

## **21st Century Skills: Problem Based Learning and the University of the Future**

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### **Abstract**

In this paper we focus on the ‘university of the future’. We aim to explore the role, relevance and potential of PBL in the development of 21st century skills in a higher education environment that is faced with profound changes, and that consequently requires a continuously adaptive approach to education renewal at all levels. We are in the midst of profound disruptions to higher education, due to fast changing technologies and the possibilities they afford. The internet and the World Wide Web have had huge impacts, which in turn have influenced the social fabric of our lives through the growing ubiquity of social media and mobile media tools. In education in general, and in higher education in particular, these changes have ushered in an age characterised by a rapidly increasing evolution of online learning with integration of online, hybrid, and collaborative learning, and most recently, phenomena such as Massive Open Online Courses (MOOCs), the rise of big data analytics driving learning, and personalised learning. Each of these developments have the potential to cause major disruptions in the way we operate in higher education. It is important to recognise and respect that these changes are here to stay, some evolutionary, some revolutionary. So we need to respond in adaptive and agile ways, and importantly, with imagination and creativity. In this paper, we explore the potential of Problem Based Learning (PBL) to address some of the unknown and uncertain challenges of the 21st century.

**Keywords:** 21<sup>st</sup> Century Skills, Problem Based Learning, Human Ecology for Learning, Supercomplexity

## Introduction

In this paper we respond to a higher education environment that is undergoing profound changes, and that consequently requires a high level of flexibility to education renewal at all levels. There have been numerous examples of industries that have been slow to adapt - slow to recognise, respect, and respond (Chickering, 2006) to fast changing contexts and they have been forced to face the consequences. One example in Australia is the demise of the national car manufacturing industry and the most recent example is the journalism profession. To some who have worked in the journalism profession for a long time, such as long-serving newspaper journalists at newspapers like *The Age* in Melbourne or *The Sydney Morning Herald*, it must have felt like the bottom fell out of their well-established world from one day to the next, and they were obviously ill-prepared for it. After all, these newspapers had been Australian institutions for more than a hundred years; surely this would not change from one day to the next? Higher education is no different.

Overall then, we are in the midst of profound disruptions to the way things have been done for a long time, not in the least due to fast changing technologies and the possibilities they afford. The internet and the World Wide Web have had huge impacts, which in turn have influenced the social fabric of our lives through the growing ubiquity of social media, networking and mobile media tools. In education in general, and in higher education in particular, these changes have ushered in an age characterised by a rapidly increasing evolution of online learning with integration of online, hybrid, and collaborative learning, and most recently, phenomena such as Massive Open Online Courses (MOOCs), the rise of big data analytics driving learning, and personalised learning and support for students. Each of these developments has the potential to cause major disruptions in the way we operate in higher education, and if we do not prepare to engage with these changes, and indeed respond, we are in danger of facing a situation where one day the bottom would have fallen out, and we would never have seen it coming. We need to recognise that changes are inevitable, and respect that these changes are here to stay, some evolutionary, some revolutionary, and we need to respond, but respond in adaptive and agile ways, and importantly, with imagination and creativity.

You may think there is a sense of inevitability about what we are suggesting, in a technological determinist sense. However, this would betray a kind of defeatist attitude whereby we consider ourselves to lack a sense of agency to influence or take charge of any of this, or that it is simply trendy, educationally, to jump on the technology bandwagon. In fact, we suggest the exact opposite. Rather than seeing change as something that is 'done to us' and that we cannot control, we believe we can respond by taking charge of the changes, and more specifically by using problem-based learning (PBL) as an adaptive educational approach to empower students and ourselves. The key point is the need to empower everyone – students, teachers, administrators, policy makers - to engage in productive and enriching ways of learning. This approach to higher education recognises “the teleological character of higher education – the fact that education always raises the question of its purpose – and account for the fact that the question of educational purpose always poses itself in relation to three different domains” (Biesta, 2015, p. 84), which are “qualification, socialisation and subjectification” (p. 77). Qualification refers to the transmission and acquisition of knowledge, skills and disposition; socialisation is about students being presented with ways of being and doing; and subjectification addresses the qualities of being a subject such as autonomy, independence, critical reasoning and so forth (Biesta, 2015). Central to these three domains is having the judgment “to maintain an

educationally meaningful balance between these domains” (Biesta, 2015, p. 84). As such, we recognise that we will always have to engage with knowledge, skills, and disposition, as well as the mechanisms of how to develop these, but that we also need to carefully consider the person – the student - in this equation.

