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Driving educational improvement through transformative agency by double stimulation in a high school change laboratory

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Abstract
Cultural-Historical Activity Theory has contributed significantly to studying and promoting educational change. Its distinctive concepts inform an approach to interventionist research called the Change Laboratory This paper reports on a Change Lab in an Australian secondary school resulting in major changes for students studying for the Higher School Certificate (HSC) in the final two years of high school. It reports on the key conflict between the HSC as a ticket to university admission (exchange value) and its importance for students' broader development and future (use value). Expansive learning and systemic contradictions have been frequent reference points in reports of school-based Change Laboratories but more recent developments in theorising transformative agency by double stimulation have received less attention. Addressing this gap, this paper considers the construction and use of artefacts that helped participants understand the problem, and develop previously unknown solutions that resulted in a qualitative transformation of activity. Mirror materials comprising aggregate and individualised student data served as a first stimulus; four-field representations of collective zone of proximal development and germ models functioned as higher abstraction second stimuli, complemented by teacher-generated ideas and models. Changes made by the school transcended the central contradiction in the local activity system, providing valuable insights into the process of change amid widespread critiques of reductive measures of student outcomes at the end of secondary school.

Keywords Change laboratory · Double stimulation · High school · Cultural-historical activity theory

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Introduction

Cultural-Historical Activity Theory (CHAT) has contributed significantly to studying and promoting educational change (Bingham, 2017; Hopwood, 2024). Its distinctive concepts inform an approach to interventionist research called the Change Laboratory, or Change Lab. This paper reports on a Change Lab in an Australian secondary school that resulted in transformation of activity relating to students studying for the Higher School Certificate (HSC). These changes transcended a fundamental conflict between the HSC as a ticket to university admission (exchange value) and its importance for students' broader development, self-determination and future (use value). The general contradiction between use value and exchange value in education is foundational to capitalism and was not (cannot be) resolved in a complete or final manner. However, it can be transcended in local activity systems, as was the case in the school. The HSC was one of several areas identified by the school as foci for change, others including adolescent engagement and co-curricular activities. The school works closely with Indigenous people and cultural organisations on issues relating to First Nations history and learning; these were outside the scope of the initiative reported here.

Change Labs enable groups of people to transform their activity (Engeström, 2015). Accounts of Change Labs in schools typically focus on expansive learning (e.g. Augustsson, 2021; Hyrkkö & Kajama, 2021; Wei et al., 2022) often adding in systemic contradictions (e.g. Engeström et al., 2002). While double stimulation has been key to Change Labs since their inception (Engeström, 2007, 2016; Sannino et al., 2016; Virkkynen & Newnham, 2013), more recent theoretical developments in Transformative Agency by Double Stimulation [TADS] (Sannino, 2015, 2022) have received less attention in school-focused research (Hopwood, 2024). This paper addresses this gap.

The school involved is called Redlands and is in New South Wales (NSW, a State of Australia), where most students complete an HSC over Years 11 and 12. The HSC offers wide choice to students, who are encouraged to select subjects that they are 'good at, interested in and may use in the future' (NSW Government, n.d.). Their accomplishments are converted into an Australian Tertiary Admission Rank (ATAR) that indicates a student's rank in their state-wide cohort. The ATAR is an aggregate of scaled marks of a student's 10 units best units (including 2 in English). This single number is widely used for university admissions: the HSC's exchange value. Mainstream media often rank schools based on ATAR results.

Such focus on measurable outcomes is problematic. Teachers are charged with producing students as a set of assessable attributes, narrowing the concept of good education (Biesta, 2019). Not everything in schooling is reducible to discrete, quantifiable measures (Hayden, 2011) and teachers can feel constrained when test preparation overrides more meaningful teaching (Taylor, 2019). An exclusive focus on ATAR does not align with Redlands' mission to offer a holistic education that prepares students for many aspects of life. The school viewed the use value of the HSC in terms of students recognising and developing their unique potential, learning to use their knowledge and abilities for the good of others (Redlands, 2023).

Research on the HSC has found evidence of performance avoidance among students, linking this to low self-efficacy, study-related stress, and focus on others' achievement (Smith et al., 2002; Smith & Sinclair, 2000). This can lead students to drift passively through the HSC rather than actively making choices based on their own growth and interests, especially for those not pursuing tertiary study via the ATAR (McIver, 1999). Others can become overly fixated on exchange value, choosing subjects based on how they are scaled in ATAR calculations (Green et al., 2022; Palmer, 2020; Pitt, 2015; Roberts & Dean, 2019).

Redlands initiated an HSC-focused Change Lab. School leader Ben Castelli and Dean of HSC (at the time) Lucy Benjamin are co-authors of this paper. We trace how they transformed their activity, consistent with a historico-genetic method reproducing the course of expansive transition (Engesrtröm, 2015). We focus on the tools that were taken up by participants as they moved through a collective Zone of Proximal Development (ZPD), by means of TADS. Following this approach, the research question answered is:

How did participants take up and construct first and second stimuli in a process of transformative agency by double stimulation?

CHAT, TADS and Change Lab research in schools

CHAT researchers distinguish incremental changes from qualitative transformations (Engeström, 2008, 2017). Vygotsky's concept of the ZPD can be understood at a collective level as "the distance between the present everyday actions of the individuals and the historically new form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in the everyday actions" (Engeström, 2015, p. 138). CHAT researchers study educational change not only in current school contexts, but in the accumulated history of a particular school, during which time contradictions can accrue and the objects of education evolve (Bingham, 2017; Engeström, 2015; Wortham et al., 2023).

Artefacts are crucial in understanding and promoting change (Engeström, 2015; Lin & Miettinen, 2018). In a Change Lab, artefacts are introduced into the research process and the emerging new forms of activity, using a process called double stimulation. First stimuli orient participants to problems without obvious solutions, while second stimuli are artifacts used to address them (Virkkunen & Newnham, 2013). Sannino's (2015) TADS model connects historical contradictions to conflicts of motives that 'differ from contradictions in that they relate to personal and interpersonal crises and affect individual short-time action' (Sannino, 2008b, p. 332). Second stimuli help people to break away from such conflicts by linking them to new motives. When stabilised they can be anchors, pulled on move in a desired direction. They are crucial as instruments creating new meaning when no existing solutions are available (Sannino, 2022).

