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Change laboratories between university and work in Emergency Medical Care

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ABSTRACT

Change Laboratories are a methodology to deal with complex problems in society in order to both better understand these problems as well as to find potential solutions. They typically involve collaborative problem solving and solution seeking from practitioner's perspectives, conducted in a series of successive, structured workshops informed by Activity Theory. The problem examined in this paper is the efficacy of mentoring of Emergency Medical Care students (paramedics) during periods of work placement. Feedback from students and lecturers suggests that student learning is often constrained or at least uneven. The problem is then examined in Change Laboratories from the perspective of university/work intermediaries, the clinical facilitators, who are key players in student preparation for work and work placement. The clinical facilitators identify communication between the university and workplaces as a crucial constraint to student learning under mentors, and formulate more advanced roles for themselves to enhance communication. The result of such enhancement, it is argued, is the potential for mutual development of both university and workplace knowledge and skills.

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Introduction

How do we deal with intractable and complex problems in organisations? What sorts of problem solving approaches are most appropriate? More typical approaches range from expert-initiated solutions which are then tried out by practitioners to interventions that are generated by the practitioners themselves, for example in action research. In Change Laboratories, as with action research, solutions are generated by practitioners. However, expert opinion is not ignored but rather used to stimulate debate. In addition, the process is underpinned by a strong theory of organisational learning and change, Activity Theory (Virkkunen and Newnham 2013).

Activity Theory is an interventionist methodology in which researchers enter a problematic social system in order to promote change (Sannino and Engeström 2017). In order to work on problems and effect change, Activity Theory draws on Vygotsky-inspired learning principles such as historically evolved, culturally-mediated learning, collective

action, double stimulation and ascending from the abstract to the concrete (see below) (Sannino and Engeström 2017). These principles are further clarified in the methodology section.

The problem explored in this research is that of the poor mentoring experiences of students who are studying towards a degree in Emergency Medical Care (EMC) that leads to qualification as a paramedic. Studies by De Waal (2013) and Moodley (2016) identified problems with the current mentoring system that impeded EMC students clinical learning opportunities in South Africa.

Both authors raise the issue that mentors do not necessarily support or value students' diagnostic abilities which may even be in advance of their own training. This difficulty has arisen, it is hypothesised, because students are currently trained with diagnostic/medical skills whereas mentors have often honed their knowledge experientially and through short, skills-focused courses. One result may be an increasing distance between university learning and professional practice, as the former undergoes change, a trend which has also been reported on in Northern Europe (Virkkunen, Mäkinen, and Lintula 2010).

Given these circumstances the concept of 'Change Laboratories' (Engeström and Sannino 2011) was explored as a potentially useful approach for further investigation of difficulties of coordinating activities between university and work practices.

The number of analyses of organisational change through a Change Laboratory methodology remains small (Virkkunen and Newnham 2013). More specifically there are even fewer examples of Change Laboratories in the field of higher education (Englund 2018). Notable recent publications are those of Englund (2018) in which staff from different Pharmacology streams attempt to tackle the problem of curriculum integration, and Guzmán (2018) on overcoming barriers to the integration of ICT in university teaching. Both Englund and Guzman's articles draw on typical Change Laboratory expansive learning actions from the literature (e.g questioning, modelling) to analyse the development of expansive learning amongst the participants, as has been done in this study. The work of Fang (2016) uses the change methodology to understand why academics were unwilling to engage in service learning; Montoro's (2016) article examines the difficulties of language teaching in Engineering. While these papers do not deal specifically with mentoring, other research can offer useful insights into student learning at work.

Konkola et al. (2007) and Virkkunen, Mäkinen, and Lintula (2010) examined students' learning while on workplace internships. They argued that we should view internships as a learning system rather than one in which only students learn. From this systems perspective, the workplace can also undergo learning and development through interacting with students (for example, the students may have theoretical insights or have been taught up to date techniques). This type of learning process is referred to by the authors as 'developmental collaboration'.

Although some of the difficulties with the mentoring system in EMC described above are already in the public sphere, the problem persists and there are no clear and comprehensive solutions on the table. Thus the purpose of this research is to encourage a selection of university staff to confront and better understand problems within mentorship and, furthermore, to seek potential solutions. Furthermore, as mentorship involves working across different constituencies it is argued that the concept of 'developmental collaboration' may provide a potentially useful theoretical approach for understanding and improving the mentorship system.

Change laboratories

Change Laboratories are future-orientated workshop spaces in which the wisdom of the participants, drawing from their past and current practices, is used to develop new and improved ways of practicing. Participants are first made aware of the nature of the Laboratory and what the expectations are from themselves and from the researcher. The starting point or first stimulus is the unearthing of problems that may exist within the system as a whole, and ensuring that these are fully understood by all participants. These problems are then further theorised as historically developed contradictions within the activity system. The next step is the collaborative identification of some form of initial in-between object which contains the fundamental contradiction of the activity (Virkkunen and Newnham 2013).

The actions in the Laboratory (which is a facilitated workshop) move back and forward from more empirical evidence drawn from participants' experiences, referred to as mirror data, to more abstract understandings encapsulated in activity system diagrams (see Figure 1). In between these are new ways of working, or tools, uncovered in the discussions. These three parts (mirror data, ideas/tools and abstract understandings/models) are displayed visually on newsprint in the workshop venue and developments from previous workshops are utilised as stimuli for subsequent ones (Virkkunen and Newnham 2013).

