Fostering Creative Ecologies in Australasian Secondary Schools

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Abstract: This study investigates and compares elements of creativity in secondary schools and classrooms in Australia and Singapore. Statistical analysis and qualitative investigation of teacher, student and leadership perceptions of the emergence, fostering and absence of creativity in school learning environments is explored. This large-scale international study (n=717) reveals the impact of teacher behaviours, teaching environments and school leadership approaches that promote and impede the enhancement of creative, critical, and innovative thinking, organisation, and curriculum structures. Implications for Australian schools and teaching urge for secondary education to challenge current, practices, pedagogies and environments, arguing for school-based strategies and considerations that enhance creativity and critical thinking and the fostering of creative ecologies within Australian schools.

Introduction

The importance of creativity to economic development has never been more a "subject of debate and research, both by academic and political institutions" (Correia & Costa 2014, p. 8). Locally and globally, research is increasingly questioning what productive, implementable and sustainable creativity across the education lifespan might mean beyond a collection of rubrics, curricular skills, or general capabilities. At the same time, creative economies, creative cognition and creative and cultural industries research continue to talk mostly about workplace flexibility and adaptable skills rather than focus on compulsory schooling and how it is increasingly disconnected from global (creative) workplace needs. There has been no regionally-focused research on Australasian creativity education (in the compulsory secondary years 7-10). Only through increased and sustainable research that bridges education and creative industries can we account for the new creative and educational practices that have emerged from the region in the last two decades. Indeed, as Runco (2003) argues, we have an ethical responsibility to do so.

Initiatives overseas such as the Welsh Government's strategic objectives for creative learning (2015 to 2020) "aim to build a successful education system which would directly contribute to greater innovation and creativity, to the cultural capital of the nation" (Arts Council Wales, 2015, p. 3). The restructuring of middle-school classes nationwide within South Korea (in public schools) through its Free Semester Program (FSP) puts in place an inter-active curriculum and increased extracurricular programming. This organisational approach meets broader and specific aims by catering to students' interests and passions, developing competencies such as creativity, problem-solving skills, and higher-order

reasoning skills, improving student happiness, and increasing opportunities for students to discover their dreams and talents (Kyung Eun Park, (2016). As South Korea's President Park Geun Hye remarked during the 2016 National Teachers Day, "our country's future depends on developing creative talents, we now need to lead changes in this generation through the power of education" Cheong Wa Dae, 2016).

Creative Victoria concurs with the necessity to value the influence of education on creativity, asserting "we have to invest in our people and their creative capacity, and in particular, their capacity to innovate" (Creative Victoria, 2016, n.p.). Australia can do better as a global and regional leader to operationalise educational and economic policy and practice toward better creative industries education in compulsory years' schooling. The consequences of failing to invest in creative education now are to risk Australia slipping regionally and globally as 21st-century creative economies advance. Our national creative economies body, *Creative Australia*, notes "Australia's increased focus on our engagement with nations in Asia provides unprecedented opportunities to grow our creative economy" (Creative Australia 2016, n.p.). This study advances knowledge within the education sector, contributing to a national agenda to develop a stronger creative climate and ecologies that facilitate creative education in Australia and across our region.

The impetus to educationally and intellectually foster creativity and innovation, and critically consider how these activities might meet the economic and workplace demands of the future is of paramount importance. Whilst a desire for greater creativity and innovation is now widespread in education, industry and government policy (Leong & Leung, 2013; Cho & Lin, 2011; Craft, 2005; Flew, 2012), political change, diversification of markets and supply suggest directional change evolving from constraining traditions and structures deeply rooted in the past (Merker, 2006; Robinson, 2011). Progressive and integrated approaches between workforce, governing bodies and education consortia are currently lacking in Australia and across the Australasian region. Consequently, secondary schools and educators may not be able to implement and develop teaching and learning practices that develop pedagogies and curricula that promote creativity in the classroom (Craft, 2011). Advancements such as these can allow Australian students to adequately thrive and compete in a complex global environment that is driven by critical thought and creativity in education worldwide.

Whilst concepts of creativity incorporate inter-disciplinarity through the lenses of innovation, curiosity, and multi-literacies, some creativity theorists see creativity defined as a discrete skill set that is taught more rigorously and more consistently than increasingly devalued and defunded arts classes taught by discipline (McWilliam & Haukka, 2009). Clearly, creativity is moving away from the domain of 'arts' education in primary and secondary classrooms, shaping significant implications for secondary school and higher education teacher-training contexts.