CHAT has been used in diverse ways to study change in schools. Some use it analytically to study change occurring independently of the researcher (e.g. Bingham, 2017; Wortham et al., 2023; Lin & Miettinen, 2018). Other studies use CHAT as a basis for intervening (e.g. Hackett et al., 2020). The Change Lab is a specific

approach to CHAT-based interventionist research. A Change Lab draws on CHAT and creates conditions for TADS. It brings participants together in a series of workshops in which stimuli are presented on three surfaces. These are summarised in Table 1, differentiating them according to levels of abstraction (see Virkkunen & Newnham, 2013; Morselli, 2019). Typically each surface has three layers, relating respectively to past, present and future.

Hopwood's (2024) review identified 55 Change Labs worldwide in or involving schools 1998–2023. The most common focus for Change Labs in schools has been on teachers' or pre-service teachers professional learning and pedagogical practices in classrooms (e.g. Augustsson, 2021; Hyrkkö & Kajama, 2021; Wei et al., 2022). A diverse range of other issues have been tackled, including leadership (Hauge et al., 2014) and teacher wellbeing (Silva-Macaia et al., 2020). This study is closer to work in Jakomäki school in Finland which engaged with student apathy, teacher constructions of students, and wider organisation of schooling (Engeström et al., 2002; Sannino, 2008a; Sannino et al., 2016). Sharing a concern for student engagement with work done by Barma et al. (2017), it is the first Change Lab to focus specifically on study toward examinations at the end of secondary school.

Expansive learning, systemic contradictions and double stimulation as a general principle have been central to school-based Change Labs (Hopwood, 2024). An early application of the more complex and recent understanding of double stimulation provided by TADS in school involved a Change Lab seeking to promote teachers' agency in response to declining student engagement (Morselli, 2019; Morselli & Sannino, 2021). Kaup and Brooks (2022) show how different phases of TADS related to the cycle of expansive learning during a Change Lab focused on computational thinking, while Tresseras and Querol (2023) used self-confrontation techniques to create conflicts of motives as the first stimulus. Lemonie et al.'s (2021) study drew on TADS to examine institutional collaboration across a network of French schools, while a rare student-focused Change Lab used TADS to explore how adolescents found meaning in their lives (Engeström et al., 2023). This study extends this line of work on school change, focusing on how different stimuli influence transformation.

Methods of data collection and analysis

Redlands is an independent pre-school to Year 12 school in Sydney with students from over 50 nationalities. It charges fees but is not academically selective. Unlike

Table 1 Change Lab surfaces

Surface	General purpose
Mirror data (particular, lower abstraction)	Data from participants' activity system and help them question the status quo and recognise problems
Ideas, tools (middle generality and abstraction)	Intermediate partial solutions, including participant-generated schemas, flowcharts etc.
Models, vision (general, higher abstraction)	Second stimuli based on CHAT, including representations of activity system, four-fields representing the ZPD, and germ cells

many nearby single-sex schools, Redlands is co-educational. Rather than exclusively on exam results its learning platform focuses on growth relating to learning and thinking (academic achievement), approaches to learning, community and collaboration, and social and emotional learning (Redlands, 2023). For Years 11 and 12, students can choose the HSC pathway or the International Baccalaureate (IB) Diploma. Roughly half choose each pathway.

Ethics approval was granted by [anon] HREC, approval number ETH21-6483. Five teachers gave informed consent to join the HSC Change Lab: the Director of Learning Analytics (also a Music teacher; T1; Author3), the Dean of HSC (also an English teacher; T2; Author 4), teachers of History (T3), Mathematics (T4) and English (T5). The group met eight times over two years. Each workshop was facilitated by Hopwood and Palmer. The data comprised:

1. Eight workshop transcripts totalling 960 min of audio data.
2. Photographs of surfaces drawn on whiteboards.
3. Documents produced by participants as they implemented new models.
4. Follow-up conversations and emails with participants, tracing change until mid 2024.

Table 2 Summary of Change Lab workshops

Workshop	Date	Purpose	Stimuli
1	Term 1 2022	Confront aspects of past and current practice to identify a problem worth solving	Individual and aggregate student data (iGrow); participant ideas
2	Term 2 2022	Systemic analysis and develop early sense of solution	Activity system; photos of ideas surface from prior workshop; early four-field
3	Term 3 2022	Develop and stress test models	Activity system; alternative participant models; four-field
4	Term 4 2022	Refine models and plan implementation	Activity system; four-field; germ cell model; final participant model
5	Term 1 2023	Reflect on implementation and revise concrete plans	As above; plus documents from implementation
6	Term 2 2023	As above	As above
7	Term 3 2023	Reflect on implementation and develop plans for consolidation	As above
8	Term 4 2024	Discuss evidence changes are working and embedded	As above; plus revisiting iGrow data

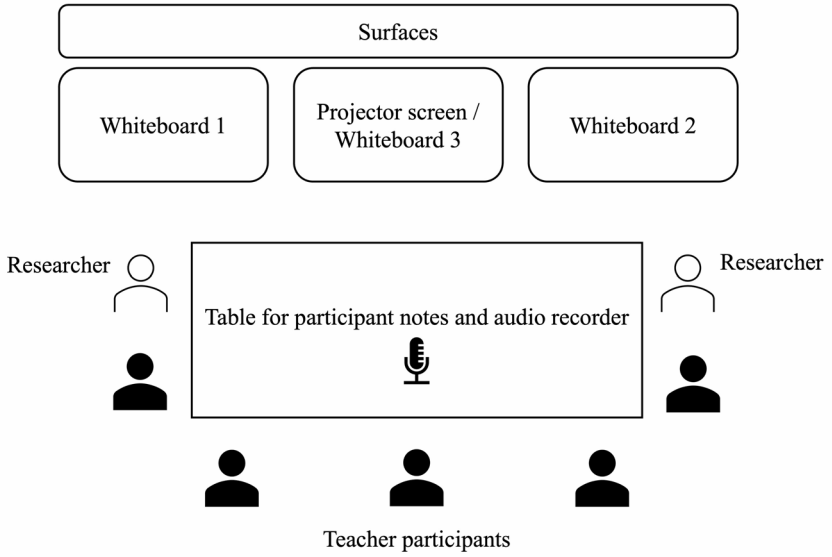

Fig. 1 Layout of Change Lab workshops

Multiple surfaces were used and different stimuli presented as the Change Lab progressed, as shown in Table 2. Figure 1 shows the layout of the workshops. One surface was used for a digital projector that could be switched between mirror data, facilitator prompts, photographs of whiteboards from prior workshops (see Fig. 2), and digitised versions of various models developed from hand-previous drawn versions. Participants also connected their laptops to show relevant documents. Whiteboards on either side were used to capture abstract models and teacher-generated ideas as they were discussed during each workshop. These had cues referring participants to past, present and future.