In Change Laboratory approaches, knowledge development by the participants of the workshop is driven by two Vygotsky-inspired fundamental theoretical underpinnings, namely double stimulation and ascending from the abstract to the concrete (Sannino and Engeström 2017). The first stimulus is that of problem identification within the system being examined. In Change Laboratories some time is spent on pinning down the initial problem to be dealt with and understanding it from as many perspectives as possible (see mirror data below). The intention is that understanding and confronting the problem will serve as a strong motivation for further discussion. The second stimulus involves providing a theoretical tool to help participants to work on the problem. In this research the tool is an activity system diagram (see Figure 1), in which the problem can be analysed in terms of the system components. The role of the activity system diagram is to understand the problem in terms of contradictions within the activity system.

Following on from identifying the contradictions, participants then explore a new process, structure or way of thinking that encapsulates the fundamental nature of the identified contradiction. It is based on participants' observations of the problem but goes beyond this to pose a theoretical or more abstract proposition. The new process or structure also serves as way of resolving this contradiction, and in so doing developing a more advanced and improved way in which the system may operate. The initial process, object or way of thinking is initially underdeveloped and weakly defined. It does, however, have the potential for much further development and refinement over time. These initial thoughts in Change Laboratories are referred to as germ cells (Sannino and Engeström 2017). The space between the initial germ cell and its more advanced and specified resolution can be said to constitute the zone of proximal development (ZPD) of the activity system. Instead of mediation by an individual expert such as a teacher, which is more typical in a classroom educational setting, it is the collaborative expertise and contextual knowledge of the workshop participants which helps navigation

in the ZPD (Engeström and Sannino 2011). Such navigation often involves participants' experimentation with the new ideas, even though there is still facilitation by the Change Laboratory researchers.

The initial weakly conceptualised abstract idea/object is thus developed by the Laboratory participants over time into a more societally useful (hence concrete) idea/object (moving from the abstract to the concrete).

The genesis and development of this germ cell (or object in the making) by workshop participants can only properly be understood if the steps in its development are elucidated. These steps are described in the methodology. Hence researchers in Change Laboratories typically describe both the process and the endpoint of the research (See, for example, Englund (2018) and Guzmán (2018)).

In the Laboratories discussed in this research, the researchers are interested in working across the boundaries between work and university. Virkkunen and Newnham (2013, 190) refer to these sorts of laboratories as 'Boundary Crossing Laboratories'. Participants in Boundary Laboratories seek to develop some sort of jointly shared initial object or germ cell which serves the interests of both constituencies, rather than trying to solve a problem within just one constituency. Boundary Laboratories, however, still utilise the same methodology as regular Change Laboratories, even though the desired outcome may be different.

Mentoring in EMC

The education of EMC paramedics has changed over time. Prior to the introduction of university-based qualifications (2012), paramedic students' training was characterised by the following:

- Training through short Courses;
- More skills-based than diagnostic or theoretical;
- Protocol/rules-based practices typically taught;
- Working under supervision

Most workplace mentors were trained in this way. However, there has been a shift to training 'healthcare practitioners' (Dalbock 1996) in which students study towards a Higher Education Diploma or Degree. The more formal higher education courses are characterised by a focus on independent practice and advanced scope of practice. Students are thus taught in a more medically-focussed evidence-based fashion whereas the short-course trained paramedics are more experienced-based. Furthermore, the focus of the paramedic mentor is on delivering a service to critically ill or injured patients whereas students use their workplace periods to learn.

Currently, students enrol for a 4-year degree in EMC. During this period the Health Professions Council (HPCSA) requires students to practice specified clinical skills and, in so doing, accumulate a specific number of clinical hours. Thus the department that offers EMC at the university teaches clinical skills and patient simulation in a hi-fidelity skills lab and students are placed at 22 clinical sites (ambulance stations, hospitals and clinics) over weekends during the academic year, under clinical supervision by clinical staff at these sites.

Given that there are upwards of 120 students across four years, the department requires assistance in placing and monitoring these students. To this end the department employs four ‘clinical facilitators’. In addition, their role is also to train students in the skills laboratories, for example in practicing advanced life support procedures on mannequins. The facilitators are drawn from industry rather than from the academic stream.

The clinical facilitators often refer to a fundamental difficulty of the gap between university studies and workplaces. Students may experience practice under mentors as problematic as they may not be permitted full exposure to practices so as to acquire the knowledge and skills they need, a point also raised more generally by Billet (2009) in discussing experiential learning.

Mentoring in general and more particularly in health sciences has been understood primarily, as about a relationship between mentor and mentee (Valadez and Lund 1993). The relationship can also be extended to include professional/identity development (Beach 2003) and as one which occurs within an enabling/disabling community of practice (Jokelainen et al. 2011). However, in most cases the focus is on the development of the mentee. For practice learning systems to function optimally, Konkola et al. (2007) suggest there needs to be greater discussion and collaborative work between university and workplaces. One way to support this approach is to make a shift in focus to mutual learning and changes in the whole learning system. Virkkunen, Mäkinen, and Lintula (2010) suggest that such a developmental collaboration approach is more suitable to dealing with the complexities of problems in working life.

