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Simulation based education and expansive learning in health professional education: A discussion.

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Abstract

The aim of this paper is to discuss the application of Simulation Based Education (SBE) in nursing and wider health professional education. Simulated Learning (SL) is discussed in relation to its history, development, application in health professional education, delivery considerations and outcomes. Simulated Learning and Simulation Based Education could be differentiated by considering SL as instances where simulation is employed as a teaching and learning method and SBE as a more comprehensive approach within curricula design. Following this, the discussion will focus on SBE in light of Activity Theory (AT) and Expansive Learning (EL) espoused by Engeström (2009). The philosophy, factors, structures and approaches of AT and EL are highlighted and their application as an underpinning consideration for SBE is discussed. It is suggested that by utilising the Expansive Learning philosophy, health professional educators can create a structured approach to effective integration of Simulation Based Education into curricula design and as a vehicle for them to deliver high quality experiences for students which is then transferable to their practice settings as professionals.

1. Introduction

It is well documented that simulation is now an established and popular teaching and learning methodology in health professional education. The UK Department of Health suggested that simulation:

"... refers to any reproduction or approximation of a 'real' event, process, or set of conditions or problems."
(DH, 2011, p.12)

It can be used to replace time spent in actual clinical practice, and learning in real world settings (Doolen, Mariani, Horsley, Rourke, McAfee & Cross 2016). Eyikare and Baykara (2017) point out that the use of SBE is advocated by such institutions as the World Health Organisation and suggest that it is a technique (as opposed to a technology) that replaces real life experiences.

Activity Theory and Expansive Learning focus on work activities and goal directed social experiences within a given context as an activity system. This includes individuals, their objectives, learning tools, rules, communities and divisions of labour, which can become units of analysis in relation to the learning (Eppich & Cheng, 2015).

2. The Historical Development of Simulated Learning

The increasing popularity of simulation as a teaching strategy has led to a plethora of literature available on the topic. However, simulation is not a radically new way of teaching and learning in industrial and professional settings. According to Ward-Smith (2008) discussing work conducted by Tocher in 1963, simulation was explored in engineering and physics fields utilising advancements in high speed digital computers for research development and education. However, the concept is much older. There is documented evidence of forms of simulation being used in Central Asia in the 5th century in relation to surgical procedures and in the teaching of acupuncture in 10th century China, with early pioneers creating crude manikins from whatever materials they deemed appropriate, through to more relatively recent examples of educating World War 2 pilots by using high level flight simulators (Owen, 2016).

Further integration of simulation into learning occurred in the aviation industry in the early 1970's, and simulated learning continues to be utilised for assessment of competency using flight simulators (Krage & Erwteman, 2015; Topping, Bøje, Rekola, Hartvigsen, Prescott, Bland, & Hannula, 2015). Simulated learning approaches were used to prepare pilots for potentially difficult and rare occurrences, which led to it being adopted by a range of high risk industries including the military, engineering, nuclear power and medicine (Kneebone, 2016).

Even with such established examples, SL is still often perceived as a relatively new pedagogy, perhaps due to the rate of change of technological advances that make today's SBE seem almost futuristic compared to traditional methods. However, in its purest sense, SL has been utilised within health professional education for many years, for example nursing students historically practised administering injections using oranges (Thomas & Mraz, 2017). Nelson (2016) describes how manikins made of straw were also used in SL approaches in health care over 100 years ago.

However, even with technological advances, significant differences are evident in the application of SBE between health professional education and aviation, specifically related to the accuracy reproduced within the variables apparent in each situation (DeMaria, 2011). Whilst instruments, visual, and motion experiences can be accurately replicated within a flight simulator, doubts are raised on the ability to accurately predict and replicate individual patient responses to a given treatment approach. However, DeMaria (2011) suggests that as experiences are undertaken within a risk-free environment, the ability to cope with rare 'near-miss' situations is beneficial in both health professional and aviation industry education.