This study addresses this gap in understanding and training in tertiary teacher education courses but also takes a much-needed holistic or *creative ecological* approach to whole-school change (Harris 2017). Schools as learning environments operate as eco-systems of knowledge transfer and behavioural development. Significant to the nurturing of creative ecologies (Howkins, 2009), is the ways schools organise and arrange a network of habitats where people- administrators, teachers, and students change, learn and adapt (or not, in some cases). Creative ecologies within school systems are dynamic educational environments that through critical thinking develop and promote sustainable learning and innovation thinking and practices in our future workforces and industries.

The Australian education sector, particularly secondary school curricula and teacher-education programs has been slow to respond to creative and cultural industries changes in the workplace. While other countries have developed various tools for enhancing and

measuring creativity in schools (Lucas et al., 2013; Craft, 2011; Cho & Lin, 2011; Taddei, 2009), all stress the need for context-specificity, making the job of finding 'consistent' or standardised national (much less international) approaches difficult. Current research refutes the notion of universal 'one form fits all' curricula or homogenous learning communities, asserting that general categorisation and standardised assessments are insufficient for the demands of future learners (Moran, 2010).

Scholars agree that cognitive flexibility will be the greatest advantage for engaging within a global economy critically and creatively – and in Australia, we have not even yet begun to address the core skills needed to nurture this in whole student bodies. This study addresses that need by suggesting ways in which schools can attend to their own needs while helping establish consistent definitions and goals, avoiding the trap of constantly 'reinventing the wheel' or floundering in uninformed attempts to initiate creative approaches. A new and consistent approach to creativity in education is crucial for a cohesive understanding of how to nurture the transferability of creative dispositions and skills, and its impact on improving literacy, numeracy and other 'core' skills (Taddei, 2009) through not only teaching and learning practices, but through a *creative ecologies* approach in which whole school environments works together for creative change.

International Contexts and Australian Implications for Creativity Education

International governments have stressed the importance of developing creativity education and creative industries strategies. Expanding on recent worldwide research on creativity in schools in the UK and Europe (Warwick Report, 2015; Arts Council Wales, 2015; Claxton & Lucas, 2015; Lucas, Claxton and Spencer, 2013; Thomson et al., 2012; Burnard, 2011; Thomson & Sefton-Green, 2010; Thomson et al., 2009; Claxton et al., 2006; Jeffrey, 2006a; Craft, 2005; Craft et al., 2008; NACCCE, 1999), the Scottish *Journey to Excellence* research summary "Fostering Creativity" (Education Scotland, n.d.), Korean secondary education research (Cho et. al. 2011), and Bejing (2012) and Hong Kong (2012) creativity indexes, this study responds to an international focus on the need for students to be equipped with creative 21st-century skills (Sefton-Green, 2011, Leadbeater, 2010; Peters & Araya, 2010; Robinson, 2009; Burnard & White, 2008; Florida, 2002) that enables them to compete successfully in global markets. Many nations now develop not only creativity within schooling, but ongoing concern and connectivity between education, workforce, and society via creativity indices amongst a range of countries. Measurements and assessments extracted from the *Global Creativity Index* (GCI) that ranks 139 nations worldwide allow nations to plot and analyse their "advanced economic growth and sustainable prosperity based on the performance of its creative class" (Florida, 2015, n.p.).

Recent reforms of curriculum, assessment, and teaching in Singapore have "developed a creative and critical thinking culture within schools, by explicitly teaching and assessing these skills for students – and by creating an inquiry culture among teachers" (Darling-Hammond, 2012, p. 328). Singaporean education has improved student outcomes through the developing of independent and collaborative learning skills through curricular change and teaching that enhances critical thinking, inquiry, and investigation (Darling-Hammond, 2012, p. 330). With an education system that relies on streaming, school-based assessments integrated into large-scale testing systems and an "unwillingness to relax Government control" (Quak, 2009, p. 182), Singaporean secondary education reflects a system grappling with developing flexibility and diversity of learning and teaching experiences, and a well-equipped teaching workforce that can nurture creativity and innovation in its learners.