Methodology

The Change Laboratory participants consisted of the four clinical facilitators, the head of department (HoD) from EMC and a researcher in work integrated learning practices (the HOD and the researcher are the authors of this paper). As already described, the clinical facilitators (CF) are responsible for managing and supporting students during their work experience, and act, in their own words, ‘to integrate what is done at university with what is done at work’. The HoD played a dual role here, as both a researcher and workshop facilitator as well as, at times, a contributor to the problem generating and solving process. Though somewhat unusual in more objective research this allowed the HoD to direct the workshop process towards the problem, keeping the focus on track. In Change Laboratories this role is known as a ‘researcher-interventionist’ (Virkkunen and Newnham 2013, 107).

In the first session with the clinical facilitators (CF) the purpose of the workshops, to work on challenges experienced in mentoring, was outlined. This first session was followed by 5 two to three-hour workshop sessions occurring each week, except for the final session which was a more reflective summation held after the participants had been on a 4 week Christmas break.

The workshops were structured following the classical Change Laboratory setting from Virkkunen and Newnham (2013) with the group of practitioners arranged in front of the three sets of newsprint (called screens): Mirror, ideas and model/vision. The mirror is basically empirical data from practice that is used to stimulate the practitioners in their discussions. The ideas screen is developed by the researcher as a record of the main ideas emerging from the discussions and in particular any new approaches that the practitioners have put forward. As with the mirror data, records are made on newsprint during the

workshop discussions as a continuous record of developments for subsequent workshops (Table 1).

The model screen is a more abstract analysis of the organisational system described by the practitioners, following the analytical components of an activity system. The model also allows the researchers to identify key difficulties emerging in a systematic manner (see Figure 1).

The activity system model basically charts the relations between individuals of interest or *subjects* (in this case, initially, students) to the *community* they operate within and what it is they are trying to work on and achieve, the *object* (Blackler 1995). These relations are further mediated by the social/cultural *rules* of the system, the roles and *division of labour* (DoL) of all participants and the *tools* or resources which the individuals of interest have access to. Such systems are never stable and always riven with contradictions, which may hamper how individuals and the community as a whole may work on the object. These contradictions can be within one or other element (tools, rules, etc.) or between them and often serve as future nodes for development and change (Engeström and Sannino 2011). Whereas the mirror data-inspired discussions serve as a primary stimulus to understand the problem proposed (see Table 1), the activity system serves as a secondary stimulus for forward thinking and change (Sannino and Engeström 2017). The system is typically represented in triangular format (See Figure 1).

The screens are furthermore divided into past present and future to provide for a deeper analysis of the way things have been, where they are now and what they could be in the future.

Mirror data

As the problem of limited/uneven student learning under mentorships is well known, there was mirror data already available from staff and students. Thus no new data was gathered specifically for the workshops, though new data was also generated by the workshop participants, the clinical facilitators. One possible gap was that there was no specific data gathering from current workplace mentors. However, the CF had themselves been recently recruited from EMC workplaces where they had acted as mentors.

The initial mirror data in the Change Laboratory sessions consisted of a two-page handout of transcribed interview data from a previous research project conducted two years earlier (Garraway 2017). In these interviews academic staff were asked to discuss the implications of replacing more practice-based diplomas with more theoretically – orientated degrees, a process that was unfolding at that time. In the course of conducting this research, much information was gathered about difficulties students may experience at work.

A second source of mirror data was research on EMC students' experiences of experiential learning, conducted four years earlier. The results of the research questionnaire were presented in session 3. The data highlighted some mentor's negative attitudes to student learning and differences between work and university-taught practices, amongst other issues (De Waal 2013).

The clinical facilitators had been asked to bring forward any data they might have on what worked/what was problematic within the mentoring system. They chose to present the results of a student satisfaction survey (Survey Planet) given to 120 students currently

under mentorship. The questions were designed by the four clinical facilitators around three main categories: Students' experiences of constraints and enablements to learning on-the-job; the role of the university staff; and systems in experiential learning. Though there was positive comment there were also instances reported where students found their mentors to be unhelpful and it was also sometimes difficult to find opportunity for practice of skills.

In addition, the clinical facilitators were asked to bring forward any critical incidents relevant to the discussion topic that they experienced in-between the workshops. These included e-mails and phone conversations which highlighted problems arising from mentors' and student's perspectives. Following Virkkunen and Newnham (2013, 84), participants were asked to question these occurrences, for example 'has this occurred before? What did you do?' etc.

In the initial workshops the CF were also asked to pair up and relate exemplars of where they believed mentorship had worked or where they had identified problematic aspects. For the problematic aspects, CF were asked how they thought the issues could be resolved.

Historical data on the mentorship system forms an important contribution to later analysis of how current problems arose in the first place. In keeping with the transformative, dialectic and participatory nature of Change Laboratory research, the researchers introduced the CF to the participatory action research method of life journeys (Bozalek 2013). The CF presented their experiences over time as students being mentored to becoming mentors themselves, and all the highlights and difficulties that ensued.