The success of SL was recognised as an accepted teaching strategy by the Institute of Medicine in 2003, specifically in preparation for management of critical events and identification of errors (Krage & Erwteman, 2015; Booth, Sinclair, Strudwick, Brennan, Tong, Relouw & Vlasic, 2017). Anaesthesiology was one of the first medical specialisations to pioneer the structured use of simulation in health professional education (Krage & Erwteman, 2015).

3. Simulation in Health Professional Education

Simulated learning has been acknowledged as a popular educational technique in health professional education, that allows interactive and immersive activity by recreating all, or part, of a clinical experience. This is achieved without exposing real patients to the associated risks (Hope, Garside & Prescott, 2011; Unsworth, Melling, Tuffnell & Allan, 2016).

It is a multi-faceted pedagogy, being defined as:

"a teaching strategy that complements traditional training with actual patients and enables students and health professionals to learn in ways that eliminate risk to patients" (McCaughey & Traynor, 2010, p. 827).

The notion of SBE being a total educational experience as opposed to merely the teaching, learning and repetition of skills is an important factor. Simulation combines educational theory and clinical competency within the teaching and learning process (Walters, Potetz & Fodesco, 2017). It affords an opportunity to vary teaching delivery by combining simulated practice with traditional didactic methods, particularly in areas requiring complex skills such as problem solving and critical thinking (Gore, Hunt, Parker & Raines, 2010).

However, to address this complex balance, it places challenges upon educators to accommodate the process

of SL as a teaching pedagogy (including knowledge delivery, attitude formation, skills development, and providing opportunities for feedback), into structured sessions and curricula (Forrest, McKimm & Edgar, 2013). Forneris (2016) supports this, suggesting that simulation needs to be integrated in curricula for health professionals, and educators need to be prepared to both understand and deliver the approach effectively.

According to Bland, Topping and Wood (2011), SL has been widely discussed in the available literature including discussion related to elements such as the authenticity of the environments, and opportunities to develop problem solving and clinical diagnosis skills. The SL approach can be delivered using high or low fidelity simulation through a range of different modes, utilising simulated patients, and/or case studies. Presado, Colaco, Rafael, Baixinho, Felix, Saraiva and Rebelo (2018) state that SL is used to imitate levels of realism and proximity normally found in real life situations in differing modalities. i.e. the further away from the reality the lower the fidelity. High fidelity simulation uses technology and situations that aim to closely attain the realism and proximity of participants to incidents and situations in a secure and safe setting. Fenwick and Dahlgren (2015) point out that fidelity is a crucial consideration in SBE, due to the complex nature of how students must suspend their disbelief to engage in imaginative scenarios. It should be noted that SBE is considered an imaginative act no matter what the level of fidelity of the socio-material elements. Therefore, it is important that health professional educators can integrate the knowledge, skills and attitudes required in the clinical context, whilst providing experiences realistic enough to address the issue of suspending disbelief.

Ewertsson, Bagga-Gupta, Allvin and Blomberg (2017) argue that practical skills are complex, involving the balance of understanding (evidenced based) knowledge, skills and attitudes in context, (particularly in environments with rapidly evolving technology). Simulation offers opportunities for health professional students to address this. Evidence suggests that well designed and implemented simulation exercises improve knowledge and skills (Fey & Kardong-Egren, 2017). Simulated learning is sometimes claimed to enhance psychomotor skill development, problem solving skills, critical thinking, clinical reasoning and judgement skills (Ganley & Linnard-Palmer, 2012; Mok, So & Yee, 2016).

Hope et al. (2011) suggest simulation developed as a way of teaching basic skills to nurses and other health professionals, which evolved from early approaches delivered in traditional 'practical rooms', to using highly technical equipment, authentic environments and applied teaching/learning strategies. Its popularity is growing in alignment with technological developments, a shift in what is considered ethical in practising essential clinical skills in 'real life' settings on real people, and, pressures and limitations in healthcare placement provision leading to reduction in practical opportunities. Nelson (2016) suggests many nursing schools in the US are moving 25-50% of their clinical practice into SBE.