Australia is ideally placed to learn and benefit from our neighbour nations, both the positive effects from adapting creativity education and of the detrimental effects of neglect and lack of vision. Of national benefit to Australian educators and policy makers in the development of Australian creativity education, is the evincing and detailing of definitions and approaches used by our Pacific Rim neighbours. Economically and politically, our identity as a more Asia-centric nation, can through cooperation and solidarity significantly attune and enhance our educationally creative and collaborative engagement within Australasia. Development of the Australian Curriculum (Australian Curriculum Assessment and Reporting Authority (ACARA, 2012) contextualises the process of defining, locating, theorizing and implementing creativity and innovation in schools. The requirement of supporting the aims of the Australian national curriculum's inclusion of creative and critical thinking as one of its general capabilities; 'critical and creative thinking', is consistent with curriculum reframing in most other OECD countries, and makes clear the Australian government's position on integrated creativity development rather than discipline-based arts training.

Recent reviews of Australian creative and cultural education and employment strategies (Creative Victoria, 2016; Harris & Ammerman 2016; Harris 2016, 2014; *Creative Australia* Australian Government, 2013; Flew & Cunningham, 2010) have begun to analyse the interrelationship between innovation, critical and creative thinking, and how exactly schools can (and in some cases are) nurturing creative dispositions such as inquisitiveness, persistence, imagination, collaboration, and discipline (Lucas, 2016). The Melbourne Declaration on Educational Goals for Young Australians (MCEETYA, 2008) has marked a change in the national educational approach to creativity, signaling a shift away from traditional arts-based creativity in education towards internationalisation, interdisciplinarity and economic value. The Australian Government's Standing Committee on Employment, Education and Training's *Inquiry into innovation and creativity: workforce for the new economy* (Parliament of Australia, 2016) was created to ensure that "Australia's tertiary system - including universities and public and private providers of vocational education and training - can meet the needs of a future labour force focused on innovation and creativity" (n.p.). Such ubiquitous global developments form the domestic backdrop for this study and indicate an Australian groundswell of attention to creativity education that drives the need for this work.

Purpose of Study

The development of creativity has been identified as one of the three most significant generic skills across all subject curricula, spanning from pre-primary education to lifelong learning (Curriculum Development Council, 2001). A desire for greater creativity and innovation are now widespread in education, industry and government initiatives for the 21st-century the world over (Cho & Lin, 2011; Craft, 2005; Flew, 2012). The great need for sustainable education strategies can be seen in the UK and elsewhere globally where previous models of creativity education (House of Commons, Education and Skills Committee, 2007) are being defunded under contracting economies, while government policies reiterate the need for creative skills for participation in competitive global economies. Higher education training in tertiary teacher education courses is an underdeveloped field, requiring a greater transdisciplinary understanding of creativity's role. This study establishes a framework for a sustainable approach to teacher-education in creativity. The education sector, particularly secondary school curricula and teacher-education programs grapple with a consistent and measurable definition of creativity, the appropriate methods to develop creativity, and

approaches for up-skilling preservice teachers to enter the workforce ready to nurture these skills and capacities in their students. Research shows that the two main impediments to implementing creative practices in classrooms are a lack of sufficient time, and teachers' discomfort or unfamiliarity with creative approaches and skills (Harris 2016; de Bruin 2016; Flew, 2012), a central area of concern which this study addresses.

By investigating principals', teachers' and students' perspectives on creativity, this study constructs meaning from those that construct, contain and constrain what is possible, what is supported, what is accessible, what is valued, and what is not. These meanings are revealed in context wherein the form and content of the creative event are dependent on the conditions of creativity and the positioning and values attributed to the creative endeavour (Blanning, 2002). Pertinently Amabile's (1996) research on creativity goes beyond arbitrary value, acknowledging "products or responses judged to the extent that (a) it is both novel and appropriate or useful to the task at hand, and (b) the task is heuristic rather than algorithmic" (p. 35). Thus, the relationship between creativity in teaching and learning and our workforces and economies is understood as comprising symbolic forms of power and influence that touch every educational experience and motivation that is conducive to a creative and growth mindset in learners.

Whilst numerous nations have developed various tools for enhancing and measuring creativity in schools, all stress the need for context-specific and individual versions. A practical capstone module for enhancing creativity within Australian institutions of teacher education has not yet been developed. The implications of this study offer assistance to tertiary teacher education programs in improving creative pedagogies that support the enhancement of creative learning in secondary schools. This can, in turn, prepare teachers with the confidence and skills to grow creative, critical and innovative thinking practices in students.

The transferability of creative dispositions and skills, and its impact on improving literacy, numeracy, arts, and connections between domains is at the forefront of research into creativity in schools. How schools develop interpersonal skills (Facer & Williamson, 2002), collaboration, communication, and co-ordination of critical thinking (Murray & Lonne, 2006) is at the forefront of research into creative skills repertoire. Australia has not yet begun to address how these core skills can be understood and implemented by teachers and nurtured in our students. A new and consistent definition of creativity in education is crucial for a cohesive understanding of how it may be nurtured through teaching and learning practices.

