Activity theory in health professions education research and practice

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Key words: health professions; health professions education; learning clinical education; learning in practice; interprofessional health education; evidence-based educational methods; quality improvement; sociocultural theory; activity theory; cultural-historical activity theory

Abstract

This chapter describes activity theory (AT) and its emerging role within health professions education (HPE). We outline AT's historical roots, before exploring its concepts and theoretical models in detail. We then describe its practical applications in HPE, in both analysis and intervention, before concluding with a discussion of its rich future possibilities.

Introduction

To say that healthcare is complex has practically become a cliché. But what underlies healthcare complexity? And what are its implications for practitioners, educators and researchers? Healthcare complexity can be considered on multiple levels.

First, and most intuitively, healthcare is clinically complex. Patients present in varied ways with unique, often co-existing, healthcare needs – and increasingly so, given the well-recognised issues of aging populations, multimorbidity and polypharmacy.[1] Patient expectations are changing, with increasing demand for care that is person centred, individualised, and co-constructed.[2] Modern healthcare routinely requires professionals to act on provisional, incomplete clinical information in circumstances where diagnosis, treatment and outcome are far from clear.[3] And all the while, practitioners must deal not only with patients on an individual basis, but with the conflicting demands posed by caring for multiple patients in the context of limited resources, and cultural and political drivers around how to use those resources.[4]

Second, healthcare is technically complex. Advances in diagnosis, investigation and treatment, whilst promising technological efficiency and improved clinical outcomes, pose significant challenges for staff on the front line. Practitioners are required to employ specialised technologies, make use of increasingly sophisticated systems, and keep up with date with an ever growing body of research and best practice guidelines.[5]

Finally – and crucially - healthcare is socially complex.[6,7] Care is increasingly delivered by multi-level, multi-disciplinary teams, whose successful function hinges not only on individual competence but on effective interactions between members.[8,9] Clinical teams are not stable entities, but fluid, dynamic collaborations whose formation is shaped by factors such as evolving patient needs, increasing sub-specialisation and recent working hours restrictions;[10] in these circumstances, care is increasingly sophisticated but its delivery is increasingly fragmented.[11]

Together, these interwoven layers of complexity underpin many of the major problems facing modern healthcare. They confound translation of innovations into practice,[12] lead novice practitioners to feel routinely underprepared to begin work,[13] and contribute to widespread medical error,[14] creating a pressing need for practice changes in healthcare organisations.

These issues also represent urgent challenges for Health Professions Education (HPE), whose role it is to support students and practitioners to prepare for and navigate the demands placed on them by their work. The Case Study below exemplifies one such issue – the educational problem of successfully implementing 'best practice' in complex and diverse social contexts and physical environments.

In the face of these challenges, the Finnish educationalist Yrjö Engeström – the leading contemporary exponent of *cultural-historical activity theory* (CHAT; alternatively and here referred to as activity theory, AT) – argues that healthcare must move beyond traditional dominant ways of thinking.[15] Drawing on decades of study in specific healthcare contexts, Engestrom concludes that expertise must be viewed as a collective, rather than an individual, attribute, defined by the ability to work within inherently unstable conditions. On this basis, educators need new theoretical tools to help understand how human activity and learning are shaped over time by complex social, cultural and contextual factors – and to help them intervene within this activity.

AT provides such tools. It offers a valuable lens for understanding practitioners' work in local organisational contexts, as well as methods to bring about change within those contexts, that may support educators in both research and practice. In contrast to individualistic models, AT, as a sociocultural theory, situates learners as subject to social and historical discourse, and cognition as distributed across people and artefacts making up a community.[16] In AT, the human mind and the external milieu are seen as inseparable, and activity systems (and, further, networks of interdependent activity systems across different work-based contexts) form the basic unit of analysis.[16]

Activity theory has already begun to impact HPE research, having been applied to support both analysis and intervention in diverse areas of study. Yet AT has potential to impact HPE further – both within research, but also by directly shaping clinical and educational practice, supporting and driving innovation and change, helping practitioners to think critically about their work, and promoting greater alignment between education and healthcare.

In this chapter, our aim is to describe - in a way that is accessible to both researchers and practitioners - the development, use, and practical applications of AT in the field of HPE. We first outline AT's historical and theoretical roots, before exploring in detail its concepts and theoretical models. We then describe how these models can be used in HPE research, both within analysis and

intervention, with reference to specific detailed examples from literature. To support understanding, we twice return to the Case Study introduced after this introduction, using it to exemplify AT's theoretical constructs and, later, to illustrate its practical applicability. Finally, we conclude with a discussion of AT's future possibilities in the field of healthcare and HPE.

Case study: Part 1 - Preparing for primary care emergencies

Max is an academic general practitioner who works in a large inner city general practice. The practice is moving into a newly built community healthcare building. They will share this space with other general practices, physiotherapy clinics, social workers and mental health practitioners. Max is keen to consider how best they will set up arrangements to manage medical emergencies in this new setting. Given the ~~new~~ physical layout of the building, and co-occupying with other healthcare providers, simply transferring their previous systems may not adequately prepare them for managing such emergencies.

Whilst such emergencies are infrequent in community healthcare settings, he recognises they are increasing and require an immediate and co-ordinated response to help provide the best outcome for patients. In order to address this issue, Max is keen to conduct an *in situ* simulation i.e. using a simulation manikin and techniques – to 'mock up' a medical emergency in this new environment. During this process, he is keen to consider how staff respond to this emergency, but more importantly how they can enhance their systems in order to improve their readiness if such an emergency were to happen in the future. Given Max's academic background he is keen to use this opportunity to conduct research into this topic. He has read about activity theory as a theoretical framework that can provide the analytical tools to understand complex activities in real world clinical practice. Importantly it may have the potential to inform and guide *in situ* simulation to facilitate organizational change.

