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Title:
Creative Ecologies in Education Futures

Date:
2019

Citation:
de Bruin, L. & Harris, A. M. (2019). Creative Ecologies in Education Futures. Mullen, CA (Ed.). Creativity Under Duress in Education?, (1), 3, pp.99-105. Springer.

Persistent Link:
https://hdl.handle.net/11343/311548

Chapter X
Creative Ecologies and Education Futures

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Abstract. The challenge to foster greater creativity in education systems represents a range of diverse and complex affordances and constraints. Creativity research in education spans policy, teaching, learning and assessment, as well as environments within and beyond the school that promote creative encounters. Worldwide, creativity, critical thinking, and problem-solving skills are marked as essential for effective learners and future employees. Creativity is closely linked with the development of flexible thinking and lateral problem-solving. Yet a shift is occurring from interest in creative individuals to creative ecologies in sociocultural formations of digitally networked cultures and collaborative methods of thinking (Harris, 2016). The value of attending to increasing creative sociality within and between diverse cultures and contexts is growing. Drawing on an international study of creativity in secondary schools across Australia, Canada, Singapore, and the United States, the authors argue that because creativity in education is central to lifelong learning and work satisfaction, schools must radically shift toward a more interdisciplinary whole-school creative ecology approach, and away from siloed disciplinary and individualist learning. The chapter draws on aspects of creative ecologies in education that combine science, technology, arts, culture, and industry, showing creativity as a fundamental aspect of education across all domains.

Keywords: creative ecologies, creative ecosystems, collaboration, creativity, interdisciplinary teaching and learning

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1.1 Introduction

Leading debates in creative educational change over the coming generation have now been firmly established. The way creativity is defined, fostered, assessed, and linked with/driven by industry, and how educational contexts interpret and prepare learners for futures shaped by creative and innovative challenges, are central to these debates. Creativity scholars have sought to define and diversify understandings of creativity's influence on core education in the 21st century and in contemporary workplaces (e.g., Harris, 2016; Jeffrey, 2006).

Globally, research is increasingly questioning what productive, implementable, and sustainable creativity across the education and employment lifespan might mean. In particular, there is interest in looking beyond a collection of rubrics, curricular skills, or general capability schemas. At the same time, creative economic discourses, such as design thinking and creative (and cultural) industries, trickle down through tertiary, and increasingly secondary, education practices, disconnecting education and workplace cultures. Standardised testing and more static/traditional pedagogies stand in stark contrast to workplace flexibility and adaptability skills. Creativity education researchers recognise the need to build upon instrumental concerns with definitions, assessment and 'top 10 lists,' thereby demanding a more nuanced 'mindset shift' approach (Araya & Peters, 2010; Harris, 2017; Sawyer, 2011). Creativity research specific to education argues the development of flexible and iterative practices that can both innovate and reinterpret current pedagogies through shared construction of new knowledge between learning domains, and teachers and students (Griffin & Care, 2015; Runco, 2014).

Whilst most studies of creativity in education emphasise critical thinking and problem-solving amongst learners, other approaches including design thinking and metacognitive studies point to convergent and divergent planning. Metacognition (i.e., thinking about thinking) in/as creative learning are well-documented constructs for

developing both individual and collective creativity (de Bruin, 2016; Hesse et al., 2015; Zimmerman, 2011).

A persistent yet false binary between arts and Science, Technology, Engineering and Maths (STEM) exists in the "creativity debate." This binary undermines the valuable task of increasing contemporary inter- and transdisciplinary approaches rather than more narrow and siloed disciplinary knowledge. Indeed, creativity research highlights the need to foster the flexible, collaborative, and improvisational skills of creative thinking and doing. Not all older research is outdated though. For example, Runco's (1984) early research on personality traits common to creative students is still widely used today, with relevance to research on networked creative workspaces and work practices. Globally, a range of studies have contributed to the body of work in this area. Studies in Hong Kong (i.e., Chan & Chan, 1999; Chan & Yuen, 2014) combined a focus on teacher and student motivation, with attention to environmental factors affecting creative development. In the Turkish context, Baloğlu and Karadağ's (2009) investigation of the relationships between teachers' thinking styles and creative environment enhancement has continued importance. Their study, which used both the Fostering Teacher Index Scale (CFTIS) (Soh, 2000) and a Thinking Styles Inventory (TSI), importantly incorporates a contextual or environmental focus.