Data from earlier sessions was used as mirror data in subsequent sessions. This was mainly accomplished by the facilitators showing selected video clips of the previous session which encapsulated key points in discussion. Such key points were typically drawn from the 'ideas screen' developed during the workshop. Furthermore, the workshop venue's walls held most of the discussion data and activity system theorisations from all the previous sessions, providing participants opportunity for 'reflection ... looking backwards to prepare for moving forward' (Virkkunen and Newnham 2013, 101). This use of prior developments as mirror data can best be understood in Table 1 which shows the proposed progression of the Change Laboratory workshops conducted.

Mirror data and expansive learning

Virkkunen and Newnham (2013, 75) outline a series of expansive learning actions carried out by participants in a Change Laboratory as they move from discussing the problem to seeking possible resolutions:

Action 1: Questioning the current situation and highlighting current problems.

Action 2: Analysing the problems raised empirically and historically. In empirical analysis problems are located within an activity systems model. In historical analysis the participants try to understand what forces were at play in the past and how these may have influenced current structures, in often hidden ways.

Action 3: Modelling new ways of operating which involves understanding problems as arising from deep-seated contradictions within the activity system, and using these as an impetus to construct new ways of operating in practice.

Action 4: Examining and expanding on the new models in practice within the Laboratory workshops.

These four actions constitute the initial analysis and planning sessions of a typical Change Laboratory cycle. They are typically followed by further implementation actions of reflection and consolidation of the new model. In the EMC Laboratory only the initial actions, from questioning to examining, were carried out, as indicated in [Table 1](#).

[Table 1](#) also shows the planned activities to be carried out in the sessions conducted in this research, following the useful table for higher education Change Laboratory research outlined in Bligh and Flood (2015, 156). The activities involved, firstly, the presentation of mirror data which was used to stimulate discussion on the nature of problems within the activity system. This was followed by an attempt to gain a deeper, more theoretical understanding of the problem through its representation on an activity systems diagram. Through this form of secondary stimulus, participants were encouraged to locate experiential difficulties within systemic contradictions in the activity system, and to come up with initial attempts to bridge and resolve these contradictions, which were earlier referred to as ‘germ cells’.

Table 1. Proposed sequence of actions in the EMC change laboratory.

Session and actions	Mirror data	First stimulus	Second stimulus
Session 1	Setting the scene.		
Session 2: Questioning	Interview data and previous research findings from the facilitators; participant reflections on critical incidents.	What are the main problems and issues in mentoring?	Draft activity system of the present.
Session 3: Questioning and historical analysis	Main issues raised from session 2 (video data, newsprint); Activity system of the present. Participant reflections on critical incidents; Participant ‘rivers of life’.	What are the main problems and issues in mentoring?	Activity system of the present and past.
Session 4: Analysis	Main issues raised from session 3 (video data and Ideas column).	What are the main problems and issues in mentoring? How has the past activity informed the present?	Contradictions across and within activity system elements.
Session 5: Modelling	Contradictions across and within activity system elements.	Working on resolving contradictions.	Activity system of the future.
Session 6: Examining and experimenting with the model	Activity system of the future; germ cells.	How could the germ cell be developed?	Issues with developing the germ cell.

Results of the change laboratory process

The data gathered from the workshops was represented against the successive actions in the expansive learning cycle in [Table 1](#), namely: Questioning, analysing, modelling and examining the model. The developments within the actions in the workshops provided the participants with tools to work on new actions in the subsequent workshops, and to seek a possible resolution to problems raised. The resolution put forward can thus only be properly understood against the backdrop of these successive actions.

Questioning

Change Laboratories spend a great deal of time in focussing participant's activities on defining and better understanding the problem to be dealt with. This questioning was stimulated primarily through providing the participants with data on the current situation and also requesting that they bring forward their own data (see mirror data in methodology).

Participants developed an initial activity mentorship system in which students were the subjects who were then working with mentors on 'becoming competent' paramedics in the field. Becoming competent was described as the object of the mentorship system. The community students were operating with included a variety of role players, for example: Paramedics in the field, doctors and nurses at the hospitals, all of whom acted as mentors, clinical facilitators at the university and some elements of management in workplaces who were responsible for organising who does what and when.

The clinical facilitators (CF) described differences in ways of operating between the university and the workplace. The nature of this difference was outlined in the below quote as being between the current ways of doing things at work and the new skills of clinical reasoning which university graduates are equipped with. This was very similar to what was hypothesised at the start of the research:

The problem is the experience and psychomotor skills of the mentors, the how, versus clinical reasoning or why we do things the way we do ... (of the students)

The students tell us about the mentor's attitude which is, forget what you learnt at university this is how we do things here. If the student tells them they want to apply this (what they have learnt) in the workplace the mentor pulls out journals (instruction manuals). Students are forced to work under the practitioners licence (so must do what they are told).

For the CF this instruction manual issue was problematic because students were often taught the most up-to-date and evidence-based practices, for example new and safer immobilisation techniques, which were not used by many paramedics in the workplace. In addition, the problem of student-mentor relationships was revealed as being even more complex, involving future positions of power and influence. Workplaces often seek university trained paramedics as employees, and rapidly develop them as managers, often over the heads of the less well-qualified incumbents who act as the students' mentors:

... then there is the issue of graduates becoming future bosses so this is a threat to the mentors ... the graduates will earn more than them ...