An overview of activity theory

Origins

It hardly seems appropriate to attempt to define AT without considering its cultural-historical evolution. The theoretical foundations for AT were laid in 1920s revolutionary Russia, driven by Marxist ideology and the work of Vygotsky, Leontiev and Luria, the so-called 'founding troika' of 'cultural-historical' theory.[17] They drew, in particular, on Marx and Engels' concept of *dialectical materialism*.[18] *Dialectics* refers to the idea that progress occurs through the clash and resolution of contradictory ideas. *Materialism* is a philosophical stance concerning the primacy of material conditions – taken to include intangible external factors such as social interaction, language and culture - over internally-held ideas. In other words, human consciousness is shaped by real world conditions, rather than being a product of the mind's perceptions, as was held within then prevailing idealist philosophy.[19] Dialectical materialism therefore holds that human activity, driven by real-world conditions (especially, in Marxist theory, factors such as social class, labour relations and economic factors), produces contradictions, from which progress (e.g. reformed social structures) arises. Building on this idea - and in contrast to the then prevalent separation of mind and body espoused by Cartesian dualism,[20] Vygotsky asserted the fundamental role of history, culture and social interaction in shaping activity, therein forming the basis of what is now referred to as sociocultural theory.[21] Importantly, Vygotsky also asserted that humans do not experience history and culture directly, but through interactions with people and physical objects. This process was termed *mediation*, occurring through interaction with *tools* or *artefacts*, either physical or psychological.[22,23] Most important amongst psychological tools is language (*semiotic mediation*), which acts as 'go-between' linking the outside world and individuals' construction of meaning.[23]

Together these ideas led to an understanding of human activity as 'artifact-mediated and object-oriented action'.[23,24] In other words, activity (or work) is driven by some purpose (its *object*) driven by real world needs, and this purpose is achieved through multiple interactions with physical tools, dialogue, and documents. This conception is considered to represent *first generation activity theory*, which concerns the triangular relationship between the *subject* (the person doing the activity) and the object, as mediated by artefacts.

Activity systems

Vygotsky's work primarily concerned individuals in their social, historical, and cultural context. Following Vygotsky's death, however, Leontiev shifted AT's emphasis from individual to collective

activity, driven by a common object.[25] Carrying these ideas forward, Engeström represented the structure of human activity as a dynamic model of an *activity system*, which represents *second generation activity theory* (Figure 1). The topmost triangle contains subject, object and mediating *instruments* (equivalent to tools and artefacts), the elements that comprise first generation activity theory.[15] Underneath lie the 'less visible social mediators', added by Engeström, of *rules*, *community*, and *division of labour*. The bidirectional arrows between all elements indicate their interrelated nature and point to the fact that activity systems must be understood holistically and not simply as the sum of individual elements. The activity system, referred to as second generation AT, is a key focus of activity theoretical research.[22,26]

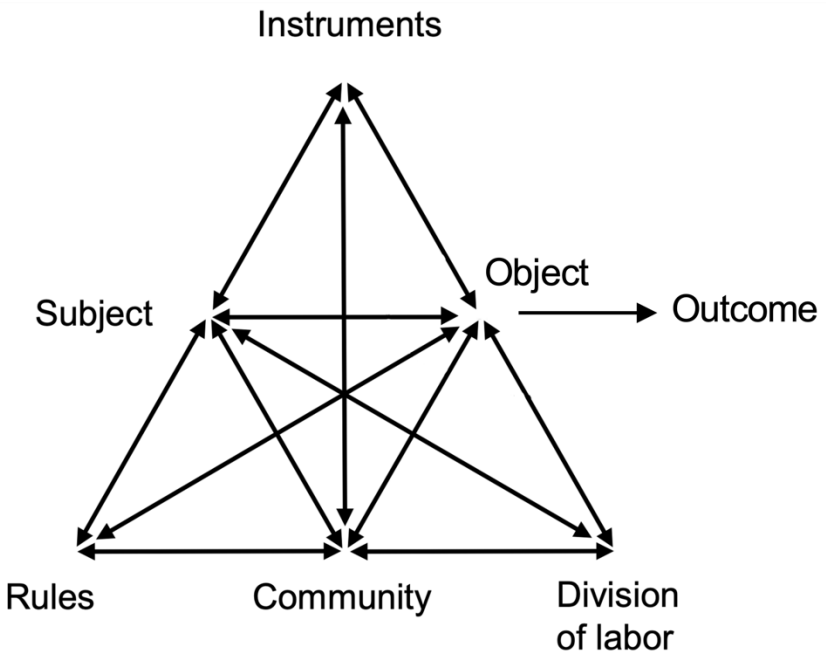

Figure 1. The structure of human activity as a dynamic model of an activity system[22]

More recently, Engeström and colleagues further developed AT by incorporating the idea that, particularly within complex organisations, multiple, adjacent activity systems interact within a wider system. Thus, in what is referred to as *third generation activity theory*, the 'constellation of at least two interacting activity systems is frequently used as an extended unit of analysis'(Figure 2).[26] The idea that two or more activity systems can be considered as interlinked, forming a network, is key to the concept of expansive learning, discussed in detail later in this chapter.