While individual creative skills and capacities remain important, multinational employers and global markets are moving toward an ecological approach, with hiring practices shifting toward those with good leadership and group skills and those attending to improving the environment and work/collaboration practices. Similarly, an increasingly important part of classroom environment change is attention on collaboration and group dynamics. Shin and Jang's (2017) study within Korean elementary schools found that specific creative dynamics in the classroom were central to fostering effective creative environments: interpersonal (ecological) factors of conflict and play, students' personalities

and motivation, and teaching and learning styles.

Creativity education and policy in many countries grapples with the role that business (especially the technology sector) is (or will be) playing in curriculum, pedagogy, and industry partnerships. Creativity in education has become synonymous with critical thinking and "innovation" (Florida, 2014; Garnham, 2005). Changes in creative workplace cultures have encouraged schools to move toward greater interdisciplinarity as a means to creative innovation, by highlighting the value of creative leadership, multiliteracies, lateral connectivity, and design thinking approaches. While still resisting a move away from siloed subject areas, secondary school creativity is increasingly ecological in promoting learning interactions that foster flexibility and processes-orientation with product outcomes (Harris, 2014; Plucker, Beghetto & Dow, 2004). Design research highlights how innovative thinking employs both abstract and concrete, as well as analytic and synthetic, processing (Beckman & Berry, 2007), yet assessment still dominates education research into creativity (Tanggaard & Elmholdt, 2008).

Teachers engage in a wide variety of evaluative practices in an effort to quantify how students create. Assessing for creative learning as a processual "event" can be difficult using existing assessment standards which remain focused on outcomes rather than processes (e.g., Craft, 2011; Harris, 2017; Lin & Cho, 2011; Lucas et al., 2013; Taddei, 2009).

1.2 Fostering Creative Ecologies

The three-year international study entitled *The Creative Turn: Creativity and Innovation in Secondary Schools* (Harris, 2016) recognised the need for user-friendly tools resulting in the first Australian education-focused *Creativity Index* and *Whole School Creativity Audit*. At the same time, this study emphasises that a one-size-fits-all approach does little more than quell anxiety in the education sector. These self-assessment checklists allow schools to gauge their own whole-school creative ecology and monitor improvement over time.

The ecological approach used in these tools facilitates a coordinated systems approach. Included in such an approach are leadership, teaching and learning strategies, administrative support, professional development procedures, school structures and organisation including timetabling, and more. Attending to school environments as networked worksites allows a shift from skills, capacities and aptitudes of previous creativity enhancement to an environmental approach. This shift allows for consideration of creative schools as workplaces, communities, and ecosystems (or ecologies), which is more in line with creative industries and design thinking approaches (Harris 2017; Kacerauskas & Zavadskas, 2015; Howkins, 2011; Stankeviciene et al, 2011; Gollmitzer & Murray, 2008); Hearn et al, 2007; Leadbeater, 2010).

School systems and school environments themselves are beginning to be understood as creative ecosystems, dynamic collaborative environments that could more productively support and incentivise transdisciplinary STEAM (Science, Technology, Engineering, Arts, Mathematics) educational achievement goals, as well as core creativity skills such as productive risk-taking group brainstorming, and critical thinking (Tan, 2014).

Creativity scholars agree that cognitive flexibility and creative improvisation is also central to engaging critically and creatively in a global creative economy (Kaufman & Sternberg, 2010; Runco, 2014; Taddei, 2009; Ward, 2004). A creative ecologies approach in which whole school environments are developed as an interdependent ecosystem—rather than discreet and atomised teacher or student practices and aptitudes—provides a missing macro-oriented perspective on teaching and learning practices and whole-school environments.

1.3 Networked and Collective Creativities

While metacognition scholarship has long argued for the need to develop students' critical reflexivity about their own thinking and learning processes (e.g, Lawson, 2006; Nosich,

2012; Schwartz, 2009), research on 21st century networked culture points toward collective approaches to understanding creative collaboration and co-design. Digital media scholars concur that curatorial and critical thinking are additional core skills of increasingly digital, networked and global creative learners and workers (Harris 2014; Sefton-Green 2011). The change in pedagogical development of of 21st century global workers requires learners to see beyond themselves as individuals, and toward a vision of self as collaborative co-designer within an ecology of creative others (McPherson & Renwick, 2011).