Wiseman and Horton (2011) suggest that SBE requires scenarios that are visual, tactile, and auditory situations that healthcare professionals would regularly encounter daily. Simulated learning encourages the health professional student to relate relevant evidence to their clinical decision making, ultimately leading to development of clinical confidence (McCaughey & Traynor, 2010). Oldenburg, Maney and Plonczynski (2013) found that students' confidence levels in relation to clinical practice was raised by being introduced to SL using high fidelity simulation. This confidence continued when the participants entered 'real' clinical practice. They suggest SL can be used as a replacement for some 'real life' practice-based experiences.

A systematic review by Lee and Oh (2015) suggested that cognitive and problem-solving skills are developed through SL, but that results related to knowledge development were not shown to be significantly different from other teaching methods. This is an important factor as knowledge changes rapidly in the health professional field, however there is a requirement for all health professionals to be problem solvers. A meta-analysis conducted by Oh, Jeon and Koh (2015) suggest the benefits of SL are in primarily developing psychomotor skills, showing significant effects in clinical competencies, with cognitive and affective skill development also occurring. A study validating a SL effectiveness tool by Pai (2016) showed that students heightened their social cognitive skills of self-efficacy, self-regulation and motivation following experiences of SBE.

Kelly, Berragan, Husebø and Orr (2016) concluded that simulation is a positive way for educators and students to co-produce knowledge and skills, alongside peers and consumers in an authentic context. They suggest the pedagogy, framework and development of materials applied in 'real' case scenarios promote meaningful engagement with concepts, and other people. This is a crucial factor suggested of SBE, that wider applicable skills are gained such as communicating with others and managing people and environments. Johannesson, Silén, Kvist, and Hult (2013) found that students reflected positively on the learning experience from simulation, pointing out that it increased their critical problem-solving behaviours and enhanced their perceptions of professionalism.

Feedback and debriefing is an important aspect of SL. Forrest, McKimm and Edgar (2013) point out that SBE is effective if the conditions of feedback, repetitive practice and curriculum integration occur. However, Hatala, Cook, Zendejas, Hamstra and Bridges (2014) argue that the form of feedback that is most effective and likely to be retained, is that which occurs after the SBE event. They suggest concurrent feedback within the session does not have the same impact. Therefore, these factors need to be considered in planning the SBE experience for students.

A meta-analysis by McGaghie, Issenberg, Cohen, Barsuk, and Wayne (2011) suggest that the power and utility of SBE is beyond doubt in skill acquisition particularly compared to traditional methods. However, they argue that it is a complex and open system impacted by many elements that feedback into the process, therefore these complexities need to be addressed and considered in its implementation. Hughes and Quinn (2013) suggest the transfer of learning

from such experiences is debatable but at the very least students may be able to internalise skills and procedures. Nash and Harvey (2017) support this stating that students in their study appreciated the use of high fidelity simulation yet perceived the transfer of learning to the clinical area challenging, due to the 'compartmentalising' of the experiences. This suggests some challenges in the suspension of disbelief required and the transfer of the learning from it into applied settings. Exposito, Costa, Agea, Izquierdo and Rodriguez (2018) found that students communicated poorly with the simulated patients in SL and instead tended to focus on the procedural skill factors and the technological aspects, raising further questions on how these skills can be transferred into real life settings. A study by Au, Cheong, Wang and Van (2016) also demonstrated that communication was an issue for students. The participants had experienced some difficulty speaking with the high-fidelity manikins within SL scenarios. However, overall, they appreciated the SBE experience, which was being used as a replacement for actual clinical practice with patients. Further discussions around the evidence in support of SBE led to questions around the lack of universal guidance, strategies for evaluation and audit on student competency and transferability into clinical practice (Handley & Dodge, 2013).