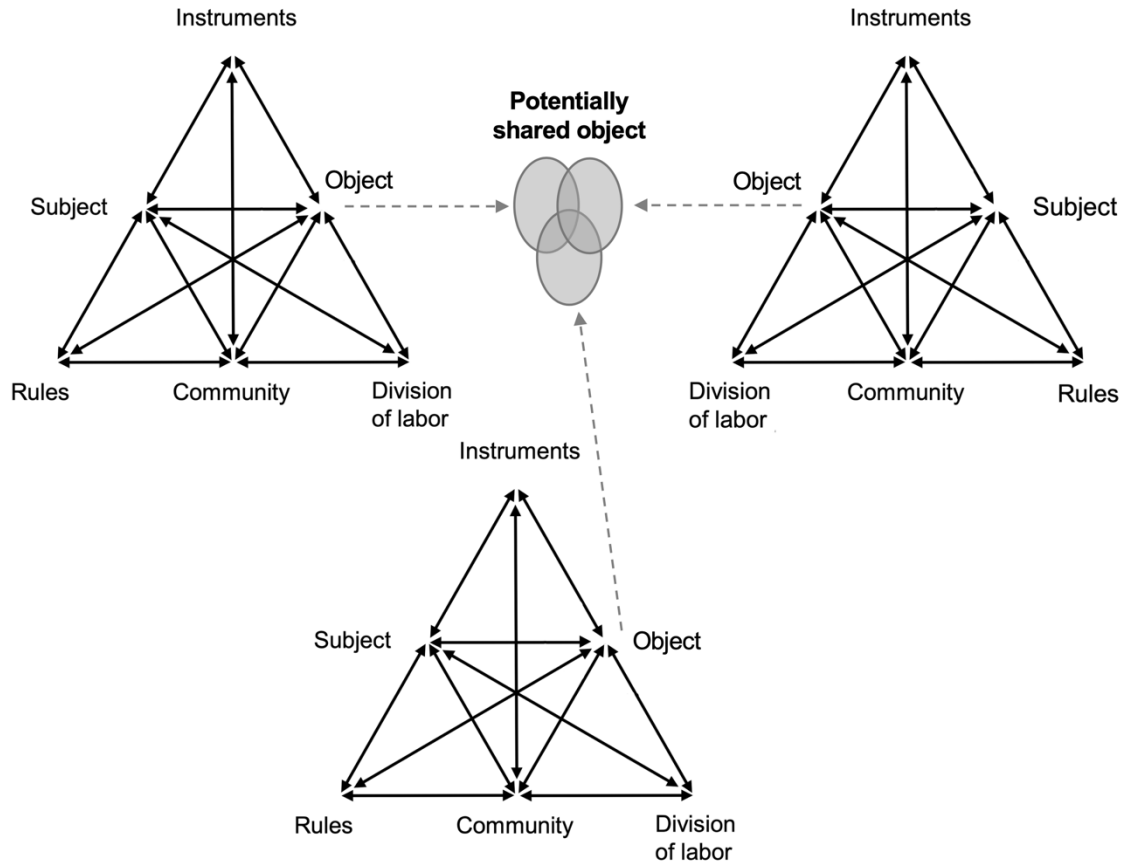

Figure 2. Human activity as a dynamic model of interlinked activity systems[15]

While elements of activity systems are interrelated, it remains useful to define each in turn.

Subject

Following Engeström's ideas,[26] the subject – or, more typically, group of subjects – is the agent (i.e. an individual who takes an active role in producing change) of the activity in question. Who is considered a subject depends on the nature of the activity under consideration and the analytic focus; in complex work environments, practitioners are typically subjects within many activity systems simultaneously. For example, the subject of a 'surgical care' activity system might be a multi-disciplinary team conducting a procedure (e.g. surgeons, anaesthetists and theatre nurse specialists) or, alternatively, if considering how residents learn to perform surgery, the subject might be the surgeons specifically. Similarly, an anaesthetist serving many care processes taking place in parallel theatres can be considered a subject within multiple activity systems. Subjects' actions are always directed toward an *object*, which includes a collective motive for the activity. The concept of object, in view of its central importance in AT, is discussed in detail below.

Outcome

The outcome of activity is the tangible 'product' that results from the collective activity. In a healthcare context, this might involve a treatment plan, or the curing of a disease. Actions, in pursuit of the object, are mediated by tools and artefacts, known collectively as instruments.

Instruments

Instruments comprise physical tools (e.g. stethoscope, drug chart), language (e.g. medical terminology) and cognitive instruments, including analytical models and concepts (e.g. heuristics such as 'rule out worst case scenario' diagnostic reasoning). When using an activity theoretical approach to make sense of complex activity, it is essential to move beyond understanding of instruments as inert, physical items, and to recognise their role as social mediators. A stethoscope, for example, is not just an instrument for auscultating a patient's chest; it is also a badge signifying that its holder is a legitimate member of the healthcare community. Instruments therefore have the capacity not just to facilitate activity, but to shape it. A medical student with a stethoscope slung around her neck may be afforded opportunities to participate in activities of physicians that she would not otherwise. While clearly instruments do not possess intrinsic agency, their ability to enable, legitimise, condition, influence, impede or inhibit activity means that they can be considered agentic.[27] Within AT, instruments provide a way to understand the activity and its mediational nature, to give it meaning, and to develop it, but must always be considered in relation to the context in which they are used.[26,28]

As human activity, and healthcare activity in particular, becomes more complex, it frequently calls for not just single tools, but multi-level instrumentality.[29] In particular, sophisticated new instruments have been created as a consequence of the revolution in information and communication technologies, which, as alluded to in the introduction, have profoundly impacted healthcare. The introduction of new technologies may precipitate qualitative transformations of entire activity systems. Implementing an electronic prescribing system, for example, may impact when and where doctors prescribe, how they access support from others, and the pattern of errors that occur.[30] These transformations are not reducible to the new technology but relate to resultant issues of responsibility and collaboration[31,32] – an increasingly relevant consideration with the advent of artificial intelligence (AI) aiming to augment or replace practitioners' decision making.[33]

Rules

Rules, as the name implies, refers to regulations or procedures governing a particular activity. Rules may be formal and codified, such as a hospital's policy on staff sickness, but are very often informal, tacit, and socially defined, such as the prevalent cultural norm that healthcare professionals should work through minor illnesses to avoid letting colleagues down.