Whereas the above quotes highlighted potential contradictions in the mentorship activity system (psychomotor versus clinical for example), there was also a conflict in motives experienced by the CF. Such conflicts often involve staff having to make a choice between options. They are also indicative of a participants experiencing a crisis, and are typical of situations requiring change (Sannino and Engeström 2017). The conflicting motive reported on here was between their stated role as advancing learning and what they actually ended up spending much of their time doing, dealing with difficult

organisational issues. These issues arose through the ‘stimulus’ of asking the CF to recount critical incidents that typified some of the difficulties they encountered with mentoring, for example:

This is a message that has just come in (on the clinical facilitators mobile phone) ‘he is not allowed to work on our vehicle till he has changed his attitude’ this is what we deal with. We should be clinical firefighters, I am exhausted, because what we do is put out fires. That is all I do, problem solving.

There was much assent from the other CF, and similar critical events were raised. For example, another incident described how a surgeon refused to have a student in his theatre because the student arrived late. Again, the CF had to smooth over the difficulty through contacting and talking to the surgeon and eventually the student-surgeon relationship was sorted out. One suggested historical origin of this difficulty is students being treated differently often via flipped classrooms – having a say – and possibly gaining a sense of entitlement. This sort of subject-disposition may be at odds with the very hierarchal nature of the profession and fieldwork (see historical analysis below), in which the student is expected to follow strict rules and instructions, and so at odds with more liberal views of education.

This concept of ‘firefighting’, as the sessions progressed, served as a stimulus for participants to come up with new ideas.

For example, CF also spoke about their ambassadorial role, in promoting the usefulness of their university trained students within the hospital environment. There was also quite a lot of organisational work as students needed to be matched to available training slots in, for example, maternity wards. These ideas arose as participants recounted anecdotes of their daily difficult experiences. During one of the stimulus events, where the CF examined a recent survey of student experiences at the workplace, it became apparent that not all sites of practice were equal as sites to train students. What was striking was the unevenness of their mentorship experiences where some sites provided good learning opportunities whereas others were not particularly helpful. Mentors thus raised the idea of some form of connoisseurship from the CF as to where best to place students.

Empirical analysis

Based on the discussions following on from the mirror data (the stimulus), the researcher-interventionists built an activity system diagram (or model) of the mentorship system, highlighting emerging contradictions and difficulties ([Figure 1](#)). The object of the system was understood as student learning in practice, which was reworked by the CF to include cognitive/clinical and operational aspects of practice. The major difficulties on [Figure 1](#) were, firstly, between the different tools/resources that students and mentors bring to bear on the object of ‘learning to be a paramedic’. As described earlier this was between more practical, rule-bound practices of the mentors and more diagnostic, theoretically informed practices possessed by students. This difficulty also influenced the ‘rules of practice’ as mentors may use outdated practices from manuals. There was also difficulty in the division of labour where students may be subjected to some hostility as potentially future bosses rather than learners. In addition, there were difficulties emerging about the organisational role of the CF (e.g. ‘firefighting’) and their attempting to optimise student learning.

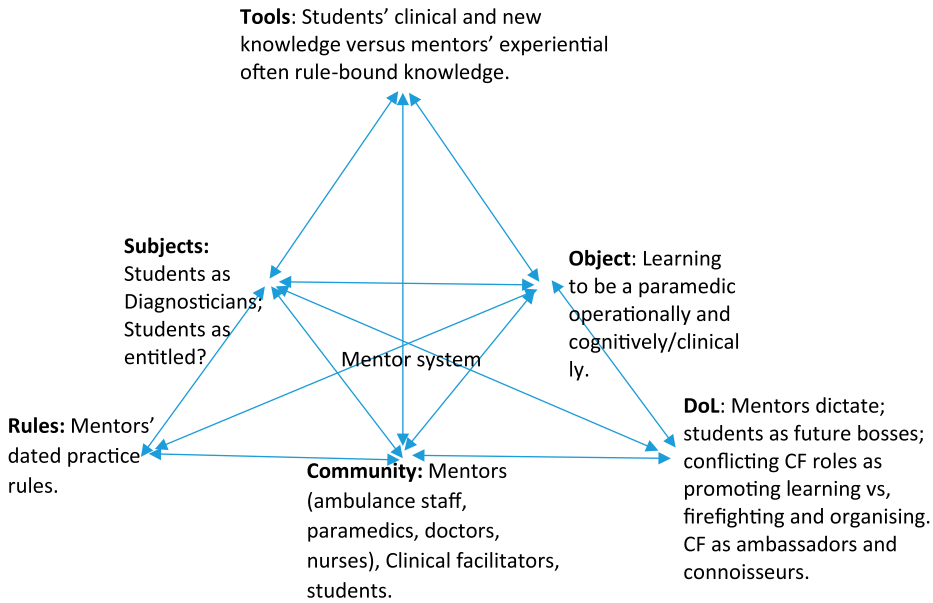


Figure 1. Activity system empirical analysis of problems with mentoring.