Intermediate and macro level approaches to analysis were appropriate (Morselli, 2021). The intermediate level focused on double stimulation within each workshop, identifying when participants used the surfaces (Table 1), as first or second stimuli. The macro level focused on TADS as a process across the eight workshops, oriented to the wider problem and collective solution (Morselli, 2021). The result was a dynamic and holistic picture of the process, tracing how contradictions and conflicts of motives were resolved (Engeström, 2020; Sannino, 2022).

Findings

The research question will be answered by focusing on the following stimuli before linking them to the concrete changes implemented as part of a qualitatively new form of activity:

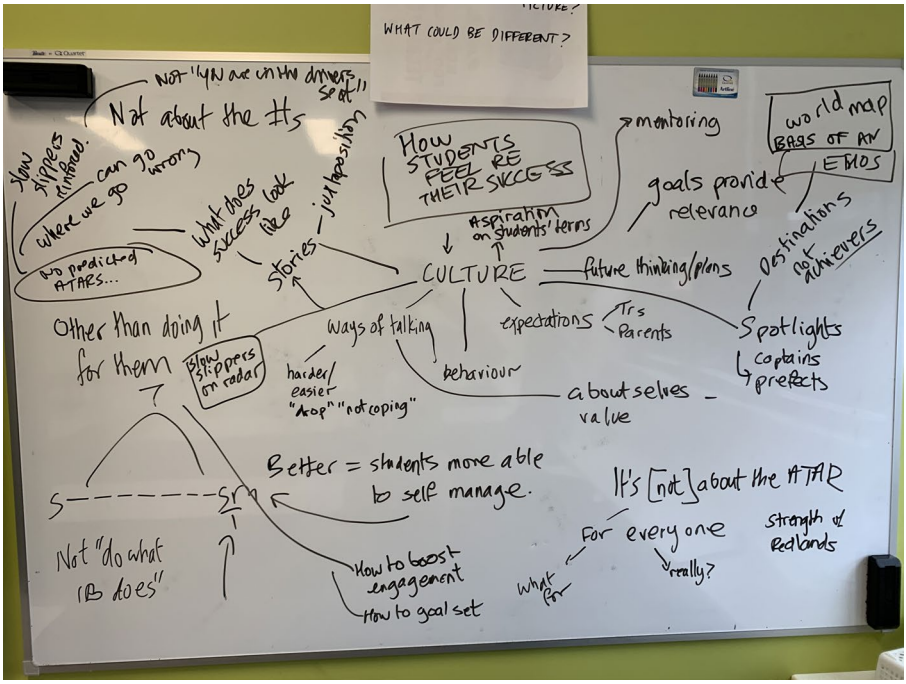

Fig. 2 Future-oriented 'ideas and tools' surface from workshop 1

1. Aggregate and individual student data as mirror data, made visible through Redlands' iGrow platform, used as mirror of the past and present (lower abstraction).
2. Four-field representations of ZPD and germ cell (higher abstraction models and visions).
3. Participant-generated ideas and diagrams (middle abstraction ideas and tools).

Morselli (2019) describes of how the surfaces span different levels of abstraction and generalisation. The value of mirror data at a lower level of abstraction and generality is that it helps participants grapple with particularities that feel close to their everyday experience, including through emotional confrontation (Engeström et al., 1996). The value of the high abstraction models and visions is that they operate at a level of theoretical generalisation. This provides distance from those particularities, and helps to trace roots of problems (including contradictions) through what might be more intellectual reflection (Engeström et al., 1996). This is crucial to Change Labs, and also helps avoid a sense that participants are blaming individuals for problems, because they are analysed at this abstract level. The middle level of abstraction is valuable because it lies between the other two. It benefits from articulation in more vernacular (less theoretical) language that participants feel comfortable with– reflecting their own words. It goes beyond particulars from mirror data to point to more generalisable processes and futures, but also incorporates possible concrete forms that are by definition not incorporated in the most abstract and generalised models.

The activity system model was also used as stimulus (Table 2). Their use has been commonly reported in school Change Labs, while four-fields, germ cells and participant-generated ideas have received much less attention (Hopwood, 2024). They thus provide a novel focus for analysis.

Mirror of the past and present

A 'mirror' of the past and present is used to represent and examine practice, problem situations and historical changes in activity (Virkkunen & Newnham, 2013). Redlands' iGrow platform was used in the workshop one (Table 2) as a mirror of the past. It represents aggregate data for all students 2018–2022. Data relating to individual students is visualised as a tree with branches relating to the aspects of the learning platform (Redlands, 2023). Student goal-setting conversations refer to these individual trees. iGrow was shown on projector, asking what stood out, how it related to participants' experiences, why things are that way, what participants would want to change.

Participants focused on graphs showing historical variations in ATAR, standardised testing, absences, additional learning needs, diagnosed conditions, pastoral issues, and engagement with careers advisers. They also examined graphs showing changes as students progress through secondary school, specifically academic performance, approaches to learning, as rated by students themselves and their teachers), detentions (proxies for self-management) and formal academic interventions offered to students. This involved confronting difficult facts about current activity (Virkunnen & Newnham, 2013):

T1: [Looking at graph showing lower ATAR for HSC than International Baccalaureate students]. It's really important to look at it and accept. Is anyone surprised by that based on your experience in the school?

