioning of roles and hierarchies within and across different groups, referred to by Engeström (2018, p. 117) as the "moral-ideological" evolution of the CL. Furthermore, as with Mukute et al.'s (2018) study, issues of solidarity and the related concept of ubuntu extended beyond the particular CL to more long-term changes in the organisation of organic farming, or to the evolution of a systemic-developmental dimension within the CL (Engeström, 2018). Thus, each CL intervention solved certain problems but raised many more, leading Engeström to propose that, "the two foundational dimensions of space and time need to be complemented with two additional dimensions of expansion: the moral-ideological and the systemic-developmental" (2018, p. 254).

Vogel et al. (2021) attempted to deal directly with the grand challenge of climate change response within a large municipality. This evolved into the involvement of multiple change laboratory sites with different roles and levels of influence within and beyond the city. The above organic farming exemplars also attempted to work with similar grand challenges, often across organisational boundaries at local and more regional levels. Such exemplars may be approaching what Engeström and Sannino (2021) described as fourth-generation activity theory, characterised as a "coalition of activities facing a critical societal change . . . (involving) horizontal and vertical interplay between multiple coalescing cycles of expansive learning" (2021, pp. 20).

Conclusions

CL work in Africa assists social groupings in confronting seemingly difficult issues in working life and, through engaging with expansive learning, in developing new visions for action. Many of the studies, furthermore, reported on participants' evolving confidence and ability to take on oppressive or difficult contexts as they developed their transformative agency (Sannino et al., 2016). This critical review offers practical contributions to CL with regard to what might enable or constrain the outcomes of an intervention. Deep levels of engagement by participants are needed, but this is often not enough. Although we found that CLs focused on relatively homogeneous communities that collectively addressed a particular issue, in most cases, multilevel collaboration was needed in order to address the many aspects of the problem. In more heterogeneous or hybrid activity constellations, different but related communities had to coordinate their work towards solving a common problem (Virkkunen &

Newnham, 2013). Many of the agricultural CLs were exemplars of such hybrid, boundary crossing forums, whereas some of the educational interventions were more homogeneous. Multilevel support for the CL intervention was generally an enabling factor, as was the creation of safe "boundary spaces" where new concepts are discussed, new identities can emerge, and new practices are negotiated.

What was particularly interesting in this review was that many of the African CLs stemmed from problems connected to struggles for social justice, economic equity, and ecological sustainability. As Engeström and Sannino pointed out, it is "not accidentally, collective initiatives for such bold formative interventions are increasingly coming from the Global South" (2021, pp. 21). Such interventions can be understood as proto fourth-generation CLs that also included moral-ideological/systematic-development dimensions given that they faced methodological and practical challenges that were different from those of earlier CLs and thus required different kinds of approaches or conceptual underpinnings (Vilela, 2019).

While many of the later classic CLs inadvertently became proto fourth-generation CLs as the complex entanglements between people, objects, and contexts revealed themselves, the augmented CLs directly addressed grand challenges described by Engeström and Sannino as "increasingly complex *runaway objects* [author emphasis] with broad societal ramifications, such as climate change or pandemics [that] connect large numbers of activity systems across national borders" (2021, p. 5). Such objects

> tend to transcend the boundaries between the history of a specific activity, the history of a singular society, and the history of humankind. The emerging fourth generation of activity theory zooms in on heterogenous work coalitions aimed at resolving critical societal problems, or runaway objects, and creating sustainable alternatives to capitalism. (Engeström & Sannino, 2021, p. 5)

We hope that this critical review of the literature in Africa contributes to an understanding of the need for, and practice of, fourth-generation CLs with their underlying moral-ideological and systemic developmental dimensions in support of all those who seek social, economic, environmental, and educational justice.

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