Historical analysis 'How did we work in the past'

The next level of stimulus involved retrospective thinking from the CF. The CF were asked to create narratives of their own experiences of being mentored in the past. Here the researchers used the participatory action research method of life journey timelines in which each CF pictorially represented their journey from students to professional paramedics (see methodology). These were then used as discussion points with the other CF. Three main themes emerged from the historical analysis. Firstly, that mentoring was largely unstructured and whether or not it worked for the CF depended on who they were able to work with. The CF highlighted that the history of mentorship was much less structured than, say, nursing and had always been somewhat ad hoc, and that this history may also have informed, in part, how things currently operate. As one CF recounted:

There was very minimal guidance and mentorship that we had back then. We had to create it ourselves and build support relationships. We had no guidelines on how to go about our own clinical training and personal development.

Secondly, the culture of paramedic practice was in some ways quite militaristic and hierarchical involving unquestioning following of instructions, a trend that still persists currently. Thirdly, as new paramedics, the CF recorded their concern with themselves being mentors when they were still learning and may have made mistakes (echoing current concerns of paramedics and the roots of unwillingness by some mentors to supervise students).

Modelling new opportunities 'How do we want to work'

Modelling new ways of operating involves understanding problems as arising from deep-seated contradictions within the activity system, then mobilising these contradictions as an impetus to construct new ways of operating in practice.

The CF group initially identified different knowledge bases of students and mentors, and the related different operational rules of mentors and students, as problematic areas.

An initial, new proposed model was the idea of a course for mentors where they too could learn best practice methods as well as how to mentor students correctly. This course could be offered by the university EMC department:

We need to create buy in for mentors and workplace management, perhaps a mentorship programme where mentors are trained in how to mentor

This training, it was suggested, could count towards continuous professional development points, so be of use to mentors beyond the mentorship system. Communication between mentors and mentees was also a problem:

We need a better platform for communication between mentors and mentees, for continuous feedback ...

To this end some sort of reflective journaling was proposed by the CFs in which mentors and mentees could share their experiences, but this was not initially elucidated.

As well as the need for training and better communications, the CF questioned whether their current role was working optimally. They suggested that a historically unstructured system (based on historical mirror data) required better structuring and role definition for the CF. A new, more advanced activity system began to emerge which focused on a new role for the CF, rather than on students as the subject of the system.

The workshop participants suggested new members of the mentor community, recent alumni, who have already been exposed to clinical reasoning approaches to care. It was hoped that they may serve to cope better with the current knowledge disjunction between student training and more by-the-book trained mentors in the field. They would also serve as a resource for students. In this new system, the division of labour now concerned the relationships and positions of authority which the CF have with workplace communities. In this new system the workshop participants stressed that their role was around firefighting but much more as well – advocacy and coordination, for example. In order for this role to work best new tools were needed, and the workshop participants suggested various forms of online interaction and organisational systems.

Picking up on the importance of their organisational role, also as ambassadors and ‘firefighters’, the CF began to realise a developing role for themselves as ‘in-between’ agents who needed to perform multiple complex roles. What then emerged was a new way of approaching the mentorship system, moving from the initial focus on students as the subjects to zooming in on the role of the clinical facilitators in the system.

As the CF moved back and forward between present and past experiences of mentoring, additional dynamics of the activity system emerged. The CF began to see a nodal point for development into the new system. In the ‘present’ activity system, the CF suggested that students’ different knowledge and ways of operating may have created resistance from mentors, such that the mentors had become less interested in student learning. In addition, the CF spoke about an exclusionary culture in some workplaces/situations – students were being kept out. This prompted the group to zoom into the rules corner (which includes culture) of the activity system diagram ([Figure 1](#)) as a potential fault line:

We see a culture of resistance from mentors ... they (students) are not part of the community, they are separate. We need (rather) a culture of mutual support ... if the employer was more interested in the future of the student as an employee, not just a student ...

The participants began to identify a new, emerging object of a potential future activity system. This new object, as yet not fully formed, concerned the position of the students within the community of practice of EMC. Somehow, students needed to be seen as part of this community, albeit peripherally, and as having something worthwhile to contribute to work practice. Mentors also needed to understand students' learning needs as well as the skills they brought with them. The role of the CF was then not just to deal with organisational issues but to deal with them with a sense of purpose. This sense of purpose was the newly found and developing germ cell of aiding student's inclusion into the community, not just because it would be more comfortable for the students, but also so as to best foster affordances for learning.

The future-looking new system opened up a zone of proximal development for learning between the old and new systems, an area for development from the previous more ad hoc methods of 'putting out fires'. The germ cell, the as yet poorly defined and abstract linking idea, was then initially proposed to be 'community' or 'bridging into the community'.

Examining the model

In examining the model, workshop participants experimented with the new idea in order to 'fully grasp its dynamics, potentials and limitations' (Engeström 2008, 130).

In terms of the initial model of individual mentor development, possibly in the form of short courses, the following difficulties were unearthed. Firstly, paramedic mentors (on the road mentors) change all the time, even from day to day. Then there was the wide variety of additional mentors that students encountered, for example doctors in emergency rooms and nurses in maternity units. So the question was, then, who will be trained?