T4: No. Because the combination of subjects HSC students are choosing lead them to lower ATARs. Even before they sit an exam.

T1: [Pointing to different graphs] You can see that HSC students start to pick up later in their diligence, engagement and behaviour. And absenteeism is an issue.

T3: But there's a lot of interruptions from psychological conditions, wellbeing concerns.

T2: But it's also expectations on students. That has an impact on how students then are in their learning in terms if they're not expected to perform highly or they're not expected to work hard because they're not on the IB. That's what they pick up on. I've heard those stories from the kids as well as from staff so that's quite frustrating because how do you combat that?… In terms of culture and language: we have an impact, things we say off the cuff, they absorb and it affects their perception.

T1: We can all think of a student who 'dropped' from IB to HSC.

T2: That's the language I'm talking about. It's about how the students feel and talk about themselves, and how the adults around them talk.

By looking at iGrow, participants moved from concrete observations to question wider aspects of activity (Virkkunen & Newnham, 2013). In the excerpt above, they made connections to subject choice, pastoral issues, and aspects of culture (expecta-

tions). They repeatedly and explicitly challenged the idea of ATAR being an appropriate focus of the problem:

T2: It's definitely about how the students feel about their success. Yes, shifting culture, yes, shifting language… I wholeheartedly agree that I think it's their perception of what success looks like for them as an individual as well as that feeding into what success looks like for us as a school.

T1: I guess the more we tap into carving their own path, the endpoint is not the ATAR, it's the destination afterwards and how they get there.

T3: They're not motivated by ATAR… There's more to life than ATAR.

Participants criticised the idea of giving students predicted ATARs, and practices of celebrating students who obtained high ATAR scores because this oriented students to the exam result and the achiever rather than the destinations they might reach in life. ATAR represented a singular fixed endpoint. In their meaning, destinations were multiple, open-ended and allowed for unknown aspects. This did not align with what they thought the HSC was for, and led to a discussion of how individual iGrow trees and goal-setting discussions could shift students away from an ATAR-centric focus.

T1: I would prefer the message from Redlands that you're in the driver's seat, you should be crafting your own tree [referring to the individual iGrow representation]. Looking at the tree with them and going "I'm going to make this decision because I know myself and where I want to go" is a much healthier mindset and something we believe in as a school. I'll show you this one. It shows how [name] started engaging in goal setting– because we see that gap between students who do set goals and those who don't. His reasoning is still sitting there [below peers].

T2: He has very different strengths, his sense of fairness and justice and he's actually quite considerate of others. He goes to TAFE and has real strengths in drama.

T1: His enrolment was in jeopardy at the start of Year 10. He has ADHD, OCD. Looking at his tree you can see cocurricular is where he's shining– soccer, music and drama. Look what happened at the end of Semester 2 when he saw his iGrow data. Now look at his academic progress! He's leapfrogged over 15 students. I showed him his detention data, he said "It was only 10", I said "Your peers get one!"… He put a goal in here that was scaffolded by his year advisor, to sit with the right people in class, have an organised layout to all my workbooks.

T2: He does check his workbooks now, if he's using the right one.

T1: That's a huge difference for that student. I asked him what he remembered about our first meeting and he said, "Attention to detail". You can see why, it's the first time he's seen himself as stronger than his cohort [referring to looking at his iGrow tree where attention to detail was noted as a strength].

Another student's data were brought up on screen, showing a high number of academic interventions and detentions:

T3: He looks like he doesn't have the tools. He just looks really lost.

T2: I hear that a lot, "I'm lost".

T3: They don't have the peers to help them come up. He's in extension [class] and is flapping around with his projects.

T1: Flapping around is a good description, everywhere. I don't think I've ever seen something like this [graph]. Last time he set goals was in Year 8.

T2: And that's an awful goal 'To have good grades'.

T5: I don't think the goalsetting is hitting the nail on the head. They fill it in but to get something meaningful out of the kids and keep them account– it's just not landing very well.

Rather than criticising staff or students, the group analysed how parts of the school *system* (peers, goal-setting conversations etc.) were not being accessed or engaged with in a way that would help such a student. iGrow's historical mirror helped them become more conscious of the problem they were working on: it functioned as a first stimulus.

This was reflected on a second surface where key ideas mentioned by participants were written on a whiteboard with two prompts: "How did we get here?" (oriented to the past) and "What could be different?" (oriented to the future). The following were prominent on the past-oriented surface: culture, tools, goal setting, pride, teacher expectations, subject choice. The future-oriented surface is shown in Fig. 2. This centralised 'How students feel about their success' in relation to 'Culture'. Points from the excerpts above were reflected here, including destinations rather than ATAR, goals, future, expectations, ways of talking, self-management.

Over subsequent workshops, loose ideas from Fig. 2 expanded and stabilised, becoming the basis for abstract models that drove concrete change. In workshop two, a photograph of Fig. 2 was shown, bringing participants back to a discussion of HSC culture in the school. This brought up the issue of ongoing struggles to enrol HSC students into a supportive peer culture:

> When I said to them "We all do well when we all do well, you need to work together" a couple of them said "It's really difficult to take that message on board when we see students not doing anything at all or not caring about other students. You're asking us to come together but we don't want to come together." [T2].

This first 'ideas and tools' stimulus (Table 2), captured early suggestions for the direction that change should take. It led participants back to ATAR and the need for a different focus:

T3: We need a new narrative, a story of what does success look like to them? For HSC it's not just having a number in mind because that's just not who they are or why they are here. We need a different concept… Before we were talking about branding… finding their passion and I think that's something that defines the HSC.

T2: Our HSC students are not driven by the ATAR but they want to be in control of it.

T1: What makes them feel like we only care about the academics and what makes them feel in control? It's a fine balance to give them the information they want while reminding them that ATAR doesn't define them.

This returned to the contradiction between exchange and use value, establishing a mission that the group was motivated to work on. The comments above express the contradictory nature of ATAR for a school like Redlands: students need information about ATAR to be in control of it, but focusing on ATAR can undermine efforts to displace it as the central focus.