This study used scrutiny of the current Australian Curriculum (Australian Curriculum Assessment and Reporting Authority (ACARA, 2012), which provided a backdrop for this research in identifying processes of defining, locating, theorizing and implementing creativity and innovation in schools through the aims of the Australian national curriculum's inclusion of creative and critical thinking as 'general capabilities'. 'Critical and creative thinking' is described as being "evident in the content of the English, mathematics, science and history learning areas" (ACARA, 2012, p.1), which was consistent with curriculum reframing in most other OECD countries. This document makes clear the government's position on integrated creativity development rather than discipline-based arts training, offers an analysis of the interrelationship between innovation, critical and creative thinking, and how exactly schools can (and in some cases are) nurturing creative dispositions. Utilizing localised and specific accounts of teacher practices, the study advances knowledge and contributes specifically to a national (Australian) agenda in developing a stronger 'creative climate' (McWilliam, 2008; Isaksen & Kaufmann, 1990).

Aims and Focus of Inquiry

This project addresses the need for a consistent, appropriate and measurable definition of creativity in schools and curricula, using the network approach of 'creative ecologies'. Lucas et al. (2013) and others have asserted a similar need for consistency, arguing that "if creativity is to be taken more seriously by educators and educational policy-makers then we need to be clearer about what it is," (p 7). Such clarity will assist educators in identifying the emphases in educational programs and the pedagogies that support the development of creativity in young Australians.

This study focused on the ways that creativity and innovation are understood between countries and the ways that creativity presents itself in existing schools and from student and teacher practices and school environments. This study produced a reliable set of regionally and internationally comparable data that provides education and creative industry policymakers with an invaluable resource for curriculum, pedagogy, and economic innovation. This study contributes crucial understandings of these local and regional contexts and learners/makers through its inclusion of both Asian, Australian, and UK contexts. The study revealed significant potential for sustainable development for creativities developed in secondary schools and offer strategic development of support to governments and departments of education and economic development in devising innovative policy.

Methodology

This study reports on data collected from individuals (principals, teachers, and students) through interviews and focus groups in a range of diverse schools from Australia, the United States, Canada and Singapore. In this paper, we address only the Australian and Singaporean data, for purposes of regional comparison. The Australian data gathering process began with an initial survey of student cohorts (years 8/9, ages 13-14, 717 students in total) that gathered quantitative data via Qualtrix pertaining to their perceptions of creativity within their school. This was used as a contextualizing element that informed the qualitative questioning throughout the international breadth of the study. These questions were delivered through one-on-one interviews with teachers in which they were asked to describe within their classrooms and school environments where there were opportunities for creative approaches, their own professional creativity education development, and 'hot spots' (classes, extracurricular groups, and activities, spaces) in which creativity thrived. Focus groups of students (n=8-12) utilized visual arts methods (drawing, writing, paper sculpting) to allow students to express their vision of their "ideal creative school of the future".

This study reports on the analysis of data gathered from a participant questionnaire, focus groups, and one-on-one interviews (Harris 2017). Participant interviews and focus groups captured a qualitative narrative richness of experiential, environmental and personal expressions of creativity. A phenomenological approach to this study explored teachers' reflections of their practice and students' understandings and reflections that encapsulate their creative processes, act, and products. Focus groups elicited thick description of the participants' beliefs, understandings, and experiences that focused on the experiential interpretation of creative processes and acts (Creswell, 2008; Smith, 2015) without imposing any a priori categorisation that may limit the field of inquiry (Fontana & Frey, 2000). The participants included 41 Australian teachers; 14 Arts and 26 non-Arts based. The teachers represented a diverse range of schools, from Queensland, New South Wales, Victoria, Tasmania, Western Australia and Northern Territory. The Singaporean sample contained 3 Arts and 4 non-Arts based teachers.

Data Analysis

Statistical and survey data was coded and analysed using Dedoose software. Participant interviews and transcripts were completed by the lead researcher. The text was firstly open-coded through an 'immersion approach' that established preliminary interpretations (Pothoulaki, MacDonald, and Flowers, 2012). Multiple readings accompanied by general note taking summarised chunks of data into initial groupings, key words and phrases were then extracted (Pothoulaki, MacDonald, & Flowers, 2012) and refined into four 'distinctive categories of experience' (Nixon et al. 2013, p. 217).