The participants thus moved away from training models and began to flesh out how they would operationalise the new approach or germ cell of 'community'. The initial, ill-formed and quite abstract germ cell then became more concrete through the addition of a number of collaborative tools proposed by the Laboratory participants. In essence, the participants facilitated the project of 'ascending from the abstract to the concrete' (Sannino and Engeström 2017).

The first turn was that students joining the EMC community, as originally understood, was somewhat unidirectional. The CF began to understand community in a more inclusive and bi-directional way (adverse events are difficult, complex even sometimes life threatening events):

... can't we focus on students reporting on adverse events they experience ... they could discuss these events with their mentor, that would improve communication ... it would be two-way.

Three significant potentially collaborative tools, which served to concretise this bi-directional germ cell, emerged from the data. Firstly, there was the tool suggested in the above quote, the reflective diary, which would serve as a means to coordinate the actions of the mentor, mentee and CF, in particular around adverse events. The CF raised the idea of case study write ups. Medical students are often asked to write up narrative cases of work they have undertaken – what happened, what they did and why – and

this was seen as a useful tool for the EMC students in practice as well. The narratives, it was suggested, could be assessed by both the mentors and the CF, possibly bringing the university, workplace and students closer together in their understandings of better care. Linked to this would be discussions of adverse events in practice, where difficulties or life threatening events emerged. Rather than seeing these events as problematic, they were understood as potential learning experiences for students, mentors and CF.

The second opportunity was the project of bringing mentors and mentees together in the university skills laboratories, in response to the following difficulty raised by the CF:

If they (the mentors) haven't seen them (students) in a training environment they are going to be very cautious about letting them treat their patients.

The skills laboratories were where students practiced advanced and often theoretically based patient treatment. Here, it was suggested, students' knowledge and skill could be showcased for the mentors, and mentors would have an opportunity to learn new knowledge. In addition, mentors' could showcase their specialist practical knowledge borne out of years of experience, so contributing to developing the practices in the Laboratory.

Thirdly, there was the suggestion of an online system of a reflective blog/wiki, populated by lecturers, students and mentors. This suggestion arose partly in response to the following proposal:

Is there a role for a social media site talking about what students can do, what they are being taught and who they are? We could have lectures about what we are teaching (on the site).

The blog, it was envisaged, could bring together and articulate different knowledges and concerns towards better outcomes for patient care, possibly around critical incidents experienced at work. Such information technology initiatives are well known in activity theory research, for example in the design of learning activities through bringing together web designers, teachers and researchers using blogs (Lund, Ramussen, and Smordal 2010). The blog could then serve as a collaborative learning space where boundaries could be crossed and different interests potentially aligned. This was seen as particularly useful where actors are spatially separated, which was the case with university lecturers and workplace mentors.

The initial concept of 'bridging into the community', and the tools suggested to concretise this concept were, the participants suggested, enablers of improved patient care for the whole system of EMC in society and not just for students' learning. Virkkunen, Mäkinen, and Lintula (2010) and Konkola et al. (2007) refer to this sort of situation, in which learning is at least two-way with all participants learning, as 'developmental collaboration'. Given the differences and disjunctures between university and workplace knowledge, and the intermediary position of the CF, such collaboration can be seen to be of benefit to both student learning and the activity system as a whole. The new focus, driving force or object of the system which then began to emerge from the Change Laboratory was that of enhanced and coordinated patient care.

Concluding comments

The Change Laboratory methodology of mirror data, theoretical modelling and raising contradictions in the past present and future provides opportunity for collaborative

ideas generation and thus new avenues for problem solving (Virkkunen and Newnham 2013). The strong focus on problem identification provides stimulation for this problem solving, as does the development of contradictions into initially abstract and ill formed ideas or germ cells, which are then further expanded on or concretised into potential solutions (Sannino and Engeström 2017).

The Change Laboratory methodology was shown to provide possible solutions for a hitherto ‘intractable and complex’ problem of how to improve the mentorship system in EMC. In the research, the researchers began with ideas of further training of mentors and improved communication, moving to issues of difficulty in coordination to a proto concept or germ cell of ‘community’. Community can also be understood as a boundary object, i.e. one which is developed in a ‘Boundary Crossing Laboratory’ (Virkkunen and Newnham 2013, 191) and which spans across the interests of both the university and the workplace. The object of community in this research was then expanded on through possible ideas and tools for the future, such as shared information sites and the concept of developmental collaboration (Virkkunen, Mäkinen, and Lintula 2010). Developmental collaboration does not replace skills development for student paramedics under mentors but enriches it by enabling students to gain access to the workplace community.

Difficulties often exist more generally in successfully articulating knowledge and practices learnt at university with those of society and workplaces. This may in turn hamper students adapting to and learning in their professional lives. Though project work, internships and problem-solving approaches may help students navigate this divide (Billet 2009), Change Laboratories could be used more generally as a methodology to help articulate the university curriculum and practices with those of workplaces and society. This, it is suggested, based on bridging developments in this research, could be accomplished through the identification of core problems and the development of potential bridging concepts (germ cells).