According to Aronowitz, Aronowitz, Mardin-Small and Kim (2017), simulated learning also offers an extra element in providing robustness to the assessment of learning clinical skills as they can be used for both education and assessment. The introduction of Objective Structured Clinical Examinations (OSCE; or what is becoming widely known as 'situational judgement') as a means of summative assessment is commonly accepted as a measure for competency assessment in health professional education and has been increasingly integrated into curricula as a vehicle for assessing both skills and theory. Situational judgement utilises scenarios based upon professional dilemmas requiring problem solving abilities based upon clinical knowledge (Patterson, Lopes, Harding, Berkin & Black, 2017). In a study comparing SBE and lecture method, Cooper (2016) found that higher OSCE outcomes were achieved in the SBE group, along with a higher rate of satisfaction in the approach. However, there is a need for consistency in implementation as Cohen, Ononye, Salud, Kwan, Salud and Pugh (2013) found an increase in confidence can turn to anxiety if there are lengthy periods between repetition of the procedures being taught. Similarly, health professionals face regular changes in clinical approaches, the development of their competence therefore can be continuously captured through OSCE examinations or 'situational judgement events' similar to the approach used in the aviation industry.

Simulation Based Education can also be used for other professional development reasons, such as a means of orientating newly qualified staff to hospital policies and procedures (DH, 2011). Burton and Ormrod (2011) suggest that newly qualified nurses begin having to make clinical decisions as they join the profession, yet also have wider responsibilities in making and taking decisions related to the patient/client, family, whole nursing and multidisciplinary teams, and the environments they are working in. These can be quite challenging issues and can be a culture shock to a student that had previously been closely supervised and observed throughout the rest of their educational experience. Reid, Ledger, Kilminster and Fuller (2015) suggest that similar issues are prevalent in the transition of medical doctors from being students to qualified working professionals. A study by Thomas and Mraz (2017) concluded that student confidence, communication skills, decision making, and reflection developed through SBE can be helpful in the transition from student to the professional role in practice. Over time, sequences of personal experiences combine to form trajectories of development. Trajectories involve the constant renegotiating of identity, which is expressed and negotiated through what health professionals do. There is a strong connection between identity and practice because practice shapes 'ways of being a person in that context'. As workplaces favour certain trajectories over others, trajectories are not clear-cut pathways for people to take. Rather, developmental trajectories are constantly being negotiated as learners move from one learning situation to another, for example when changing clinical team or moving to a different hospital (Cantillon, Wood & Yardley, 2017).

4. Delivering Simulation

Hughes and Quinn (2013) outline the typical process of SBE, for example in dealing with someone in cardiac arrest. The SL experience is organised by the teacher by providing an authentic situation which simulates the kind of healthcare environment that might be experienced, with a patient in a bed, locker and charts etc. Students are provided with specific roles and a scenario identifying situations for consideration. In working through the scenarios, students can experience a situation without the anxiety of the 'real' life setting and can develop understanding of skills, techniques and procedural approaches. According to Nystrom, Dahlberg, Hult and Dahlgren (2016), there are three main phases when implementing SL. These are briefing, simulation and de-briefing. Their study focused on collaborative simulation between Doctors and Nurses. They found some positive aspects in collaboration and an emergence of students' adaptive responses and attitudes towards the manikins as simulations developed. This is counter to the findings of Au, Lo, Cheong, Wang and Van (2016). Berndt, Dinndorf-Hogenson, Herheim, Hoover, Lang, Neuwirth and Tollefson (2015) highlight some positive benefits in the use of collaborative classroom simulation (CCS) which utilises an unfolding scenario where one or two students are undertaking the clinical task, with the whole class observing and using various means to communicate and offer advice, therefore promoting collaborative learning.

5. Outcomes of Simulation

Initially explored by the UK Nursing and Midwifery Council (NMC) as a potential way of addressing the decreasing number of available clinical placements (NMC, 2007), SL is acknowledged as a method of preparing nurses who are self-confident and have enhanced levels of clinical competence whilst also contributing to patient safety agendas (Blum,

Borgland & Parcells, 2010). However, Lavoie and Clarke (2017) argue that whilst it creates 'safe realism' it is not necessarily a cheap option in terms of resources required.
The benefits of simulated learning such as error making within a safe environment have long been recognised (Handley & Dodge, 2013). Studies on error identification and improving patient safety, place nurse educators in the forefront of influencing patient outcomes, and SL is an appropriate vehicle for this (Henneman, Henneman, Roche, Fisher, Cunningham, Reilly & Nathanson, 2010).