Critical and creative thinking education has expanded from individual, extrinsically-motivated and -monitored work to learning within groups in experiential, multisensory environments where experimentation is intrinsically motivated (Harris, 2017; Järvelä et al., 2015). Educators increasingly see the value of collaborative participation in interactive learning events that foster interpersonal negotiation, group-devised contribution to knowledge, and creative outputs.

Greater attention to creative ecosystems (over individual traits) can help education service providers develop creative cultures rather than creative individuals per se, and expand their creative networks outside of schools (Glaveanu, 2014). Networked and distributed approaches to creativity (rather than individualist ones) can offer multiple opportunities for rehearsing creative processes and relationships (Harris, 2016; Chan & Yuen, 2014), offering empirical evidence for both metacognitive and co-design approaches (Harris, 2017; de Bruin 2016; Zimmerman, 2000).

1.4 Self-regulation Theory and Collaborative Creativity

While creative ecologies do challenge metacognitive and other individualist (including giftedness) approaches to the study of creativity, here we include aspects of self-regulation theory that encompass three phases of activity pertinent to ecosystems approaches: pre-action, in-action and after-action. While Zimmerman (2000) asserts that learners prompt and

adjust their activity through a feedback loop that monitors actual outcomes against goal orientations, metacognition theory advances the notion of individual decision-making (Hadwin & Oshige, 2011) informing co-regulation (CoRL) and socially shared regulation (SSRL) in successful collaborative and interactive learning (Zimmerman & Schunk, 2011).

Whilst CoRL involves the regulation of activity between student and peer or teacher, SSRL refers to processes collaborators use to regulate their collective activity. SSRL for groups involves interdependence and collectivity in shared regulatory processes, beliefs, and knowledge (Hadwin, Järvelä, & Miller, 2011) whereby learners engage with, collaborate, and activate self-regulated, co-regulated and SSRL with peers and teachers (de Bruin 2016, 2018). Best-practice creative ecosystem activities therefore encourage students to adapt to situated contextual demands and preference learning that involves all three processes occurring simultaneously (Hadwin et al., 2011). Training in skills like empathy (step one in Design Thinking, and a core component, for example, of drama education) can help teachers develop comfort and confidence with their students' and their own creative risk-taking, iteration approaches, and productive failure.

1.5 Harris' Creative Ecologies secondary school study (2014-2016)

Creativity is consistently identified one of the three most significant curricular skills from early childhood to tertiary or vocational training (Curriculum Development Council, 2000). A desire for greater creativity within secondary education, as well as more consistent and sustainable creative education across the education lifespan informed Harris' three-year study of secondary teaching and learning practices across Australia, Canada, Singapore, and the United States (2014-2016). This study also recognised the need for more comprehensive and forward-looking policy change regarding creative teaching and learning, as well as a creativity framework for teacher education reform. Research shows that the two major barriers to implementing creative practices in classrooms are lack of sufficient time and

teachers' discomfort or unfamiliarity with creative approaches and skills (Harris, 2016; Flew, 2012).

Harris' (2016; 2017) mixed method study reported widespread desire from both teachers and school leaders for more individualised training, professional development and whole-school training for fostering creativity across their schools. The study drew on 681 student surveys and 30 student focus groups within Australia, in addition to over 70 one-on-one interviews with teachers and school leaders from all four countries. The study focused on creative events, environments, values, and restrictions experienced in secondary schools. Both principals and teachers saw educational value in developing creative teaching and learning both at the micro and macro levels, yet were concerned with standardised testing procedures that reduce time and severely curtail the development of slower and deeper teaching methods that engage students (and themselves) in creative activities and achievements.

While teachers consistently identified rigid organisational and assessment constraints, the most significant impediment to ongoing and sustained fostering of creative learning in students was a lack of time. This problem was tied to standardised testing, especially in the senior secondary years, across all four countries. For most teachers, "teaching to the test" imperatives created time-poor ecologies in which teachers, students, and school leaders were unwilling to try creative approaches to learning at any level. Conversely, positive and trusting learning relationships between teachers and students stimulated creative mindsets, as well as teachers collaborating with each other transdisciplinarily. The study identified four main creative areas for improvement: *creative facilitators, creative environments*, *school leadership,* and *policy change* (Harris, 2017), each of which we next expand upon.