Four-field model charting the ZPD of activity

Change Labs are designed to foster movement through a collective ZPD of activity. This movement is represented through a four-field model (Chang, 2021; Virkkunen & Newnham, 2013; Engeström, 2016), but Hopwood (2024) notes they have rarely been explicitly documented in literature on Change Labs in schools. Four-fields comprise two axes whose intersection creates quadrants, each a different form of activity. A four-field was used from workshop two onwards (see Table 2).

From ambiguous and unstable beginnings, participants reached consensus on the four-field shown in Fig. 3, based on two key dimensions of change in activity: from orientation to exchange value (ATAR) to use value (destinations); and from choices in what and how to study being made around ease to choices based personal passions, accepting challenge as part of this pursuit. This depicted four different qualitative forms of activity. The bottom left quadrant represented the 'old activity' (the status quo). The top left quadrant represented a 'given new activity', a societally already known activity form (Engeström, 2015): the HSC is explicitly framed around choice, coupled with a dominant focus on ATAR (exchange value). The struggle for a 'created new' form of activity involved breaking away from an exchange value orientation to reset that choice to be more around personal passions.

Participants discussed what the two axes should be, what their poles should be, and how the resulting four quadrants should be characterised with reference to the HSC in their school. In this way, they were using it to orient to the solution and to take control over the direction of development of their activity system. As such, the four-field was taken up as a second stimulus by participants. It was not a map to be followed, but actively constructed and modified as a tool for determining a solution and gaining control over change from the bottom up.

The four-field as constructed by participants pointed to the need to work on choices and destinations as aspects of activity development. As the group proposed

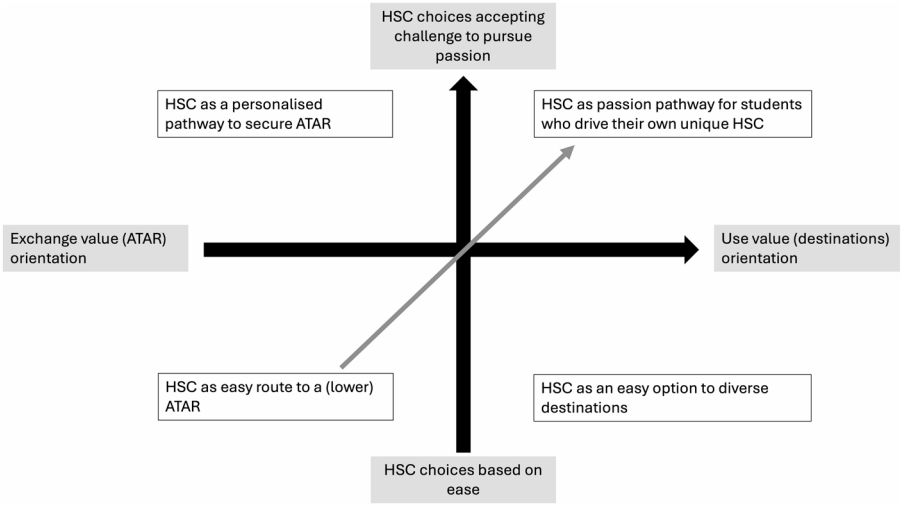

Fig. 3 Four-field charting ZPD for HSC activity

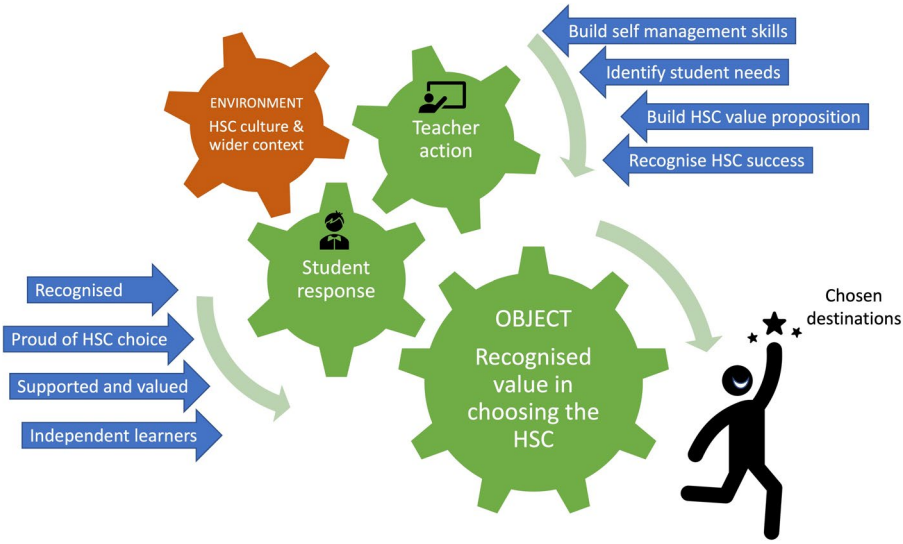

Fig. 4 Participants' ideas as of workshop three

and reported on various concrete changes, they checked whether those changes were moving them towards the top right quadrant. It thus functioned as a 'mirror of the future', connecting practical experiments with new concepts, helping to build the future form of the activity (Virkkunen & Newnham, 2013, p. 16).

There was a continuing dialogue between the four-field and participants' emerging ideas. Figure 4 shows the latter as of workshop three.

One result of this dialogue between stimuli was a greater focus on what students would be doing in the new form of activity. The top-right quadrant of the four-field (Fig. 3) was linked to the 'student response' cog of the participant-generated idea (Fig. 4). This was related to goal-setting, building on prior discussion of iGrow, and to study periods, time when HSC students did not have any scheduled lessons:

T3: I think we're a lot here but I think we need to think about this cog [student].

T2: Yeah.

T3: That's where we've got work to do.

A1: So, let's pause there for a bit.

T3: The student cog. What's it going to look like for them? I'm thinking about study periods.

T2: Our messaging that students can leave school supports their notion that they don't have to work in that time. They are expected to manage it themselves, but what do we provide for them? It says a huge amount.

This line of development was continued in workshop four, using a germ cell model taken from the student's perspective and a revised participant-generated model.