Division of labour

Division of labour refers to the social structures, networks, and hierarchies that determine responsibility for particular actions within an activity system. Again, these may be enacted formally– senior doctors are given overall responsibility for patients within their care – or informally – consultants frequently delegate prescription writing responsibility to junior doctors rather than doing it themselves.[34]

Community

Community refers to the 'actors' involved in the activity system that form its social context. Healthcare (and all human) activity always takes place within a community governed by a certain division of labour and by certain rules. How the community is defined and bounded depends on the historical development of the activity system.[32]

Object

Many discussions of AT deal with the concept of the object,[35,36] reflecting its position as 'perhaps the most challenging theoretical construct of AT', but one that holds central importance.[15] Activity is always collective and driven by a shared object-related motive.[37] On this basis, individual actions can be said to be *goal-oriented*, whereas overall activity is *object-oriented*. In healthcare contexts, patient care can be considered the common, overarching object. In practice, however, the object is constructed within a given healthcare activity. For example, in considering doctor-patient encounters, Engeström describes individual patients as 'raw material' from which the object ('a collaboratively constructed understanding of the patient's life situation and care plan') is formed.[15]

The object holds the community together and gives it a long-term purpose.[35] On the other hand, the object is conceptualised differently (and often subconsciously) by different participants, making it *multi-voiced*.[15] Moreover, the object of activity may be constructed between adjacent activity systems with differing but overlapping purposes, referred to as a *potentially shared object*. That the object of activity is constantly moulded, shaped and negotiated by the activity systems that

reproduce it means that object-orientated actions are often unpredictable and surprising.[38] It is this dynamic, evolving quality of the object that underlies activity systems' potential for change; over time, activity systems and their elements reorientate themselves towards a new understanding of the object, whether as a natural consequence of activity, or due to conscious intervention by researchers and practitioners.[26,31] This process, called *expansion of the object*, is the basis of the theory of *expansive learning*, discussed later.

Contradictions

Activity systems change in response to *contradictions.* Stemming from the previously discussed concept of *dialectics* – that progress occurs from the clash of opposing ideas - contradictions are inevitably occurring points of tension within and between activity systems, whose resolution leads activity systems to reformulate. Indeed, the activity system model is designed to explore tension-laden relationships between elements of singular activity systems, and between multiple interacting activity systems.

Contradictions 'are not the same as problems or conflicts' that occur between practitioners on the ground.[15] Instead, contradictions are systemic, structural tensions that manifest at different levels. Contradictions often surface as discursive manifestations such as dilemmas, conflicts, and double binds. Once healthcare practitioners begin to consider the concept of contradictions, it can help them to identify their manifestations within their own practice. For example, the increasingly recognized interdependence of patients' physical health, mental health and wellbeing challenges the traditional biomedical separation between body and mind (with even the descriptors used in this sentence a testament to this tension). Or, in another example, primary care practitioners are all too aware of the contradiction between the need to see patients quickly (e.g. in short ten minute appointment slots) while attempting to feel that their needs, both medical and interpersonal, are met through high-quality care.

Contradictions can be classified as *primary, secondary, tertiary* and *quaternary* and their location may be denoted within the activity system model (Figure 2).[26] Primary contradictions occur *within* single elements of activity systems and arise, Engeström argues, from the Marxist idea of 'use value' and 'exchange value'.[15] Use value refers to an item's intrinsic usefulness in mediating activity, whereas exchange value refers to what an item is worth when traded (i.e. its market value). For example, healthcare professionals have skills that are used in service of patients yet, as employees of healthcare organisations, are also exchanged for financial reward, an arrangement that invariably

gives rise to primary contradictions. In another example, medications (which can be considered instruments) have a use value in their potential to relieve symptoms and illness but also a monetary exchange value. Again, this may create contradictions for practitioners responsible for making treatment decisions. *Secondary contradictions* are those that occur *between elements* of a *single activity system*. For example, professional guidance suggests that doctors should not act beyond their limitations (rules), but a colleague may have made clear that they do not wish to be awoken with queries during a night shift (community). *Tertiary contradictions* are those which occur *between an activity system* and its *future, redeveloped form*, and may manifest as inertia or resistance to change. For example, switching from a paper-based to a computerised hospital discharge system might be met with opposition, with knock-on effects on division of labour, community, rules etc. For progress to occur (towards a new, shared object), tertiary contradictions must be overcome. Finally, *quaternary contradictions* occur *between activity systems*; typically, such contradictions arise from the potential for a shared object. For example, both healthcare education and practice aspire to the outcome of excellent patient care but their specific objects – educating students within practice and delivering a safe, time-efficient clinical service, respectively – frequently conflict. This particular example represents one of HPE's signature challenges,[39] which has been the subject of previous activity-theoretical study.[40]

While a potential source of turmoil, contradictions enable organisational development because they build and accumulate over time, stimulating practitioners to look for new, stable ways of working in which they seek to establish shared objects of activity. Put more formally, the collective analysis and resolution of contradictions enables organizational transformation through renegotiation and reorganization of collaborative relations and practices, and through actions such as the construction of new tools.[26] This process, involving expansion of the object, constitutes *expansive learning*.[15]

Expansive learning

Educators more familiar with more dominant theoretical perspectives in HPE, such as cognitivism, might come to question AT's role in understanding practitioners' learning and development. First generation AT, based on Vygotsky's work, is deeply concerned with individuals' development of meaning. In contrast to other individualistic, cognitively-focused models, however, Vygotsky's (sociocultural) framing held learning to be an essentially participatory process,[41] in which learners, through material and social interactions, progress towards their developmental potential, termed a *zone of proximal development*. Moreover Vygotsky characterised learning as a process of development of identify and self; in activity theoretical terms, people not only construct knowledge,

but they also create their historical realities in object-oriented activity.[22,23] In sharing common roots in sociocultural theory, AT is linked to other educational theories, such as Communities of Practice,[42] which characterise learning as a socially-mediated process.

Activity theory's shift in focus, from individual to collective, called for a further paradigm shift in what constitutes education and learning. In his most recent book, Engeström argues for a new vision of expertise that is collective, heterogenous, boundary-spanning and transformative. That this kind of expertise is needed may resonate with healthcare professionals and educators familiar with the challenges presented by the ever-changing landscape of practice, including those described in the introduction to this chapter. This framing forms the basis for expansive learning. Expansive learning refers to the development of new professional knowledge and new forms of work activity, by systematically questioning, reflecting on, and expanding the object of activity. By its nature expansive learning views cognition as distributed and emphasises organisational development than individual identity formation. The formal expansive learning cycle is described later, in relation to the Change Laboratory method, which is designed to systematically facilitate and structure the process.