1.5.1 Creative Facilitators

Effective dynamic interpersonal connections between teacher and student were found to nurture problem-solving and divergent thinking, and promote flexible, imaginative possibility thinking (Craft, 2005). Creative education requires space in which facilitators (teachers) can explore the curriculum, expand the class, and enjoy productive risk-taking once trust is established. Teacher respondents articulated differences and similarities in the way they understood creativity, and the way it appeared in their classrooms. Teachers described fostering creativity through learning events in which identifiable transferable skills like problem-solving, imagination, critical thinking, and improvisation can be encouraged for more creative involvement with learning tasks.

Engaging class activities that engaged and developed curiosity/independence, empathy, analytical skills, resilience, complexity, and communication were conducive to such creative 'events'. Teachers recognised the need to be creatively engaging regardless of subject area, understanding that as facilitators of creativity they must take a lead role in modelling critical thinking and creative experimentation. Through effective modelling, teachers could encourage and value personal development of creativity, even when their school environment or education system overall devalued it. Teachers expressed the need to explore, take risks, and recalibrate not only their thinking but also of the students' in promoting a safe and trusting relationship between teacher and student within an environment that facilitates learning at one's own pace and where multiple possibilities to solutions can be worked out to their inevitable success or failure. Student respondents referred to influential teachers across diverse subject areas who modelled creativity, who introduced and scaffolded learning through creative processes, and who had been transformative for the students' conception of creativity, collaboration and design thinking.

A social or ecological view of creativity is that manifestations of creativity are usually the result of complex collaborations across social groups (Harris, 2016).The teacher, school

leader and student data in this study supported that view. Teachers noted that specific collaborative practices facilitated students' development of, and confidence in, their creativity and creative relationships, and that had a direct increase in achievement and lateral application in other subjects.

1.5.2 Creative Environments

Research has shown that both physical and social environments impact creative capacity (e.g., Hunter, Bedell, & Mumford, 2007) and that characteristics of this social environment affect whether and how creativity emerges (Csikszentmihalyi, 1996; Gardner, 1993). Teacher participants (in Harris 2017) described the learning environment they tried to create, depicting classes as a dynamic "incubation bed," with teachers as "trainers" who mentored students and acted as role models. Organisation of classrooms that promote ideation, prototyping, and reflection/re-evaluation of work individually as well as through collaborative interplay stimulate metacognition and increase students' positive involvement in creative learning and critical thinking.

Student participants (Harris 2017) felt that environments in which they were allowed to trust their curiosity, intuition and creative "daydreams" offered an empowering creative landscape. Patience and understanding was a cornerstone of the learning relationship, with one teacher expressing, "We go as fast as we can but as slow as we must." A strengths-based approach was seen as crucial to establishing creative environments through trusting relationships, reflected in physical environment features such as more "private" space to ideate, wander, and engage in unstructured creative activity or just have some down time.

Research indicates that both students and teachers (as well as employees and managers) are more creative in environments in which personal control can be exercised over activities and the environment (Amabile, 1995; Araya & Peters, 2010; Ryan & Deci, 2000), but in which there is also room for play. Creativity in classrooms was perceived as not a

static, procedural expectation, but rather as having emerged from interactive events or "creative moments." Good teachers were those who developed strategies for enabling creative environments for self-guided student experimentation, for validating productive risk-taking, and for celebrating the irregular appearance of "aha" moments rather than seek to engineer rote pedagogical and behavioural practices.

Creative thought, effort, and collaboration were deemed possible within and across domains via interdisciplinary connectivity. Sites of creativity were perceived as being not exclusive to creative arts subjects but instead as connected interdisciplinarily. Creative environments were those making space for intermingling mathematics and music, English and drama, and graphic design and science. Student responses reflected a growing body of research on the transferability of creative and arts skills to enhance learning in other areas of endeavour. These moments of transferability provided opportunities for peered and tiered (Harris 2013) learning between students and multi-directionally between students and with teachers, affording a thinking-together approach that was unquestionably welcome.

School environments were desired that provide time to brainstorm, collaborate, develop, and plan programs, exchange ideas, and enact deep(er) critical and creative activities, yet these were the scarcest of creative resources reported. Coupled with a crowded curriculum, student and teacher participants lamented the limited opportunities for "what if moments" and "possibility thinking" (Jeffrey & Craft, 2006).