Our purpose in higher education is to develop meaningful participation and engagement between students and ourselves - teachers, administrators, professional staff - and the ‘world’, and vice versa. No longer are we just facilitating students so that they can perform (qualification), but we must also ensure that they are being socialised (socialisation) into a ‘way-of-being’ (subjectification) that includes attributes and skills to take risks, to reason critically, to reflect, to be resourceful, and to be autonomous – qualities of lifelong learners – which will allow them to work and live productively in a world of uncertainties. In this vision, higher education has a big role to play, but not in a ‘business as usual’ kind of way. In this paper, we focus on the potential of Problem Based Learning (PBL), as an adaptive approach to higher education, to connect students and the world, and vice versa, for learning in the university of the future. Here, Ito et al.’s (2013) connected learning model of education is useful; it “advocates for broader access to learning that is socially embedded, interest driven, and oriented toward educational, economical, or political opportunity. Connected learning is realised when a young person is able to pursue a personal interest or passion with the support of friends and caring adults, and is in turn able to link this learning to academic achievement, career success or civic engagement” (p. 4). Even though Ito et al.’s connected learning model is designed with young children in mind, in this paper we share a similar notion of connectivity, where students are connected to learning beyond the garden walls of university, and where at the same time the world beyond university is participating and contributing to education in a meaningful way. For in Barnett’s (2013, p. 4) words, “we are at a fork: we are faced with a self-imposed entrapment within some very narrow ideas of the university in one direction and, in the other, a glimpse of the ‘possibility of possibilities’ is just beginning to open”.

### **Enter Problem Based Learning (PBL)**

Since PBL’s conception in medical education nearly 50 years ago (Barrows & Tamblyn, 1980), it has been incorporated into many higher education learning and teaching spaces with varying success. PBL is still being adopted and adapted in a wide range of educational fields and levels. The ‘elastic’ quality of PBL has allowed for different types and culturally variant versions of PBL with associated challenges and successes in implementation (e.g. Hmelo-Silver, 2012; Woei Hung, 2011; Woei Hung & Loyens, 2012) and PBL continues to evolve with new types or constellations of PBL (Savin-Baden, 2014, p. 197) for yet unknown and uncertain challenges of 21<sup>st</sup> century. The new PBL constellations must “embrace ‘liquid learning’ – the sense that learning and knowledge are always on the move...within and beyond disciplinary areas” (Savin-Baden, 2014, p. 210). Interestingly, herein lies both its strength and its potential weakness, for PBL is obviously seen as elastic enough to be shaped into a wide variety of context-specific versions, or indeed constellations, but at the same time this creates a potential danger of ‘anything goes’. In this paper, we engage with PBL for its potential, and so we consciously position ourselves on the side of the fence where (with Barnett, 2013) imagination is allowed, to think about future possibilities in an unrestricted manner. We acknowledge that much has been written about the practical aspects of PBL in the form of guidelines, ‘how to’ guides, and evaluations of small scale practices, as well as larger scale practices in some cases

(O'Grady, Yew, Goh, & Schmidt, 2012). Moreover, much has been written about the impact of PBL on university students' learning and teaching practices.

In this paper however, we are interested in imagining the future of higher education, through imagining ways to leverage the plasticity of PBL and activate Savin-Baden's (2014) concept of 'liquid learning'. Thus, we are interested in identifying ways that would allow us to respond to future challenges and that could be coopted into practices that may shape that future. This is not a paper about ready-made solutions nor is this about a toolbox of answers. Rather we imagine the 'person' we would like our students to be whilst they are in the university and when they graduate, and about how we would approach educating students in a world that is growing increasingly 'fuzzy' and complex in tandem with advances in technology. We agree with Barnett (2013) that the broader contemporary debates about 'the university' in the 'age of supercomplexity' (Barnett, 1999) are stunted by rigidified and narrow neoliberal thinking, and that "we require, therefore, in the first place, a 'proliferation' of ideas of the university, if only to begin to demonstrate that things could be other than they are" (p. 5). This is not simply about 'dreaming', but instead Barnett (2013, p. 6) urges us to generate what he calls 'feasible utopias', which means simultaneously thinking outside the square and carefully considering practical implications and applications. Barnett's discussion concerns the university itself and its position in contemporary contexts, and it is thus rather ambitious. In this paper, we begin to take up his challenge to some extent, but we focus it more specifically on approaches to teaching and learning that might be imagined and that might be feasible in yet to be defined future university contexts. More specifically, we explore PBL as an approach to learning and teaching with sufficient potential to be adapted to such futures, and in this sense, our discussion is closely aligned to Savin-Baden's (2014) notion of new constellations of PBL.

### **Imaging PBL as an Activator of a Way-of-being in an Age of Supercomplexity**

We consider the idea of imagining PBL as the catalyst in activating disposition, knowledge and skills in students that become habitual, like second nature, when they live and work in a world characterised by uncertainties. In other words, we consider PBL as an activator of a way-of-being - the minds, hearts and actions - with reference to Barnett and Coate's concept of knowing, acting and being (Barnett & Coate, 2004), and the qualities of being a person (Biesta, 2015). These qualities are deemed important for higher education to enable students to prosper in the 'age of supercomplexity' (Barnett, 1999), "in which there are no stable descriptions of the world, no concepts that can be seized upon with any assuredness, and no value systems that can claim one's allegiance with any unrivalled authority" (Barnett, 2004, p. 252). It is a world where multiple paradigms co-exist and co-locate, making for a radically interdisciplinary world.