Just as 'every way of seeing is a way of not seeing',[43] health professions educators may contend that AT's emphasis on large-scale change, with activity systems as the unit of study, might detract from understanding how learners develop within object-oriented activity, particularly the novice practitioners with whom HPE is often concerned. Exploring how HPE can best embrace collective understandings of performance, and the issue of how individual practitioners learn and form identities within an activity theoretical framework, may represent areas of interest for HPE researchers moving forwards.

Case study - Part 2: Using AT to make sense of complex activity

Max is preparing to perform an *in situ* simulation in the new community healthcare building. In doing so, many of his colleagues comment *'are you preparing an emergency trolley?'*. For Max, his intentions are much more than 'just' preparing an emergency trolley. He is keen to step back and consider the wider perspective of how best to prepare for medical emergencies that may occur in the building. Increasingly he is drawing upon AT in his understanding of this complex activity.

For Max, the overall purpose of his activity is to bring about change that enhances readiness to provide best care to an acutely unwell individual (i.e. *object*) in the vicinity of the healthcare facility. In doing so he wants to bring a multi-disciplinary team *(*i.e. *subject)* of healthcare professionals (including doctors, nurses, physiotherapists, social workers) who will be key individuals in responding to an emergency. In terms of preparedness, he also wants to consider the various *instruments* for managing an acutely unwell patient. Whilst emergency equipment such as airways and emergency drugs are of critical importance - he also wants to consider the physical layout of the building.

Of course there is a wider *community* of individuals within the healthcare facility who also need to be considered - including the administrative personnel and other clients (patients) who may be in the facility at the time. Importantly there are explicit *rules* that apply across clinical settings governing the treatment of a patient who is experiencing an emergency (e.g. resuscitation guidelines). However, there are also local rules, whether explicit (such as local protocols around using emergency medications) or tacit, existing within the minds of Max and his colleagues, perhaps discussed but potentially unspoken. Within these local rules lies potential for development. Are there policies on who will update and maintain the emergency equipment? Are there procedures to ensure new staff are orientated to the emergency process?

Finally, Max also turns his attention to 'who will do what' in an emergency situation (i.e. *division of labour*). Whilst it is important to consider the practical tasks of managing an emergency (e.g. placement of a defibrillator on a patient) – it will be important to consider the many other tasks and who has responsibility for them; for example, ensuring that other patients in the facility are not distressed by the situation. Who updates and maintains the emergency trolley? Should it always be 'the doctor' who manages the emergency? What if they were unavailable at the time?

As Max prepares to plan a 'mock up' simulation - he anticipates there will be contradictions between and within these various elements. Through this in situ simulation, he is keen to bring these contradictions to the surface – but more importantly, to bring about a positive change through renegotiation and reorganization of all of these aspects of a complex care scenario.

Using AT in health professions education research and practice development

That AT is well suited to researching and understanding problematic topics within HPE is reflected in an increasing body of literature, introducing AT to HPE audiences, describing its relevance to specific problems, and applying it directly within empirical study. Specific instances include book chapters,[42] a recent themed issue in a leading HPE journal[44] and methodological articles within wide-ranging domains such as simulation,[45,46] cultural complexity[47] and interprofessional collaboration.[48] Empirical articles have applied AT to analyse and address educational problems on topics such as prescribing,[7] patient safety,[49] clinical examination,[50,51] organisational development,[24] and student learning goals.[52] Having set out AT's theoretical constructs, this section now explores practical considerations in using AT within HPE research, with reference to specific examples.

AT as a theoretical framework

AT can usefully inform all stages of research, including study design, data collection, and analysis. AT can be applied flexibly; there is no single approach to its use. In some cases, for example, it may be that AT can be used on a 'post hoc' basis, applied to existing or routinely collected data, to enable deeper understanding. Nevertheless, it is important that researchers remain conscious that activity theoretical research has particular underpinning assumptions. For example, it gives primacy to social and cultural influences; it focuses on object-oriented activity rather than purely abstract or theoretical considerations; and it is concerned with systemic relationships rather than elements in isolation. It is essential that researchers reflect on the affordances created by these assumptions, questioning the aligment between them and their research questions, methodology and methods. In doing so, researchers may decide, for example, that AT might be a less appropriate theoretical lens to study the cognitive aspects of medical students' self-directed learning (but, equally, that AT may be appropriate for studying how their learning goals are enacted within specific healthcare contexts). In all cases, it is good practice for researchers to makesdecsions reflexively and to describe them in relation to the theoretical orientation of their work.

Data collection

Taking the activity system as the basic unit of analysis has implications for how researchers might choose to collect data in activity theoretical studies. While quantitative data may contribute, the desire to explicate and explain social relationships, culture, and historical development mean that qualitative data is the mainstay of AT research. In seeking to explicate these aspects of activity, multiple forms of data collection (perhaps in combination) may be considered, depending on the

specific nature of the study. Researchers should reflect on how particular forms of data might shed light on the various elements that have comprise activity. For example, qualitative interviews might explore participants' experiences of workplace social relations, hierarchies and informal rules of practice. Ethnographers might seek to identify significant instruments and, through observation and discussion with practitioners, understand their practical and cultural significance. Alternatively, documentary analysis may help trace the historical development of activity and the rules which govern it.

In examining how participation in simulation supported students' learning, Battista drew upon video recorded scenarios, transcripts of speech, and instructional design documents.[46] Videos enabled the researcher to produce narrative accounts of participants' activities; transcripts gave insight into social exchanges and participants' verbalised goals; and documents revealed tools, rules and participant roles within scenarios. Together these modes of data collection, chosen to align with an activity theoretical approach to analysis, enabled the researcher to explain how simulation-based scenarios might support students' learning by scaffolding object-orientated activity, and how tools, artifacts, and social interactions might mediate this.