Student, teacher, and school leader participants were all critical of school cultures and practices that reduced creative opportunities, insufficient engagement with digital media, retention of outdated and overly narrow definitions of success, and lack of flexibility and openness to student input into their own learning. Such inhibitors to building truly creative ecologies within schools rather than isolated practices by gifted or creative individuals require coordinated change at the environmental practice and policy level, drawing on greater

links with creative and design literature and empirical success evident in changes in workplace mindsets.

1.5.3 School leadership

Principals who adopt approaches that encourage staff to build capacity, resilience, and confidence in applying creative approaches in class foster creative school environments. School leaders (Harris 2017) described this crucial creativity-enabling work as "building capacity," "celebrating capacity," and "giving permission to develop the capacity of themselves and others through risk-taking and reinvention."

The principals in this study established the creative environment of their schools through encouraging productive risk-taking (a core component of creativity) and positively assuaging their teachers' and students' fear of failure. Administrators play a crucial role in modelling and valuing creative skills and capacities, thereby enabling their whole-school community to flourish as a creative environment, specifically a networked ecology of creative practices, spaces, and relationships. Even schools where teachers felt confident in their own creative abilities, the school community's environmental creativity was enhanced or diminished depending on the affects of school policy and leadership.

Some principals noted that in developing and fostering individual as well as collaborative creativities in their schools, there was a greater—but still insufficient—need to address assessment of students' conceptual and practical understanding of their creative works. Cowdroy and de Graaff (2005) describe the need for a double paradigm shift in teacher pedagogy and assessment, "from teacher-derived criteria for examination of work to student-derived criteria of assessment of the student's understanding of his or her own concept in terms of the philosophical and theoretical frameworks of the relevant field of creativity" (p. 515). Similarly, Lucas and Claxton (2009) argue for assessment that focuses on the learner: "our experience suggests that finding ways of tracking and articulating

progression in wider skills may well best be done in collaboration with the learners themselves" (p. 31). In most schools, a culture of accumulation in standardised testing is well entrenched. Similarly, assessment by traditional measures remains a preoccupation of the creativity debate regarding how to implement creative skills and capacities, and measure their demonstration, in schools.

Principals and other school leaders expressed a commitment to fostering creativity in their school environments, but were challenged by both teachers and parents who voiced anxiety about its value and the perceived risk to students' preparation for future goals (e.g., university entrance, good jobs). Principals struggled to support teachers who consistently felt they lacked the skills and preparedness to teach in a way that elicits creative responses and thinking. Within subject areas, younger teachers felt it was often difficult to get older, more experienced staff to experiment and diverge from tried and tested class methods and management styles. Some conflicting narratives emerged among teachers who felt hesitant to invest in developing new classroom styles when their perception is that leadership and the cultural ecology of the school remains generally resistant to valuing creativity, despite its ubiquity in curriculum (and increasingly school-based) policy documents.

1.5.4 Policy Change

Professional teacher training can bring macro-level change to the education sector through better skills development in improvisation, ideation, and trans- and inter-disciplinary collaboration (Sawyer, 2015; Tan, 2014). Yet many teachers and school leaders feel that creativity is just one more thing added to an already full curriculum and school timetable. Creativity education policy is central to helping "arm" teachers, school leaders, and all those interested in changing standardised curricula and school ecologies toward more open, creative innovative places against those who fear or criticise such moves.

The Australian government (like other governments worldwide) has identified a need

to improve teacher capacities in creativity including across STEM subjects (Arts Council Wales, 2015; Commonwealth of Australia, 2017) in policy and vision documents. An example is the Australian government's *Inquiry into Innovation and Creativity* (AP, 2016) policy document and *Recommendation 10 (2.94)*, which "recommends that the National Innovation and Science Agenda explicitly recognise the importance of STEAM, creative digital skills, the creative industries and the arts more generally" (p. 40). Still, even well-meaning government policies have failed to effectively implement these creativity imperatives in compulsory teacher training or professional development of inservice teachers or school ecologies(Harris & de Bruin, 2017a, 2017b; NESTA, 2012; Warwick Commission, 2015).