Simulation Based Education will now be discussed in light of Activity Theory and Expansive Learning highlighted by Engeström (2009).

6. Activity Theory and Expansive Learning

According to Lavoie, Michaud, Bélisle, Boyer, Gosselin, Grondin and Pepin (2018), following a systematic review into learning theories and SBE, most papers do not cite any learning theory, and those that do tend to focus on Bandura's social learning theory, or Kolb's experiential learning theory. This therefore raises the question as to what benefits may be gained in SBE if a learning theory is applied and is integral to the process? Engeström (2009) suggested that a learning theory should answer questions about who are the subjects of learning? Why do they learn? What do they learn and how do they learn? His theory of 'Expansive Learning' (EL) builds upon the 'Activity Theory' (AT) of Vygotsky (1978) suggesting a relationship between 'Subject' (learner), 'Object' (what is learned or observed) and a 'Mediating Factor/Artefact' (contextual learning tools) (see Figure 1). Ajjawi, Rees and Monrouxe (2015), suggest that the subjects are the individuals or group engaged in the activity, and the object is the motive for the learning (e.g. the patient's needs and care approaches). The tools or mediating artefacts influence the subjects' interaction with the object. The object is incumbent in an activity learning system and part of the whole learning arena including the context and the entire activity in which learners are engaged.

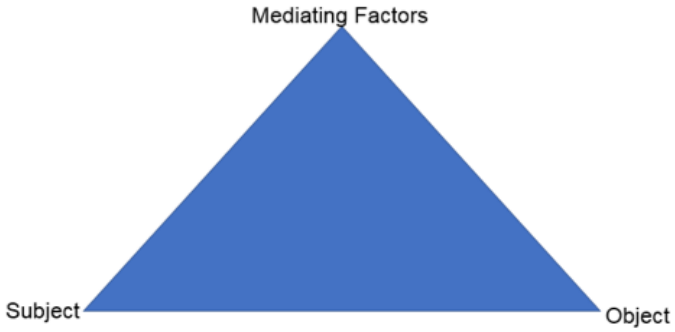

Fig 1: Activity Theory based on Vygotsky 1978. Adapted from Engeström (2009:54).

Therefore, in the case of SBE the subjects could be considered as the students, the objects are the clinical situation requiring the appropriate, knowledge, skills and attitudes to solve, and the mediating artefacts are the tools used to achieve this (the case study, the simulation equipment etc.).

7. Interconnectedness and Systematicity

Engeström (2009) also credits the work of Gregory Bateson in the development of his ideas. Thomassen (2017) highlights how Bateson considered an epistemology based on patterns, interconnectedness, systematicity, the quality of these, and how this leads to change and development. These aspects do appear inherent in AT and EL. Haigh (2007) suggested that in AT, it is the process of change and not stability which is the major factor. It focuses on factors that create the context or activity system which impacts on what, why and how students learn.

The activity system is the interaction between the subject (student), the object (what is to be learned), and the mediating artefacts (the pedagogical tools used for learning). The premise relies on challenging the predominant cultures and transforming this. It could be argued that these are all aspects recognised as part of the pedagogical process instrumental in delivering high quality SBE. Berragon (2013), argues that SBE provides students involved in education in university and clinical learning areas with such 'expansive learning' espoused by Engeström, where they are encouraged to address contradictions between the two settings, leading to learning, development and change. Sannino and Engeströms' (2017) definition of an activity system appears to fit neatly with the processes involved in delivering SBE:

"An activity system is a relatively durable formation that consists of actors working on a shared object, mediated by instruments, division of labor, and rules" (Sannino & Engeström, 2017, p. 81).