Analysis

Activity theory is also, and perhaps most commonly, applied as an analytic framework, in both exploratory and interventional research studies. Researchers may choose to describe and analyse activity systems in their entirety or, alternatively, use AT concepts to inform their analysis. In the former approach, researchers frequently 'populate' the activity system model (as presented in Figures 1 and 2).[45] By defining individual elements – subject, rules, community etc. – contradictions may be identified, particularly in subjects' conceptions of the object of activity. A recent study applied this approach to analyse an educational intervention,[40] enabling the authors to address a key issue within HPE: the aforementioned contradiction between the object of the educational activity system (teaching and assuring students' competence) and the clinical activity system (providing safe, efficient patient care). This contradiction explained on-the-ground problems, such as clinicians' unwillingness to engage students in practice because it was seen to take too much time and pose a risk to patient safety. Carrying this forward, the researchers were able to show how their intervention – introduction of medical student 'pre-prescribing' (authentic prescribing for real patients with sign-off by qualified doctors) – led to an expansion of the object, as clinicians and students reshaped their activity toward the shared purpose of caring for patients. In this instance, post-hoc application of AT added

significantly to the transferability of the work, highlighting an important contradiction and a potential solution that will resonate with educators in other settings.

Rather than formally depicting full activity systems, Kajaama et al., aiming to understand doctors-in-training' experiences of the error-prone antibiotic prescribing process, drew on the concept of contradictions to focus their analysis.[7] They first used existing literature (e.g. national policy documents) and stakeholder input to develop a process map, reflecting the rules and procedures underpinning antibiotic prescribing. They then analysed narrative interviews with doctors-in-training about their prescribing practice. This enabled the researchers to identify 'disturbances' (contradictions) between the idealised process map and doctors' authentic prescribing experiences, such as when junior doctors struggled to reconcile conflicting advice given by ward-based consultants and microbiologists. In these cases, doctors were often more preoccupied with short-term goals (such as getting a prescription written) than the espoused object of achieving safe and effective treatment. This approach, emphasising contradictions, enabled the authors to point to priority areas where interventions would be likely to have most impact.

Similarly, within a wider activity system analysis, Larsen et al. used the concept of *knotworking* – the way in which subjects form temporary, fluid teams centred around a specific purpose[15] – to explain how stakeholders came together to realise students' learning goals.[52] The authors argued that learning goals could act as tools, leading students, supervisors and patients to come together in support of students' learning, but that 'the knot was just as likely to unravel as tighten', as competing forces conspired to prevent these interactions. In this instance, the knotworking metaphor, drawn from AT, enabled the authors to explain and powerfully illustrate the dynamic, elusive and context-dependent nature of students' learning.

AT as a driver of change: the Change Laboratory method

AT differs from some other sociocultural theories in that it aspires to facilitate practical change, not just abstract understanding, and provides methodological tools in support of this aspiration. Engeström, whose approach to AT is now largely concerned with harnessing its creative potential to facilitate social change and forward movement, argues that change is inherently local, with 'decontextualized prescriptions typically [leading] to solutions alien to the local activity system's developmental dynamics [leading them to be] rejected or unpredictably altered'.[15] In other words, stakeholders within activity systems are best placed to conceptualise, develop and bring about transformation.

To facilitate this sort of transformation, Change Laboratory (CL; often referred to as Change Lab) is a research-assisted intervention method, which draws theoretically from activity theory[23,37] and, especially, from expansive learning.[24,26,53–56] Change Laboratory is commonly used as an intervention in the context of research, although the CL approach need not be the subject of formal study. As described above, expansive learning is a collective process, aiming at overcoming tensions, leading to the formation of a new, expanded and (at least partially) shared object between the participants of the activity.[26] The purpose of CL is to facilitate an expansive learning cycle (Figure 3).[24,53,54]

The CL method is participatory and aims to enable stakeholders to understand the systemic nature of their daily activities and, through discussion,[57] to develop and implement new models and work practices.[29,32] While not prescriptive, well-established procedures exist to support researchers in facilitating CL.[53,54] Facilitators initially collect 'mirror data' - data that enables participants to hold up a mirror to their own practices – by, for example, conducting observations. The CL intervention itself typically involves 6-10 sessions in which researchers and key stakeholders convene, facilitating a series of actions: questioning, analysing, modelling a solution, examining the model, and implementing.[22,58]

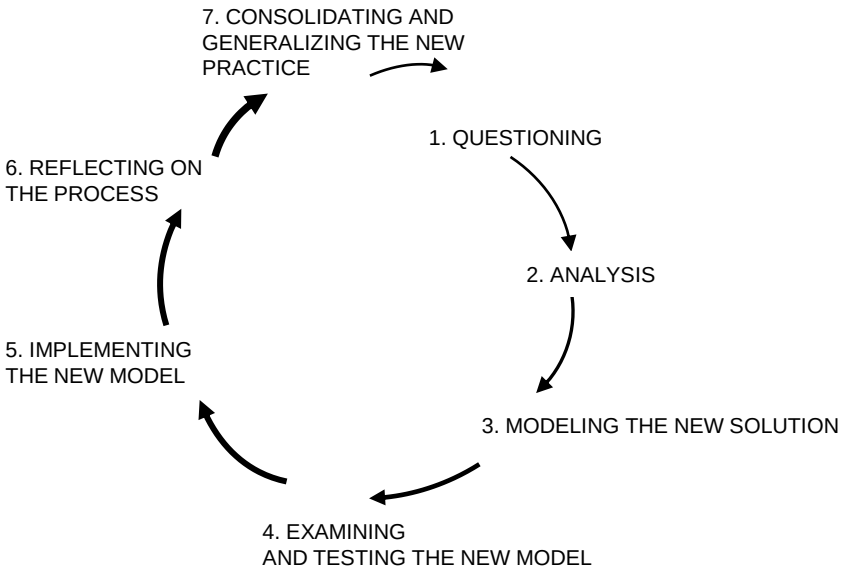

Figure 3. Sequence of learning actions in an expansive learning cycle (adapted from Engeström and Sannino, 2010;[58] see also Engeström, 1987/2015[26]