Still missing is attention to the need for creating better creative environments and cultures (ecologies) in schools. This would require that students have the time and space to practice their creative, practical, and leadership skills in environments resembling the professional settings in which they will be employed. Harris (2016, 2017) and other creativity research (e.g., Craft, 2003; Kim et al., 2012; Partnership for 21st Century Skills, 2009; Roberts, 2006; Robinson, 2011; Sefton-Green, 2011; Yakman & Lee, 2012) argues that individualist approaches to learning and teaching are insufficient. They agree that what is needed are systematic and sustainable whole-school approaches that cultivate creative ecologies within schools in order to make effective and long-lasting change.

Whilst a discourse of greater creativity and innovation is now widespread in education policy (e.g., Cho et al., 2011; Craft, 2005; Flew, 2012; Leong & Leung, 2013), cultural and political resistance still shackle educators to outdated, individualist, and subject-specific ways of thinking about workplace creativity and innovation. While computer coding in early years education may be the most ubiquitous example of creativity permeating mathematics and other STEM subjects, in practice there remains a long way to go beyond a

narrow digital technological understanding of creativity education or creative industries more generally (Garnham, 2005).

1.6 International Policy Approaches

Policy analysts continue to argue the need for better development of creative and cultural industry preparation since the UK's report titled *All Our Futures* (National Advisory Committee on Creative and Cultural Education, 1999), which appeared two decades ago (Claxton & Lucas, 2015; Craft, 2005; Craft et al., 2008; Creative Partnerships UK, 2012; Jeffrey, 2006; Lucas, Claxton, & Spencer, 2013; Thomson & Sefton-Green, 2010; Warwick Report, 2015). Examples since then from national policy perspectives include: Scotland's national creative education policy and vision documents *Fostering Creativity* (Education Scotland, n.d.; Creative Scotland, 2013), *Korean Secondary Education Research* (Cho et. al., 2011), Hong Kong's creativity curriculum restructure (Curriculum Development Council, 2000), and the European Commission's survey of creativity in schools in Europe *Fostering Creative Learning and Supporting Innovative Teaching* (Ferrari et al., 2009), to name a few.

In addition, national economic indexes (see particularly Beijing [2012] and Hong Kong [2012]) are on the rise, positioning creativity education as part of a greater creative economies ecology. More recently, reports like the internationally-comparative *Global Creativity Index* (GCI, 2015), rank nations worldwide based on their gross domestic product and other creative economic measures. Such measures allow them to plot their "advanced economic growth and sustainable prosperity based on the performance of its creative class" (Florida, 2015, n.p.), thus ensuring creativity's primary position in national economic forecasts for at least the next generation. Yet education-based Creative Indexes (such as Harris, 2017) that value creative skills alongside more traditional benchmarks like literacy and numeracy scores are only beginning to emerge as necessary education companions to the PISA (Programme for International Student Assessment) and other international ranking tests

tied to national economic health.

Across Asia, educational change remains firmly attentive to a move away from rote teaching and learning practices but is slow to move toward more collaborative and experiential education styles. Singaporean education has improved student outcomes through curricular change and teaching that enhances critical thinking, inquiry, and investigation (Darling-Hammond, 2012) by developing independent and collaborative learning skills, and by "creating an inquiry culture among teachers" (p. 328).

Cheng (2004) notes the emergence of a Chinese model of creativity education, within an educational region that remains largely dominated by standardised learning, teaching, and testing. Yet most creativity education scholarship remains focused around individualist notions of creativity, or individual skills and capacities, rather than ecological or environmental approaches for effecting whole-school change. Increasingly though, creativity scholars are seeking to tie metacognitive and individual measures of creativity to environmental enhancement, recognising the networked nature of creativity development (Amabile, 1996; Csikszentmihalyi, 2014; Harris, 2017; Seelig, 2012).

1.7 Creative Turn in Teacher Practice

The challenge of fostering greater creativity in education involves a range of complex affordances and constraints, united primarily by the school-based ecologies. Such efforts must span teaching, learning and assessment, as well as the environments within and beyond the school that promote creative encounters. Worldwide, creativity, critical thinking, and problem-solving skills have been marked as essential for effective learners and future employees and employers. Yet, despite ample empirical evidence, teacher education and in-service teaching seems slow to adopt design thinking or other systems-based approaches. Increased attention on trans- and interdisciplinary practices in both creative education research and teacher training and practice offer new opportunities for threading diverse

disciplinary (subject) practices to work toward common goals (Holley, 2009), breaking down disciplinary boundaries (Moran, 2002, 2009).