The idea of activating a way-of-being aligns closely with the original PBL spirit or essence, which has not always been explicitly stated. Having the necessary knowledge (mind) and abilities to perform (actions) are not sufficient in a contemporary context. It is only when learners are also equipped with a strong and confident conception of 'self' (heart - the being) that they can be active agents in their environments (Bronfenbrenner & Morris, 1998) without fear or anxiety, and that they can prosper in any context in which they decide to live and work. Indeed, being active agents would be a pre-condition for confidently choosing the context in which to live and work. The ability to quickly get accustomed to change or 'way of being' might

also be seen as adaptive expertise, a term coined by Hatano and Inagaki (1984) to contrast it with routine expertise. They posited that expertise comprises, at its base, both subject-level knowledge, and the ability to perform efficiently and effectively in familiar situations. However, when an individual encounters a novel or unfamiliar situation, i.e. the task, method or desired results are not known in advance, the individual with routine expertise struggles. By contrast, adaptive expertise would allow for that individual to easily overcome the constraining effects of novelty or unfamiliarity, both on an affective and a cognitive level, and this in turn would allow for sufficient flexibility to respond appropriately (Schwartz, Bransford, & Sears, 2005). In short, adaptive expertise empowers individuals to perform at a high level in the face of supercomplexity, by leveraging the ability to adapt, be flexible and agile in thinking, feeling and doing.

Consistent with the Gestalt tradition in which the human ecology development model was developed, the whole is larger than the sum of its parts. In other words, in the age of supercomplexity, human beings function in complex ecosystems that are characterised by various intersecting layers, which impact on each other. To function successfully in such ecosystems requires knowledges, skills, abilities, and dispositions, and as we argue, a particular way-of-being that allows people to deal in productive and creative ways with uncertainty. PBL, in its various adapted forms, is ideally suited to activate a way-of-being in students, partly because of its inherent focus on metacognition.

### **PBL and a human ecology for learning model**

In our view, new constellations of PBL align well with a human ecology for learning model that we propose would fit a supercomplex world, and positions students at its very core (see Figure 1). This human ecology for learning model is adapted from Bronfenbrenner's (1979) pioneering work on ecological systems theory, which has evolved over the last forty years. Today, via a posthumous publication, it is known as the ecological model of human development (Bronfenbrenner & Morris, 2006). This human ecology for learning model places the student squarely at the center of any university's multiple rings of environments, ranging from the immediate (microsystem) to the distal (macrosystem) contexts (Bronfenbrenner, 1979, 2005; Bronfenbrenner & Morris, 2006). This human ecological model also reminds us to engage with the higher education contexts (exosystems) situated outside the students' formal learning and teaching contexts, and to seize the opportunity to reposition such contexts as spaces that are outside of the formal learning environment but still an integral part of the overall learning context. This then allows us to recognize and embrace liquidity and porousness of learning that are characteristics of contemporary global environments (Savin-Baden, 2008, 2014). Repositioning PBL within a human ecology for learning model creates affordances and spaces for students to learn to be active agents and creators of change during their university studies, and continue to be habitual creators when they leave university to live and work in an uncertain, complex world.



empirical” (Barnett, 2013, p. 20). This is not to suggest that there is no room for practical skills, but rather that the age of supercomplexity requires more than mere “technicians of the academic marketplace” (Barnett, 2013, p. 37). Imagination and creativity are key to a better tomorrow, and we believe that PBL is ideally suited to help set them free.

This human ecology for learning model allows us to reposition PBL-based learning as a ‘holistic’ approach, in which boundaries between formal and informal learning environments, between work and study, and between public and private spaces are continuously blurred, and frequently morph into, and impact on, each other. Such blurred boundaries not coincidentally also increasingly characterise 21st century learning and teaching environments. As Sharples et al. (2014) for example note (albeit in reference to pre-tertiary education):

When students bring their own smartphones and tablet computers into the classroom, this action changes their relationship with the school and with their teachers. They arrive equipped not only with individual technologies that they maintain and improve, but also with their own personal learning environments and social networks. This means that teachers become managers of technology-enabled networked learners, rather than providers of resources and knowledge (p.4).

Although we do not necessarily agree with the idea that teachers have become merely facilitators or ‘managers’ of learners, Sharples et al. (2014) do draw our attention to radically changing learning environments. In such fast-changing environments, teachers need to be flexible and adaptable, and moreover, they need approaches to teaching and learning that are agile enough to be both responsive and proactive. We argue that PBL is indeed such an agile approach to teaching and learning, malleable to changing contexts, knowledge and learning, activating liquid learning.