Findings

Findings are presented through the four emergent categories, revealing distinctive thematically separated experiences in which qualitative data is presented; definitions of creativity, creative ecologies, enhancement of pedagogical approaches, and impediments to creativity.

Definitions of Creativity
Singapore

Singapore has a national education structure with a pervading culture of high stakes national exams and large class sizes (40) that are seen to impede more creative pedagogies and curriculum. The Singaporean teachers in this study widely reported that school cultures are expected by the Education Ministry to be innovative and independent learners, teaching 21st-century competencies. Teachers offered a range of qualities of creativity including thinking out of the box, possibility thinking, and creativity as a way of thinking and working, collaboration, problem-solving and flexibility. One teacher remarked:

> *We try to find connections between subject areas. The first thing that dissolves are the barriers between domains; science and maths can be arranged with artistic qualities, music, maths, history and literature and languages also melt together if you allow the dialogue and creative inquiry to take hold. Establishing and nurturing this culture in a classroom is so important.*

Another teacher offered:

> *We perhaps don't use the word creativity as much, the word innovation gives a more utilitarian feel. Innovation has to lead to something, it's not just about only being creative. I think what we are really thinking about is the ability to get students to think – to have the flexibility in thinking, to be able to solve problems and to try and use what they've learned in class back to how to solve wider problems.*

Most teacher participants in Singapore felt parents held narrow definitions of what academic 'success' is, but witnessing their children performing and engaging in arts productions was beginning to turn that around because they could see the growth of confidence in their children. One teacher suggested that in Singapore, parents defined creativity and academic 'success' in somewhat narrow ways. Teachers reported that creativity is generally opposed by parental pressure because they are looking for measurable gains in academic areas which will lead to 'success'. Teachers felt that school cultures constrained their approaches to promote creativity and collective problem-solving, claiming that "there was little time to establish longer immersive projects that fostered creative and critical thinking", feeling that a dominantly utilitarian imperative was necessary.

Australia

Numerous Australian participants expressed the ability to dare to create something—risk taking as an essential feature of creativity. Confluent qualities to this such as self-reliance, confidence, resilience and ability to overcome a fear of failure was deemed part of the layered attributes of creativity. One teacher remarked:

> *If you're going to be creative, if you're pushing then you're going to fail. You're going to experience failure along the way and learn from it rather than [it being] a negative thing…it's all right to fail, it's all right for something not to be that great, it's like crafting it, building it, re-establishing yourself and moving on, and I think those are great skills that you can transfer into life as well.*

Other qualities teachers reported as embedded in creativity were teamwork, collegiality, and collaboration. One teacher remarked:

> *When you're looking at a higher aspiration to have a better creative world, then collaborative skills gained through negotiated means are so important. When the students are problem-solving together, they each bring an idea, and they get to try it out. Their dialogue, interaction, thinking out-side the box just increases, and they become more expectant of this creative thinking from each other. I try to engage students in these activities as much as I can because I see the benefits.*

Creative Ecologies

Harris (2017) has theorised *creative ecologies* as a conceptual model for fostering creativity, specifically in secondary contexts, extending notions of social creativity (Gauntlett, 2011). Nurturing creativity returns thinking and strategizing to the recognition of collaboration in creative pedagogies, and whole school cultures as creative work sites. British and Korean research has identified the secondary years as optimal for enhancing creative attributes and dispositions in developing learners. Drawing on Cho et. al's (2011) three-pronged model which prioritises creative curriculum, evaluation, and teaching/learning opportunities as the core components for 'education for creative talents', a *creative ecological model* takes Cho further by addressing the field (environment) in which these creative practices occur. Cho's model formalises three key elements of creative education research: the importance of a curriculum that formally organises and implements creativity education; the importance of creative pedagogies that nurture not only creative arts but wider creative and innovative dispositions; and developing the means for evaluating such pedagogies and programs. A new attention to the creative ecology or field of relationships within creative schools might offer is a joined-up approach to the interconnections between place, space, and practices. As Hearn et al. (2007) have suggested, a *creative ecological approach* identifies an important shift from "consumers to co-creators of value; the shift from thinking about product value to thinking about network value; and the shift from thinking about cooperation or competition to thinking about co-opetition" (p. 2). The creative industrial shift is already emerging in schools by adopting the language and strategies of creative industries; 'pro-sumers' rather than producers or consumers, and 'co-opetition' instead of collaborators or competitors. With the shift from industrial/production education economies to networked knowledge economies, schools can re-activate as important knowledge hubs in 21st-century creative economies. (Harris 2017, pp 44-45)