The social and distributed nature of creativity through practices of designing, reflecting, and collaborating is increasingly required of teachers as well as students (Glăveanu, 2014). Collaboration is key to developing shared understandings, practices, and goals among team members, regardless of whether the creative ecology consists of teachers and students, co-workers, or creative industry collaborators (Sawyer, 2011; Wells & Arauz, 2006). Successful collaboration between students can evoke positive interdependency by team members—an ideal collaborative environment in which groups create in ways that exceed the abilities of any one individual (Vass & Littleton, 2009). Whilst there are similarities between successful collaborative knowledge construction and creative collaboration concepts, creativity and learning are not simply one and the same thing in all contexts (Sawyer, 2015; Sawyer & DeZutter, 2009; Craft 2008).

1.8 Future Visions

Florida (2015, 2014) has argued for an environmental (or ecological) engineering strategy of creative economies in which urban environments are creatively engineered rather than allowing or hoping for creativity to organically emerge. Although his research has been widely criticised over the past decade, Florida's overall argument for an environmental approach to fostering creativity in cultural and collective settings still holds sway. In a Floridian commodified creative economy, broader principles of creativity reflect a dominant Western meta-narrative of 'progress' wherein learners must progress from school to industry with *just the right amount* of creativity to meet current demands. Yet, digital technology over the past decade has accelerated at a rate not even Florida predicted. Emaciated contemporary understandings of 'creative industries'—envisioned by Claxton and Lucas (2015) as a

multifaceted and interconnected performance of creativity across all sectors—has been reduced to a dangerously narrow tech-sector economic driver (O'Connor & Wynne, 2017).

A narrowing creative industries discourse over the past twenty-five years has increasingly decoupled creativity from arts and culture, and tethered creativity to more economic catch-words like *innovation, design* and *critical thinking* (Harris, 2014). The value of creative practices in compulsory and tertiary schooling has moved from a use-value of wellbeing and whole-child development to national investment in global transnational economic measures such as the increasingly popular *creativity indexes*. Improving transnational creative collaboration between countries promotes more holistic creative mindsets as well as global trade (Robinson, 2012; Sprague, 2012).

Acknowledging creativity as an essential universal trait with meaning, value, and currency within global education today positions creativity education far above reductive notions of innovation. Effective creative education involves moving beyond instrumental, skills-based approaches to individual creativity, toward more networked distribution and design-oriented creative engagement within and across groups and environments. To foster truly creative ecosystems (whether national, corporate, or educational), education systems must shift to a 'macro' approach in thinking about creative practices, environments, and outputs, including assessment. Perhaps most challenging, teachers must embrace creative uncertainty, relinquishing 'expert' roles and reimagining themselves as curators, consultants, and mentors. When critical thinking becomes a mode of collaboration rather than a criterion for expertness (Ambrose, 2005; Shalley & Gilson, 2004), educators will be free from positivist notions of 'right and wrong' ways of learning. Many students now have the tools to source information in independent and unprecedented ways. What is needed for growing robust knowledge economies are resilient, creative, and flexible ideators. Sadly, the education

sector is dangerously lacking in preparing students for creative futures across a range of industries in our new knowledge economies.

The status of creativity in education highlights significant differences between the approaches of policymakers and practitioners resulting from factors such as differing incentives, goals, language, demands and timeframes (Harris 2017; Tseng & Nutley, 2014). Large-scale creative education research must continue to determine how creativity is most effectively taught and fostered, both locally and globally. Increasingly transnational contexts, values and flows coalesce, vitiate, or enhance the dynamics of localised creative ecologies. We acknowledge that the practicalities of improving creative and critical thinking across secondary and higher education contexts as well as in workplace environments (virtual and physical) is complex, yet the increasingly networked, distributed, and transnational nature of our digitised workforces demands a more robust and achievable response.

Acknowledgement

The empirical research discussed in this chapter was funded by the Australian Research Council DECRA fellowship: Anne Harris, Project #DE140100421, *The Creative Turn: Creativity and Innovation in Secondary Schools* (2014-2016).

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