At its basic level the activity system is used to generate actions and operations. At its higher levels an activity system creates systemic change due to the development of collaboratively constructed perceptions of the components of the system and how they relate. Engeström (2009) develops AT further into EL, suggesting that there are a number of dynamic influences in the nature of learning and the environment(s), social systems and cultures in which it takes place. This further iteration is sometimes referred to as 'Cultural Historical Activity Theory' (CHAT) (Voogt, Laferriere, Breuleux, Itow, Hickey & McKenney, 2015). Reid et al. (2015) in considering medical education within the EL model, suggest learning can occur at organisational or systems level within specific socio-cultural historical contexts. The activity occurs within the 'divisions of labour' and the 'rules' of practice of the system within which the activity is taking place. This therefore suggests a fixed or established set of rules that influence the above-mentioned 'who is taught, what are they taught, and how do they learn?' aspects required as suggested by Engeström (2009) (see Figure 2). It could be argued that SBE provides such a framework whereby there are rules provided in specific contexts and systems that replicate 'real life'. The students are the actors and subjects whilst the patient and the scenario are the object.

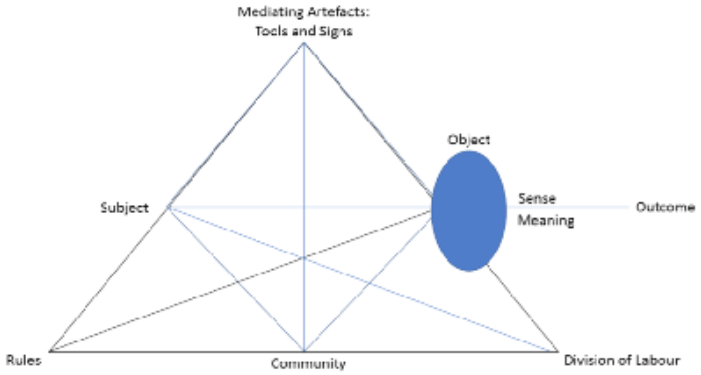

Figure 2: An Activity System. Adapted from Engeström (2009: 55).

Expansive Learning purportedly leads to new patterns of cultural activity. This is a cyclical rather than a linear process that ideally includes the collective learning actions of (1) questioning, (2) analysis, (3) modelling a new solution, (4) examining and testing the new model, (5) implementing the new model, (6) reflecting on the process and (7) consolidating and generalizing the new practice (Engeström & Sannino, 2016). This can also be considered as 'Transformative Agency' (Haapasaari, Engeström & Kerosuo, 2014). Transformative agency depends upon collective activity going beyond individuals and looking at collective change efforts. This process can be seen in SL. In SBE scenarios, it is often important that the simulation involves collaborative efforts in dealing with the enacted situation, this can be seen in stages 1-3). Following this, the important aspect of debriefing (stages 4-7) should lead to the development of knowledge, reflection and application of the skills learned to the clinical situation. However, how much this changes the actual culture is an interesting question? Voogt et al. (2015) suggest Engeströms' work falls into the category of 'situated learning'. In this approach learning is collaborative, moving from routine performance to problem solving and emergent understandings. This should eventually lead to creating change within the culture itself. They summarise this as 'situatedness, agency and cycles', which operate as a dynamic process. Simulation Based Education does tend to involve these aspects, yet the latter stages of an SL approach may not engender the amount of change suggested in the cultural context, due to the separation from 'real life' and the compartmentalising of unique learning situations.

The cyclical process looks at the potential stages that learners will pass through. In SBE there can still be the notion of the dominance of an individual expert (or expert knowledge and procedures) as mediating factors, in that specific outcomes will be sought in relation to the object, and specific protocols tested (activity system).

Thereby, these established protocols may limit the amount of change that can occur in such settings and be culturally transferred at a later stage. As discussed earlier this might lead to the learner compartmentalising the learning in the SBE environment and explain the debate over the transferability of it into the real-life setting.