Exemplifying the use of CL approach in healthcare practice, Diniz et al. set out to counteract disrespectful care of women during childbirth – including inappropriate obstetric interventions and

impersonal treatment – in an academic maternity hospital in Brazil.[59] Using CL principles within a process of action research, and supported by mirror data collected through observation, interviews, focus groups and historical and documentary analysis, they convened discussion sessions with clinicians and managers. Within these sessions, contradictions were identified, leading participants to suggest, model and implement solutions. Specifically, the CL approach enabled identification of a key contradiction between mothers' wishes for person-centred care and clinicians' desire for residents to practise procedures. Principles of AT helped researchers to explain cultural and historical issues underpinning this contradiction, such as culturally-embedded hierarchical tensions between doctors and nurses and between men and women, and anachronistic beliefs that procedures could be performed without informed consent. As a result, changes were introduced, resulting in a friendlier environment, improved patient privacy, and fewer unnecessary procedures, although the authors did note that 'changes that do not challenge hierarchies are easier to implement'. This highlights that, while CL provides a powerful forum to explicate and redefine power relations, the methodology alone cannot bring about change without stakeholders' engagement and agreement.

Case study - Part 3: Using AT to bring about practical change

Following discussion with all of the stakeholders in the health centre, Max organises a series of meetings to consider how best they could prepare for managing emergencies in this new building. In the first meeting, Max prepares an in situ simulation of an emergency (a patient who had collapsed because of a cardiac event). Max was able to co-ordinate key stakeholders to meet over lunch time (when no real patients were in the health centre). They include GPs from each of the separate clinics sharing the building, pharmacists, social workers, and members of the nursing and administrative teams. He briefs everyone about the simulation and then asks them to 'go about their normal routines'. Meanwhile, Max sets up a CPR manikin in the waiting room to recreate a collapsed patient scenario, and briefs a medical student to act as a distressed relative. An 'emergency' is declared and the various healthcare workers respond to this simulated emergency. As the simulation unfolds, Max video records the event with his smartphone. Once the simulation has finished, all of the healthcare workers meet in the common room to have lunch and discuss the simulation. Following a debrief, Max explores with the group the 'best practice' cardiac arrest guidelines. He then asks the group to review the video footage of how the cardiac arrest simulation was managed. Though the arrest was managed appropriately, it becomes evident that the overall response could have been better. The video footage provides an insightful 'mirror' to what happened and reveals a number of contradictions. For example, not all of the staff knew where emergency equipment, such as the cardiac defibrillator, was located. Surprisingly, the pharmacists did not leave their desk to help with the emergency - given that the 'unwritten rule' was that it was always doctors who managed emergencies. However, the GPs who responded to the emergency felt they would have really benefitted from the assistance of the pharmacist, particularly with administering medication to the collapsed patient. It also becomes evident that, although an emergency ambulance was called for promptly, no one had thought to look out for the paramedics and direct them to the scene, despite the vast size of the building. Max reflects with the group on a number of these issues. He also draws their attention to AT and discusses how that these 'issues' can be considered to represent 'tensions' between the various elements of activity. Following this meeting, participants are given notebooks to record tensions brought to their awareness as a result of the simulation. Moreover, they are asked to consider potential solutions to overcome these tensions.

At a follow up meeting a few weeks later, all of the healthcare workers meet again and have a round table discussion. They consider, collectively, the tensions identified and solutions to improve their overall preparedness for dealing with an acutely unwell patient. Through dynamic discussions, facilitated by Max, imagined meaningful changes surface and are considered. Following this meeting the various stakeholders go about making these changes that were collectively agreed upon. For example, they develop an emergency trolley that houses all essential clinical equipment. Importantly this trolley is located in a central area and with appropriate signage. Induction policies are modified to ensure that all new staff are oriented to where the emergency trolley is located. Equally, all current members of staff are oriented to the trolley and the new arrangements. Located in the emergency trolley are 'prompt cards' that provide guidance on the important steps in managing various emergencies. Importantly, based on the previous simulation, a card is included that highlights the need for an individual (e.g. a member of the administration team) to wait at the front door, to beckon the paramedics and take them to the collapsed patient. Policies are also put in place that if a pharmacist is present in the building, that they also should be called to help in an emergency situation.

The third and final meeting is also held over a lunch time a few weeks later. At this meeting a further simulation is mocked up, this time involving a patient having a seizure. The response to this acutely unwell patient is again filmed by Max. Following debriefing, the various healthcare workers reflect on how much improved the response was: everyone knew where the emergency equipment was located; the pharmacists provided invaluable advice in helping to treat the patient; and an administration team member waited for the paramedics and brought them to the scene. The team express their thanks for Max's input in enhancing their organisational response to dealing with a medical emergency in the building. The team describe feeling much more confident and continue to suggest further modifications to enhance their response. It is agreed by the team that these changes would be made and a further simulation carried out to test them. Max is delighted and volunteers to conduct the further simulation in a few weeks' time. He also reflects that this would make the basis of an interesting research project.

Future directions: AT in educational development

We would like to stress that AT involves many important concepts relevant to HPE beyond what is described within this chapter; we encourage interested readers to read more deeply (with suggestions for useful resources given below).

We also encourage readers not to view AT as a finished product: like activity systems themselves, AT is changing, evolving, and expanding. Its use within HPE should serve to extend, not just apply, its concepts and methods. We conclude this chapter by reflecting specifically on how AT can be used within educational practice, not just research, with specific reference to the emerging field of in situ simulation.