In the meantime, it is important to be able to map the different elements of such fast-changing learning environments, or what we call a learning ecology, with concepts borrowed from the ecology systems model pioneered by Bronfenbrenner (1979). A key focus in Bronfenbrenner’s model is on the proximal processes or “the engines of development” (Bronfenbrenner & Morris, 2006, p. 825) between the students and their immediate learning and teaching environments, which affect the desired developmental change in students. What is appealing here is that the developmental change is assumed to be enduring, from the present moment in time to a future time. In practice, this refers to the moment students first step into their university environments to the moment they blend into the world of supercomplexity after graduation. In other words, during their university studies, students would have acquired a particular ‘way-of-being’ that is one of a lifelong learner, characterised by disposition and qualities such as critical curiosity, design thinking, creativity, entrepreneurial thinking, and imagination (amongst others). In other words, this is about recognizing where students come from before they arrive at university, as well as where they are going after graduation, and about blurring the boundaries between these domains that are often presented as separate. Thus, it is about a ‘way-of-being’ dimension that lasts throughout students’ lives after they graduate from university studies. We propose repositioning PBL towards what we call ‘agile PBL’, as an engine of development that propels an enduring way-of-being, in the form of both a curriculum and a pedagogy (Barnett & Coate, 2004). Agile PBL is closely related to Savin-Baden’s (2014) ‘new constellations of PBL’ that include the following

elements: knowledge management; learning through activity; project-led; practical capabilities; design-based learning; critical understanding; multimodal reasoning; collaborative, distributed PBL; transformation and social reform. It is agile in the sense that it veers between these elements depending on which element(s) is most appropriate for the context, and depending on where students are at in their learning journeys. In other words, it does not follow rigid PBL structures (e.g. a seven step process, one PBL problem a day), but still takes advantage of the strengths of PBL, albeit in a more contextualised and agile manner.

The human ecology for learning model also reminds us to be aware of the interactions between the student and the multiple contexts that constitute the university, which includes spaces that the students do not necessarily encounter or interact with directly, and it includes spaces that are external to formal university spaces. Together however, they all influence their developmental outcomes and they impact on their learning journeys. In this respect, we imagine positioning learning beyond the ‘business as usual’ boxed-up, fixed systems and spaces for learning and teaching, and creating interdisciplinary learning opportunities and activating “liquid learning” (Savin-Baden, 2014, p. 210). Repositioning PBL as the engine of development of a learning ecology allows for both the recognition of these multiple learning spaces, as well as for meaningful and proactive engagement with and in them.

As noted, we believe a human ecology for learning model is useful for mapping and visualising the complicated constellation of learning spaces involved in contemporary and future learning environments, suitable to 21st century context of supercomplexity.

### **Conclusion**

In this paper, we have discussed the potential of PBL in an imagined ‘feasible utopia’ of higher education. From an institutional point of view, this may sound like utter madness, because it would require massive and fundamental changes in the way higher education institutions, and particularly universities, currently operate. However, this is precisely our point. This is our initial attempt to respond to Barnett’s (2013) timely call for an imaginative university that engages with a breadth and abundance of ideas about itself and makes room for self-reflection (conceptual spaciousness) and self-criticality (institutional self-criticality); it is a university that is situated within a culture of trust (trust) and mutual respect and humility (conviviality), through open communication and transparency (communicative openness), and one that is engaged with wider society on mutual terms (societal transactionality). What we present here is our vision of such an imagined university, and we see this serving as a starting point for dialog. We see the application of an agile form of PBL within a human ecology for learning as an important step in reimagining the university in the 21<sup>st</sup> century. However, this is currently still in the imagination; the next step will be fleshing out the practical application without losing the essence of what has been imagined. With Barnett (2013) we see this as an instance of “responsible anarchism” which is a necessary step in unleashing the imagination and letting it soar, without ignoring its feasibility” (p. 43).

Overall, agile PBL is about recognising, respecting and responding to supercomplex changes. It deliberately blurs the boundaries between disciplines, between students and teachers, between students and employers, between employers and teachers, between formal and informal learning spaces, and between academics and professional staff. It is based on the recognition that all of these elements are

interconnected, rather than exist in discrete units. This is not about maintaining comfort zones, but rather about becoming comfortable with discomfort. The actual implementation is of course beyond the scope of this paper and we envisage that changing mind-sets towards this vision will be a mammoth task. However, we believe that the alternative of leaving things as they are will one day have us look down to a bottom that has suddenly fallen out, and more distressingly, will leave a generation of students fearful to think, feel, act, generate and challenge in a 21<sup>st</sup> century context.

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