The teachers in this study described pedagogies used, the learning environments they tried to create and the school or institutional environment factors that affected creativity, altogether comprising diverse sets of 'creative ecologies'. Teachers in Singapore felt

administrators made choices about the school's focus and its values, particularly regarding the number of set tasks and exams students sat, and the necessity to develop rote learning skills. Despite such impediments to deeper learning opportunities, teachers described learning environments where they tried to bring out kids' curiosity, collaborative and creative thinking. Participants described that it took time for students to learn to be creative, where initially some would wait for instructions. Teachers articulated frustration at the lack of time and patience they could allow for the students to develop creative attributes; as one participant put it: "we are caught between going as fast as we can but as slow as we must".

Like Singapore, the Australian data revealed teachers negotiated highly risk-averse school environments. Prevalent amongst teacher's responses were descriptions of constraint and reflections capturing creative impetus hampered by testing cultures. Despite this, pedagogies were often creative, participants noting qualities of open-mindedness and critically reflexivity as influential in establishing creative pedagogies within constraining curricula and assessment. One teacher remarked:

The importance of creativity and creative thinking are becoming more prevalent in discourse with colleagues, and as teachers, we feel the need to drive more critical thinking and reflexivity in student's creative processes. Yet, we're moving in this data-driven approach to measuring student outcomes as we move rapidly and aggressively toward standardised, on-demand testing. Teachers want to open curriculum and methods of teaching despite NAPLAN and other perceived high stakes tests narrowing our capacities (Australian teacher 13).

Those considering approaches to enhancing creativity in secondary schools would benefit from returning to Vygotsky's zones of proximal development (ZPD), long recognised as effective in eliciting and developing creative thought and behaviour (Vygotsky, 1978). Erin Manning suggests that 'thought propels creativity as the activity of the in-between that makes relation felt, activating the "how" of the event, inciting inquiry, curiosity, play' (2009, p 225). This interrelationship between thinking-doing-place too often goes unremarked in education scholarship. Rather than thinking in terms of pedagogy or curriculum, a *creative ecologies* approach thinks in networked terms taking into consideration time, place and collaboration.

Pedagogical Approaches

Participants from Singapore noted questioning as a key pedagogical tool. This was articulated as crucial to building trust and establishing creative environments via relationships. One participant shared a process of questioning between students and teachers as part of the creative process:

The task may be to make or to think about something. During this immersion in the creative process, we ask, why do you do that, what is the purpose of this? A lot of questions, and articulating the process is very important. We want to find out from them why do they even do that in the first place. Then you may even question whether maybe this is a new original material, this is how this person has their own unique way of learning.

Singaporean teachers described utilizing approaches based on notions of understanding, empathy, and experience and one that moves beyond simple skills-based approaches. Participants widely described encouragement of student's immersion in problem finding tasks, and the teacher used as a sounding board to enhance discoveries and experiences that initiate and sustain creative endeavours. A personalised approach was perceived as crucial to building trust and establishing creative environments via trusting

relationships. One participant shared the questioning process between students and teachers, articulating the inquisitive moments, the processes and the transformations that are part of the creativity:

> We ask, why do you do that, what is your purpose? A lot of questions and the process is very important. We want to find out from students why do they even do that in the first place. Then we may even question whether maybe this is a new original material, this is how this person has their own unique way of learning.

A significant number of Australian teachers responded to pedagogy that promoted creativity through enhancing transferable skills that matched with assessment rubrics. A key question in assessing creativity is whether to measure the process or the product; the inability to use a product measurement or to measure a process. For example, if assessing creativity as a process, you would include a willingness to take risks, to act on feedback rather than assessing creative outputs. This teacher responded:

> My view is that creativity is a process, but what we measure is outcomes. Unless that creativity produces an outcome that fits into the measurable, it's really hard for it to be judged in the secondary school environment.

Metacognition was another key perspective that was reflected on via formative assessment. The encouragement of students to articulate how their thinking has changed and developed before and after an experience, in both qualitative and quantitative aspects of change, was one proposal. This teacher elaborates the dichotomy:

> Is it about assessing the creative product, or is it about consciously raising it, naming it, identifying it and assessing what we build through the quality of the process. We raise the level of importance to the process and assess it. Can that happen?