Activity theory as a sense-making tool

While AT's development and main applications have been in a research context, we suggest that its ability to support practitioners to make sense of complex situations means that it can be used more widely. In applying AT principles, for instance, practitioners may begin to reflect more deeply on how contradictions arise within their own workplaces and, indeed, how solutions may be found. For example, a health professions educator, frustrated that students appear more interested in passing exams than interacting with real patients, might begin to perceive a primary contradiction: students focus on assessments because they must be passed in exchange for the right to practise as a doctor.[60] This does not imply that change will be easy, but it may at least influence the educator's understanding that solutions might lie at the level of the educational system rather than in addressing students' motivation.

Activity theory and in situ simulation: SimLab

Just as AT can be used to help make sense of complexity, we also suggest that it has the potential to augment, inform and energise change efforts (even without adopting a formal CL approach), including service reconfiguration, quality improvement and – of particular relevance to HPE - educational development.

In an example, which informs the case studies within this chapter, the authors have gained experience in using AT alongside in situ simulation to improve organizational responses to medical emergencies.[45] Medical emergencies, such as cardiac arrest or acute anaphylaxis, are time dependent and difficult to manage well. Aside for the complex nature of the clinical presentation,

healthcare professionals rely on a wide range of complex technical tools (e.g. defibrillators; emergency medications), which they must be able to access and use immediately. Furthermore, they must be able to coordinate their actions within a team to achieve optimal outcomes. Yet, due to the relatively rarity of events and fluid nature of healthcare teams, the clinical environment and the other team members may be unfamiliar to them.

Simulation, because of its ability to afford learning opportunities that are not readily available in real clinical environments, is regularly used to improve preparation for emergencies. Typically, however, simulation occurs in dedicated facilities remote from real clinical environments (e.g. simulation centres). To address this, there has been increasing interest in in situ simulation, in which scenarios are conducted in authentic clinical workplaces. While this adds contextual richness, individual learning has remained in situ simulation's main emphasis. Our work theorises that AT, as a systemic framework, can extend the use of in situ simulation, enabling it to drive organizational transformation alongside practitioner development. Recordings of initial simulations can provide powerful mirror data for subjects to reflect on their responses in relation to best practice (e.g. resuscitation guidelines). The principles of AT, through facilitated discussions, can enable subjects to consider issues, beyond individual performance, that might not otherwise have come to light. By identifying contradictions, participants can scope, agree, and implement solutions within the workplace. A simulation-based approach provides an opportunity for solutions to then be tested, refined, and consolidated. We argue that this 'SimLab' approach exemplifies how educators can use AT to 'expand the object' of conventional education, bringing it into closer alignment with the needs of real world clinical practice.

Conclusion

In the face of increasing healthcare complexity and the challenges this poses, both clinical and educational, it seems appropriate that HPE is beginning to embrace new 'ways of knowing'. This article outlines the increasingly-recognised theoretical framework of AT, describing its roots, conceptual constructs, and applications within HPE. Given its focus on practices, multiple actors and disturbances, which when collectively identified and analysed are potential drivers for change and development, AT is particularly well suited for studying healthcare practice and education. Further still, under Engeström, AT has been iteratively developed and refined through extensive empirical study in healthcare contexts. While initially challenging at a conceptual level, AT offers huge potential as an approach to make sense of complex issues and as the basis for established methodological procedures supporting both analysis and intervention.

Given healthcare's challenges, it is perhaps AT's explicit concern with implementation and change that appeals most. Unlike some other theoretical constructs, AT does not aspire to exist only in the abstract, unconcerned with the needs of practice. As Engeström puts it: 'In the face of the pervasive and often dramatic changes in workplaces, avoidance [of putting theory to use in organisational development] amounts to hiding one's head in the sand.'[15] Instead, he argues that AT should be used to drive healthcare reform: 'disturbances and conflicts in everyday medical work … challenge the medical social system to understand and manage complexity, identify the dynamics of contradictions and utilize them in emancipatory transformations.'[61] This approach, in which development is not simply continual forward progress but 'partially destructive rejection of the old',[15] may be challenging for healthcare and HPE to embrace.[44] It requires practitioners to continually question existing ways of doing things, accepting that learning is a lifelong process. It threatens dominant structures, hierarchies and power relationships. It undermines the continued dominance of the translational model in HPE, in which teachers teach, students learn, and improved clinical outcomes are taken for granted.[62] Yet, by the same token, AT offers the potential for reforms that are sorely needed. It enables social boundaries between clinicians, students and patients to be reassessed and redrawn, leading to healthcare that is more inclusive and more equitable. It promotes a conceptualisation of expertise that takes account of healthcare's inherently collaborative and unstable nature. And it gives rise to the possibility that practitioners themselves are best placed to lead transformations within their local contexts. We encourage readers to reflect on how they might use AT to bring about change in their place of work.

Suggested further reading

In-depth discussion of expansive learning

Engeström Y. *Expertise in Transition: Expansive Learning in Medical Work*. New York: Cambridge University Press; 2018.

Overviews of AT and its use in HPE

Engeström Y, Pyörälä E. Using activity theory to transform medical work and learning. *Med Teach* 2021;43(1):7-13.

Dornan T, Kearney GP, Pyörälä E. Destabilising institutions to make healthcare more equitable: Clinicians, educators, and researchers co-producing change. *Med Teach* 2021;43(1):4-6.

Change Laboratory and organisational development

Morris C, Reid AM, Ledger A, Teodorczuk A. Expansive learning in medical education: Putting Change Laboratory to work. *Med Teach* 2021;43(1):38-43.

Kerosuo, H., Kajamaa, A. & Engeström, Y. (2010). Promoting innovation and learning through Change Laboratory: An example from Finnish Health care. *Central European Journal of Public Policy* 4(1), 110-131.

Gormley GJ, Kajamaa A, Conn RL, Hare SO. Making the invisible visible : a place for utilizing activity theory within in situ simulation to drive healthcare organizational development? *Adv Simul* 2020;5(29):1-9.

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