By creating structures based on AT, EL and the CHAT model, health professional educators can begin to address the challenges of simulation mentioned earlier, in terms of understanding the nature of SL, integrating it into curricula and being able to deliver it effectively. Eppich and Cheng (2015) suggest AT provides a framework for health professional educators to observe simulations and organise higher yield topics for discussion in interprofessional debriefing sessions. Any contradictions can be explored through reflective discussion in identifying the components of the system, i.e. subject, object and mediating artefacts. However, there is some debate on the effectiveness of debriefing approaches in SBE. Abelsson and Bisholt (2017) suggest that it depends on the prior knowledge of the student, the skill of the teacher in debriefing, and can be affected by factors such as peer evaluation where students have to provide negative feedback to another. Roh, Kelly and Ha (2016) found instructor led debriefing to be more effective than peer led debriefing. Reed (2015) found that there were mixed results with written debriefing of students. Reed, Andrews and Ravert (2013) and Grant, Dawkins, Molhook, Kelner and Van Ce (2014) found the use of video and oral feedback to be more effective as debriefing mechanisms. Forneris, Neal, Tiffany, Kuehn, Meyer, Blazovich and Smerillo (2015) suggested that structured debriefing based around the concept of reflective practice can help develop clinical reasoning. These aspects are crucial if such learning can lead to the cultural changes that Engeström (2009) suggests should occur.

As discussed previously the end stage of a given SL experience will be tested through assessment OSCE, or 'situational judgement'. Goss, Ryan, Waring, Judd, Chiavaroli, O'Brien and McColl (2017) suggest that situational judgement tests are used to assess judgments, decision making in work related settings, as well as affective attributes such as empathy and resilience. By considering EL and the activity system, such assessments can be constructively, philosophically, cognitively, and affectively aligned.

8. Conclusion

Simulation Based Education is now an accepted aspect of health professional education. There is evidence to suggest its effectiveness in developing clinical knowledge, skills, attitudes and problem-solving abilities for health professionals. There are some challenges in ensuring that SBE is implemented effectively and is fully integrated into health professional curricula. Some of the challenges are related to overcoming issues related to suspending disbelief and compartmentalisation from reality in the simulated environment, in order to ensure that the learning is wholly transferred into the actual clinical arena. Debriefing, reflection and collaboration with other disciplines are important factors required in order to achieve this.

Expansive Learning can be utilised to theoretically and philosophically underpin the integration of SL into curricula, and ultimately into practice, therefore creating a process which breaks down the traditional boundaries between classroom learning and the reality of practical experiences within actual clinical environments. Engeström utilised the work of Gregory Bateson in discussing crossing boundaries

as a fundamental part of a systematic framework for learning. Morisette, Cravens, Miller, Talbert, Talbert, Jarnevich and Odell (2017) suggest that boundary crossing involves collaboration, communication on a number of levels, and co-production of knowledge and skills that are pertinent to all of the subjects in the activity system. By transferring these into the real life clinical environment, the nature of learning from one activity system can be applied in a new context and activity system, which may ultimately lead to the change in health professional culture as suggested. Therefore, health professional educators may benefit from developing their understanding of EL and applying this to their curricula if SBE is to be utilised.

The implications suggested above in considering SBE approaches are that health professional educators need to develop an understanding of AT and EL in the early stages when developing curricula. This should ensure the structures and philosophies of the approach are embedded and aligned within the whole program and are understood by faculty, particularly those delivering the SBE. Berragon (2013) highlights that EL applied to SBE can create environments where students are supported to explore, examine and identify responsibilities that are incumbent on them to deliver high quality evidenced based care. A curriculum taking the factors of AT into account, should provide students with perspectives related to themselves, others, the context, applied knowledge, environmental awareness and the dynamic processes occurring between these factors, to become fully competent practitioners and change agents in their practice.

Activity Theory, Expansive Learning and Simulated Learning needs to be carefully embedded within developmental programs for health professional educators. By providing understanding of structured theoretical underpinning, SBE can be developed as a process which not only provides required skills in health professionals but heightens their professional interplay and ability to lead change in their future practice.

More research studies are required to investigate how AT and EL can be applied within SBE. Further studies using AT and EL as theoretical frameworks for analysis of SBE approaches would also be beneficial in creating further knowledge and adding to applied learning theory.

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