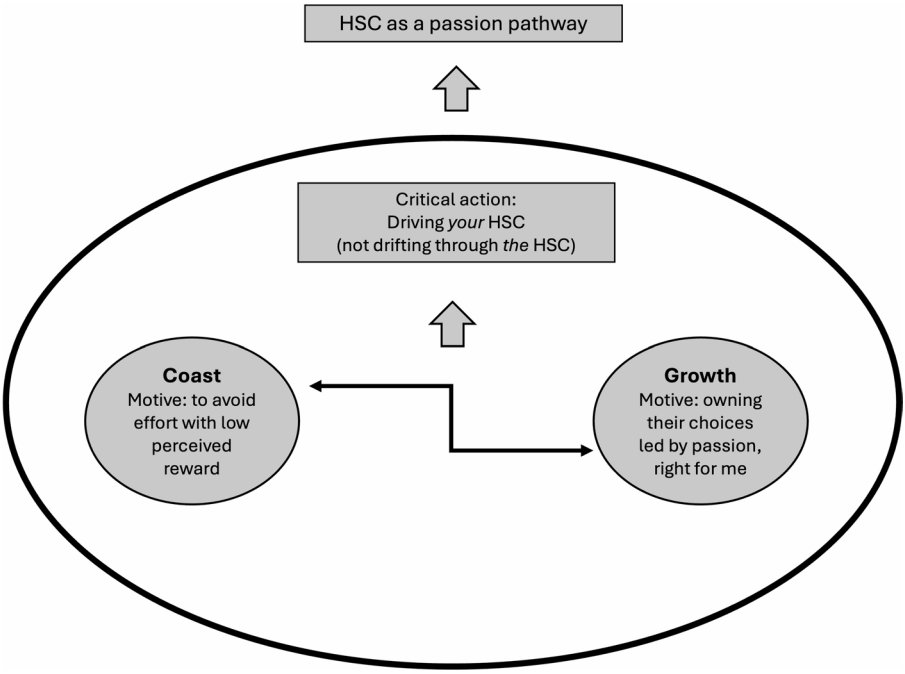

Fig. 5 HSC Germ cell model

A germ cell modelling conflicts of motives and critical action

A germ cell model was introduced in workshop four, developed by Hop and based on Engeström (2020). The root of a germ cell is a conflict of motives, in this case taken from the student perspective. Participants discussed various options for each component, settling on the version shown in Fig. 5.

The germ cell aligned this Change Lab more closely with Saninno's (2015) TADS framework. It relates to the fundamental contradiction, but from a different angle.

> There is a substantial difference between conflict experiences and developmentally significant contradictions. The first are situated at the level of short-time action, the second are situated at the level of activity and inter-activity, and have a much longer life cycle (Sannino, 2008a, p. 243).

The roots of conflicts must be explored in relation to the activity level of contradiction (Sanninio, 2008a, 2008b). Thus, conflicts students face and contradictions between exchange value and use value were deeply connected.

The way into these connections for the participants was through the idea of coasting: a lack-lustre approach to study focused on perceptions of ease and (avoiding) individualised competition. This echoes issues of passivity, self-efficacy, and subject choice documented in the HSC literature (Green et al., 2022; McIver, 1999; Palmer,

2020; Roberts & Dean, 2019; Smith et al., 2002; Smith & Sinclair, 2000). Participants identified the following as examples of coasting the HSC:

- Choosing subjects perceived to be easy or scaling well in ATAR (an effort and reward calculus).
- Study time, with students reported as saying "I have nothing to do" or "I don't know what to do".
- Aspects of HSC culture, specifically language use and approaches to learning ratings that put a ceiling on expectations.
- Competitive ranking-based nature of ATAR discouraged students from collaborating and supporting one another.

The motive to coast was understood as oriented to exchange value (if it at times, ambivalently), something that made sense to students when conditions favouring a orientation to use value were lacking.

The opposing motive was related to growth, not attached to ATAR but aligned with Redlands' mission and the high degree of choice built into the HSC. Growth would reflect choices around what students were passionate about, eager to develop, and what would be valuable in terms of the destinations they wanted to reach in life rather than what was easy. Traces of the ideas developed through the four-field (Fig. 3) are evident here. 'Destinations' was the term used by Redlands to point to how the HSC might help students step forward in life-long and life-wide (not just academic) journeys. Destinations did not just refer to where students went after completing school, but multiple points of significance in their life course. It thus invoked an open-ended and unknown aspect, not a singular end point.

Participants discussed many immediate situations of action where this conflict would arise: choosing which subjects to study; choosing which to study at higher level or discontinue; tasks in lessons; assessments; study time (and more). Their task became designing new features of activity that would enable students to pursue the motive to grow rather than coast. The germ cell model frames this solution in terms of a critical action, a compact abstraction that contains the seeds of the various concrete solutions.

The critical action was 'Driving *your* HSC' (Fig. 5). The idea of 'driving' had come up in the very first workshop (see above), and in the four-field (Fig. 3), but as a metaphorical label rather than a compact abstraction. The shift from one to the other occurred through discussion of another middle-level abstraction model, shown in Fig. 6.

The previous version had culture, teacher and student as different cogs (Fig. 4). The new version framed the whole model from the student perspective, with HSC culture now represented as context. The learner, journey and destinations (plural, maintaining an open-ended tenor) all step into students' shoes, orbiting a central HSC Value Proposition, a collaboratively developed way of articulating what students can get out of the HSC. This is shown in Fig. 7 and clearly orients to use value rather than exchange value. Helping students take control was central to the dialogue between the participants' model and the more abstract notions of breaking away captured in the germ cell:

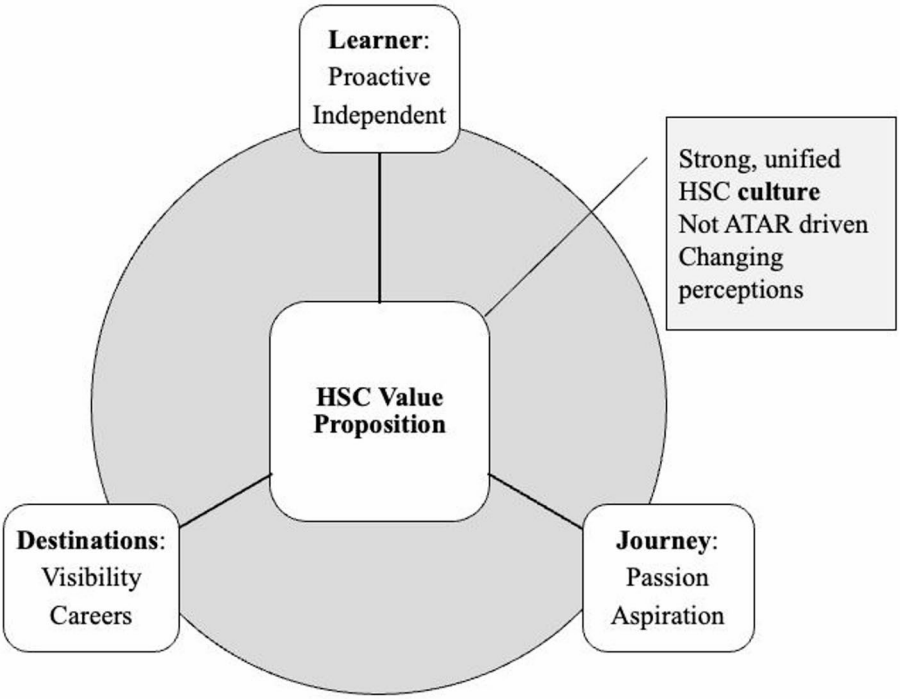

Fig. 6 Revised participants' model (workshop four)

The HSC offers students a unique opportunity to shape their academic and career pathways based on their strengths and passions. The HSC empowers students to take control of their education and tailor their learning experience and specialise in their chosen areas of interest. A key benefit is the choice and autonomy it provides. Whether selecting from a broad range of subjects or taking extension courses, the HSC encourages students to explore their interests and passions, while also developing key skills and knowledge.

Fig. 7 Redlands' HSC value proposition

T2: How are we empowering our HSC students to take more control of their learning journey? Coming back to the main purpose of this, for every student to feel like they have left school with what they need and that they're ready for the next step and they feel empowered?

At the top of the germ cell model was a new concept of HSC as a passion pathway. This related to the top-right quadrant of the four-field (Fig. 3), capturing the essence of the 'created new' form of activity, distinct from the 'given new' form (HSC as a high-choice pathway to ATAR). The need for a new concept and narrative articulated in workshop one was satisfied.

The idea of 'driving your HSC' thus transformed from a handy if ambiguous metaphor to a compact abstraction. As the latter, it incorporated the learner, journey and

Table 3 HSC core time as fostering critical actions

Content	Link to critical action: driving your HSC
Individual and collaborative study skills sessions	Providing students with tools to manage time, meet deadlines, prioritise, support each other, use study periods effectively
Talks by former students	Reflecting on social-emotional experience, post-school-pathways and destinations (planned and unknown), study skills and self-management, encouraging collaboration
Careers sessions	Raising awareness of diverse post-school options and helping students navigate these (with follow-up 1:1 meetings)
Goal setting	A complement to individual conversations with tutors around setting meaningful goals and being accountable to them
Presentations on ATAR, subject scaling	Enabling students to make informed choices about which subjects to continue or not, at which level
Workshops by teachers with exam marking experience	Helping students identify areas for focus when revising and doing practice papers

destinations as key elements, supported by HSC culture not occupied with ATAR. Driving was not seen as an isolated solitary action, but with peers and supported by the school. From this compact abstraction, a multitude of concrete solutions unfolded.

Concrete changes made to realise the new form of activity

One significant change was the creation of HSC Core time, which brings all HSC students together every two weeks to build a sense of cohort, foster collaboration, develop study- and self-management skills, and provide information around ATAR while managing the narrative around it not being all-important. This was piloted with Y12 in 2023 and implemented as a formal part of the timetable for Y11 and Y12 in 2024. HSC Core was facilitated by the Dean of HSC (T2) in collaboration with subject co-ordinators and teachers. Table 3 presents foci of Core sessions and how they enabled students to drive their own HSC (the critical action). This included former students talking about their post-school pathways, including destinations they had in mind, and those that were not anticipated when at school. Documents relating to these sessions were shown in later workshops, as participants co-developed their sequence and content. HSC core sessions were planned to help students pursue a growth motive, taking on challenging passion-oriented choices about what and how to study.

Reflecting on this during workshop eight, T2 commented that HSC Core was "vital for bringing the cohort together and driving key messages over time". Other participants gave examples of changes in HSC study culture becoming more collaborative from their experience as classroom teachers and subject coordinators. There is thus indirect evidence that the HSC Core was functioning as intended.

HSC Core was coupled with a change to study time. Staff were allocated to supervise them, helping students use them productively, and particularly collaboratively, rather than as empty time with nothing to do. While no observation or interview

data with students were available to document the impacts of this, it is nonetheless evidence of the school implementing changes aligned with the new model of activity.

Several changes were implemented to uplift expectations of HSC students among teachers and students themselves. HSC Core and staff meetings were used to clarify the classroom behaviours expected to merit a certain approach to learning score as self-rated by students, an as rated by teachers. By the time of workshop eight, iGrow data showed no traceable difference between HSC and IB cohorts in these scores. Other evidence from iGrow included:

- Growth in Records of Academic Discussion– verbal conversation between teacher and student that is captured in a brief digital record– to drive self-management, appropriate behaviour, and active use of feedback.
- Student goals becoming more aligned with the HSC value proposition, contrasting previous goals focused on grades in particular subjects.
- More HSC students had a clearer idea of what they wanted to do after school (indicated in 'firmness of plans' data), a reflection of increased engagement with careers advisers as encouraged in HSC core.
- Data for 2023 showed the best attendance on record for Year 11 and 12 students, at a post-COVID time when many schools were struggling with absenteeism.
- ATAR results for HSC students significantly increased in 2023 compared to past years.

Collectively these changes were seen by participating teachers as reflecting a cultural change in HSC:

T2: They're talking about it differently. They're aware of where the ATAR fits in their future plans, but they recognise that there are lots of different ways for the same goals. It's more about what is it that they need to do, how do they want to do well, where do they want to go? And having some control over what that looks like is where I've seen the shift with students… Handholding with all of them is definitely reducing. Being given a consistent message from me and others in Core that they're capable of doing it. We want them to leave us knowing that they know what they're doing and that they're driving that.