The revised Bloom's taxonomy (Krathwohl, 2002) offers a structure for helping teachers organise aspects of higher level creative thinking, making clearer at what levels students are entering the learning experience, and at what level they are exiting it. Respondents thought it possible to measure the *growth* of creative thinking within an individual, but not necessarily against a standardised scale. Teachers also discussed gauging and evaluating creativity in relation to multiple intelligences, encouraging students to leverage off and flex between different modes of thinking and responding to various situations (Moran & John-Steiner 2003; Gardner 2006, 1993).

Impediments to Creativity in Schools

Teachers and students articulated aspects of learning and teaching that constrained and restricted the flow of creative processes in class and around the whole school environment. Teachers felt they lacked the skills and preparedness to teach in a way that elicited creative responses and thinking. Teachers in Singapore reported impediments such as a lack of 'discipline mastery', with many feeling unconfident to experiment or 'productively risk-take'. Many also identified assessment as a major impediment. Despite the Singaporean syllabus stipulating that there must be room for creativity and exploration, teachers felt that assessment regimes (particularly national exams) mitigated against propagating creativity in their classrooms.

In Australia, within subject areas younger teachers felt it often harder to get older more experienced staff to experiment and diverge from tried and tested class methods and management styles. Teachers felt little compulsion to invest in developing classroom pedagogies when administration and the purveying cultural milieu within the school

remained ignorant and not pro-active in promoting discourse and inquiry into incorporating creativity within pedagogical and curriculum applications.

Institutionally within schools, those teachers that were intent on facilitating and promoting creative capacities in their students expressed frustration regarding barriers to cross-disciplinary collaboration. Lack of time to meet, develop and plan programs, exchange ideas and enact deeper critical and creative activities than what is already catered for was the most precious and rare of commodities. Coupled with a crowded curriculum, teachers themselves lamented 'what if' moments- possibility thinking towards the rewards to teachers and students of collaborative organisation, the making more transparent and permeable siloed approaches to subjects, and the use of collective 'inquiry' spaces that enabled the classroom to be a cognitive, social and cultural laboratory of thinking and action. Teachers and principal participants were critical of endemic cultural habits within the school, from lack of engagement and relevance extending to parent's and student's expectations and narrow definitions of success, and what creative, critical thinking looks like in 21st-century secondary schools.

With a focus on assessment and aversion to risk taking students acclimatised to rubrics and scores, by directing rational choices about directing their energies to perceived maximum gain, teachers may be providing for students missed valuable learning experiences. Within many school cultures, this may well be the norm rather than the exception. This teacher remarked:

> *Lots of our kids are more interested in what they need to do to get the big score, to get to where they want to get, they're making some pragmatic decisions about where they put their time and energy. To get creative outcomes you have to stick your neck out a bit and the kids who are going to do that are probably not the conformists or ones who are going to succeed in a highly-structured environment.*

Evolving and asserting creativity in classrooms is not to tame creativity, but rather to celebrate its moment, and develop strategies of how to ride its wave, to celebrate its quirkiness, and to cut it free rather than tie it down. The following teacher recollection captures such epiphanies and occurrences possible in our classrooms:

> *My students enjoy coming in and negotiating their projects. Once I started to allow them to think of how they wanted to present their learning, I was amazed at the variety and thoughtful, creative ways they choose to present their work, often visually and verbally, greatly exceeding my expectations.*

How can Secondary Schools Become Creative Ecologies*?*

Practical definitions of creativity within secondary schools have been established (Harris & Ammermann, 2016), that address the use of creative literacies, teacher education and awareness, and assessments that enhance and not constrain creativity (p. 110). This study applies a more detailed and nuanced exploration in the ways in which administrators, teachers, students, and parents negotiate and better understand creativity in learning and teaching in our schools. Strategies, considerations and pedagogical approaches enhancing creativity that emerged from the data included aspects of differentiation, constraints, structure (task structure and relational structure), systemic development v. staff development, spaces/environments, boundary crossing/cross-disciplinary, real-world relevance, partnership and the role leadership can play in asserting creative practices and pedagogies in schools.

Cross-disciplinary learning was articulated by teachers as an aspect of curriculum organisation that could have a positive effect on student understandings of creativity. The

breaking down of discipline silos and exploring creative ways of conducting and presenting on projects allowed focus on cross-disciplinary problem solving and investigatory divergent thinking that reflected on other domains and possibility thinking. Supporting strategies that encouraged trust and professionalism of teams by locating the staff team together (usually a year level) working together that facilitated the connectedness, collaboration and the easy sharing information was considered important in enacting change. This study concurs with widespread creative economies literature that shows that interdisciplinary approaches (at work, in school) provide the conditions for creativity more than any other single factor (Amabile, 1996, 1995; Florida, 2002; Gauntlett, 2011, 2007).