The current research in this paper only reports on the first part of the expansive learning cycle, up to modelling and developing solutions to deep-seated problems. The next phase, implementation and experimentation has only been partially carried out in 2018/19. The CF report they have implemented reflective reporting from students of adverse events in their practice, and an online blogsite for both mentors and mentees has been developed, with some success. Attempts at getting mentors active in the university skills laboratories has been less successful, with mentors citing lack of time to do this extra work as a constraint. Furthermore, a new HOD was appointed, with a different vision of the CF role to that developed in this research, and some of the CF in the project have been redeployed, further constraining the implementation phase. As Virkkunen and Newnham (2013, 236) point out, Change Laboratories that put forward a new form of activity (as occurred in this research) may need an additional ‘implementation and experimentation’ Change Laboratory as circumstances change. A starting point for the Laboratory in 2019, could then be the germ cell of ‘enhanced and coordinated patient care’, as emerged in the final session, involving both the remaining CF and possibly also including current mentors.

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References

- Beach, K. 2003. "Consequential Transitions: A Developmental View of Knowledge Propagation Through Social Organisation." In *Between School and Work: New Perspectives on Transfer and Boundary-Crossing*, edited by T. Tuomi-Gröhn, and Y. Engeström, 39–62. Oxford: Elsevier Science.
- Billet, S. 2009. "Realising the Educational Worth of Integrating Work Experiences in Higher Education." *Studies in Higher Education* 34 (7): 827–843.
- Blackler, F. 1995. "Knowledge, Knowledge Work and Organizations: An Overview and Interpretation." *Organization Studies* 16: 1021–1046.
- Bligh, B., and M. Flood. 2015. "The Change Laboratory in Higher Education: Research-Intervention Using Activity Theory." In *Theory and Method in Higher Education Research Volume 1*, edited by J. Huisman and M. Tight, 141–168. Bingley: Emerald Group Publishing Limited.
- Bozalek, V. 2013. "Participatory Learning and Action (PLA) Techniques for Community Work." In *Participation in Community Work: International Perspectives*, edited by A. K. Larsen, V. Sewpaul, and G. O. Hole, 55–71. London: Routledge.
- Dalbock, G. 1996. "A History of Ambulance Practitioners and Services in SA." *South African Family Practice* 17: 118–121.
- De Waal, B. 2013. "Paramedic Student Perceptions Towards Work-Place Learning". Unpublished Master's Thesis. Cape Peninsula University of Technology.
- Engeström, Y. 2008. *From Teams to Knots*. New York: Cambridge.
- Engeström, Y., and A. Sannino. 2011. "Discursive Manifestations of Contradictions in Organizational Change Efforts." *Journal of Organizational Change Management* 24 (3): 368–387.
- Englund, C. 2018. "Exploring Interdisciplinary Academic Development: The Change Laboratory as an Approach to Team-Based Practice." *Higher Education Research & Development* 37 (4): 698–714.
- Fang, Y. 2016. "Engaging and Empowering Academic Staff to Promote Service-Learning Curriculum in Research-Intensive Universities." *Journal of Higher Education Outreach and Engagement* 20 (3): 57–78.
- Garraway, J. 2017. "Future Orientated Approaches to Curriculum Development: Fictive Scripting." *Higher Education Research and Development* 36 (1): 102–115.
- Guzmán, W. C. 2018. "A Change Laboratory Professional Development Intervention to Motivate University Teachers to Identify and Overcome Barriers to the Integration of ICT." *Outlines: Critical Practice Studies* 19 (1): 67–90.
- Jokelainen, M., H. Turunen, K. Tossavainen, D. Jamookeeah, and K. Coco. 2011. "A Systematic Review of Mentoring Nursing Students in Clinical Placements." *Journal of Clinical Nursing* 20: 2854–2867.
- Konkola, R., T. Tuomi-Gröhn, P. Lambert, and S. Ludvigsen. 2007. "Promoting Learning and Transfer Between School and Workplace." *Journal of Education and Work* 20 (3): 211–228.
- Lund, A., I. Ramussen, and O. Smordal. 2010. "Joint Designs for Working in Wikis." In *Activity Theory in Practice*, edited by H. Daniels, A. Edwards, Y. Engeström, and S. Ludvigsen, 207–230. London: Routledge.
- Montoro, C. 2016. "Learn or Earn? Making Sense of Language Teaching and Learning at a Mexican University Through a Change Laboratory Intervention." *Learning, Culture and Social Interaction* 11: 48–57.
- Moodley, K. 2016. "An Investigation into the Clinical Practicum Experience of ALS Paramedic Students and Their Preparedness for Professional Practice." Unpublished Master's thesis. Durban University of Technology.
- Sannino, A., and Y. Engeström. 2017. "Co-generation of Societally Impactful Knowledge in Change Laboratories." *Management Learning* 48 (1): 80–96.

- Valadez, A., and C. Lund. 1993. "Mentorship: Maslow and Me." *Journal of Continuing Education in Nursing* 24 (6): 259–263.
- Virkkunen, J., E. Mäkinen, and L. Lintula. 2010. "From Diagnosis to Clients: Constructing the Object of Collaborative Development." In *Activity Theory in Practice*, edited by H. Daniels, A. Edwards, Y. Engeström, and S. Ludvigsen, 9–21. London: Routledge.
- Virkkunen, J., and D. Newnham. 2013. *The Change Laboratory: A Tool for Collaborative Development of Work and Education*. Rotterdam: Sense publishers.