T5: It invites them into that driving, not drifting. They're the ones initiating those conversations.

T4: My class, they're more aware of how they're going and what's working for them. They're very literate on that, more so than before.

Data from iGrow and participants thus complement the evidence of enacted change to suggest that the new activity was supporting desired changes in students' approaches to the HSC. Teachers' observed changes in lessons and study periods, and iGrow data do not prove that students were breaking out of the conflict of motives, rejecting coasting and driving their HSCs– but they are what would be expected if this were the case. The germ cell model takes the perspective of students, and a next step in exploring these effects would be to engage directly with students (this was not covered in the scope of ethics approval). Nonetheless, there is robust evidence that the HSC activity had been pushed through its ZPD (Fig. 3).

Discussion

Engeström (2011) identifies four characteristics of effective second stimuli, all of which were met in the examples discussed above. First, the four-field, germ cell and teacher-developed models were all actively constructed by the participants: the researchers introduced the abstract CHAT model structures but teachers determined their specific content. Second, in all cases, participants progressively enriched them from an ambiguous to an enriched, precise form. Third, they each became stable, serving as anchoring devices, pulled on to move forward (see also Sannino, 2022). Finally, the second stimuli addressed the contradiction faced by the participants, each in a different way: the germ cell connected it to conflicts of motives experienced by students, the four-field charted the direction of transformation in a collective ZPD to a created new form of activity, and the middle abstraction models expressed responses to the contradiction in the everyday language and structures of the school. These findings echo Morselli and Sannino's (2021) finding that in a Change Lab, double stimulation may not follow the TADS model in strict order.

The repeated presentation of the four-field and germ cell models was crucial in this study. As participants gave updates on what had been done in implementing concrete actions, their reports were captured as mirrors of the future on the hand-written whiteboards (Fig. 1; Virkkunen & Newnham, 2013). These could then be compared with the four-field whether movement was towards the upper-right quadrant form of activity, rather than just horizontally or vertically.

This repeated encounter with the higher abstraction stimuli contributed to their function as instruments elaborating new meaning when a pre-existing solution was not available. Sannino (2022) identifies this as a key aspect of TADS, concerned with how people pull themselves forward to break away from problematic situations (see also Hopwood & Gottschalk, 2022; Hopwood et al., 2022). Discussing iGrow mirror data generated new meaning in terms of discomfort with the present form of activity. Discussion of the four-field elaborated new meaning as to what the new form of activity should be, not only how it should be different from the status quo but how it should be different from an socially available alternative that remained focused on ATAR. Discussion of the germ cell elaborated new meaning by shifting the focus from systems and history to students and many instances of decisions and actions they take in their schooling. All these new meanings were vital, showing that multiple stimuli are important in TADS.

Participants' own ideas were also crucial in driving the development and use of the higher-abstraction models. They were literally side by side on surfaces (Fig. 1), so participants could see their concerns reflected in the four-field, and taken up in the germ cell model. These middle-level abstraction surfaces often captured the embryo of ideas (such as 'driving your HSC'). They were not sufficient to figure out what to do when no known solutions were available. However, dialogue between these and the more abstract models drove the elaboration of new meaning mentioned above.

TADS links systemic contradictions to immediate situations of action through the notion of conflicts of motives (Sannino, 2008a, 2015). TADS is not a once and for all resolution of the conflict, but rather a complex of decision and actions that are repeated over time and progressively cultivated (Hopwood & Gottschalk, 2022; San-

nino et al., 2016). The critical action must be dispersed across time and situations of action where the conflict recurs. This dispersal was evident across the concrete changes including HSC Core time, supervised study periods, reset approaches to learning rating processes, use of Records of Academic Discussions, goal-setting, and reference to the Value Proposition when helping students with decisions about subject selection: all moments to choose growth rather than coasting.

Conclusions

Change Labs are a demonstrated method to secure significant change in schools, distinctive through their basis in CHAT (Hopwood, 2024). Double stimulation can make conflicts of motives and contradictions visible to educators, enabling them to develop new collective solutions (Kaup & Brooks, 2022). This study adds to the body of work on Change Labs in schools, extending prior research on student apathy (Sannino et al., 2016) and engagement (Barma et al., 2017). It is the first to focus on the final two years of schooling, and the first from an Australian school (Hopwood, 2024). The two-year duration differentiates the study from many in the field, building on Augustsson's (2021) argument that longer timespans are advantageous in allowing for consolidation of new activity, and for participants to reflect and develop practice between workshops.

Literature on Change Labs in schools has oriented more to expansive learning and systemic contradictions, while more recently developed aspects of TADS (Sannino, 2015, 2022) have received less attention. The use of stimuli to drive change where no known solutions exist is central to Change Labs, so this paper explored how this happened, focusing on stimuli that have received less attention in prior work in schools: four-fields (Chang, 2021), germ cell models (Engeström, 2020), and participant-generated ideas and tools. The transformation of activity towards a historically new form has been traced in historico-genetic fashion (Engeström, 2015), showing repeated engagement with stimuli and dialogue between them to be crucial in elaborating new meaning, charting the ZPD for activity, and ensuring implemented changes delivered the desired transformation. These insights add to accounts of double stimulation as part of the texture of school change (Engeström, 2008).

Critiques of reductive educational outcome measures as narrowing our view of good education (Biesta, 2019; Hayden, 2011; Taylor, 2019) are widespread, and not just confined to Redlands or the HSC in Australia. The study demonstrates the importance of recognising that these issues reflect a contradiction between exchange value and use value. It shows that the former does not have to prevail as the primary orientation of high school education, even if examinations continue to be used for university admissions. This echoes Wortham et al.'s (2023) use of a Change Lab in Korea to escape a false alternative between academic achievement and wellbeing. This study shows how school-based educators can envisage alternatives that do not diminish exchange value, but transform activity based on use value and the diverse destinations within and beyond university that secondary schooling can help students reach. The contradiction between exchange value and use value can be transcended in local activity systems.

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Declarations

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