With the increasing standardisation of curriculum and assessments, teachers in both Singapore and Australia find it more difficult to develop classroom cultures of risk-taking and experimentation despite being eager to promote this behaviour. Schools can benefit from this aspect of learning by changing or setting school cultures to support shared philosophies of *teachers* taking risks with trying new pedagogies, that can in turn nurture student learning. Institutional training of pre-service teachers can invest in modules that enhance divergent and possibility thinking in new teachers, and break the mold of conformity and risk aversion in experienced teachers. A ten top creativity skills and capacities needed to be developed and nurtured in secondary schools (Fig.1.) offers teachers and teacher training institutions a compendium of skill/capacities and relevant supporting literature.

Top 10 Creativity Skills and Capacities

#	SKILL or capacity to be fostered	Per creativity scholar or evidence
1	**Curiosity -** Stimulating and rewarding curiosity and exploration in students	Lucas 2013; Sternberg & Lubart 1999; Csikszentmihalyi 1999; Hunter
2	**Collaboration** / Teamwork	All major studies
3	**Problem-posing / problem solving** itself rather than its impact or outcome. Amabile (1983) described situations in which creativity in problem-solving included a phased step-by-step process or a combination of pathways of steps. Research using laboratory investigations of this notion of creativity typically begin with the presentation to the participants of problems that are already well-defined.	Amabile 1983; Newell, Shane & Simon 1962, and Mumford et al. 1998, cited in Nickerson, 1999). (Walsh et al. 2011, p.
4	**Divergent thinking exercises** (such as brainstorming programs) & evaluating those divergent ideas. "Being imaginative can be seen as the divergent aspect while being disciplined can be seen as the **convergent.**	Runco 2010, p 424; Australia 2020 Summit (2007)
5	**Motivation, confidence and persistence**, especially intrinsic motivation must be built over time.	Lucas, Claxton & Spencer 2013, p 17; + Amabile (1999; 2010); Cole, Sugioka and Yamagata-Lynch (1999, p 288).
6	**Innovation** (the implementation or application of creativity in industries and in value-added production of goods or services); the process by which new ideas are implemented	Flew & Cunningham 2010; Hartley in McWilliam 2011. Robinson; Melbourne Declaration on Educational Goals for Young Australians (2008, p 8); 1999 Robinson Report *All our Future: Creativity, Culture and Education*
7	**Discipline/mastery** (by which is meant developing expertise or mastery in a range of discipline-rich technical skills and knowledge; encouraging the	Lucas 2013; Sternberg & Lubart 1999; Csikszentmihalyi 1999; Jeffrey & Craft 2004; Nickerson 1999

	acquisition/mastery of domain-specific knowledge and skills)	
#8	**Risk-taking / Mistake-making** – productive risk-taking that is not penalised by teacher or education system, in order to build creative 'trust'.	Australian Government National Innovation and Science Agenda, 2015; Cropley 1992
#9	**Synthesising**: The capacity to make connections – the ability to bring together previously unconnected 'frames of reference'	Koestler 1964; and in Nickerson 1999, p 394.
#10	**Critical thinking** - creativity as a *thinking process* – again, must be assessable to be environmentally-enhanced/valued. Lucas et al. proposed a formative assessment criteria and process for the progressive development of creativity skills in UK children aged 5-14 (NOTE: pre-senior secondary)	One of 7 'general capabilities' in the ACARA Australian National curriculum and Amabile's work on intrinsic and extrinsic motivation (1999; 2010) and Csikszentmihalyi (1999); Lucas, Claxton & Spencer 2013. Ramsden 1992; Boud 2010

Figure 1: Top 10 list from Harris (2016, p. 42)

Creativity emanates in thought, in work, in products, and emerges from the interaction of stimulus and the beholder—our students. Policy, administration and teachers are necessitating confronting the risk/reward ratio that pervades activation of application and development in teaching for creativity. Educators can and do decide against creativity, not willing to risk appropriately maintained levels of assessment compliance. Teachers' willingness to be critical of their existent pedagogical choices can mean having to change, taking risks, dancing with failure, and dismantling psychological as well as physical obstacles that impede their development effectiveness in teaching for creativity. Embedded in these environments, practices, and pedagogies are important change initiatives that help shift the identity of learners from interpreter of knowledge to creator as they immerse and revel in the interior dimensions of the creative process.

Investing in cross-disciplinary measures that enhance creativity do so by increasing student engagement and achievement because students access ideas in multiple ways that hold attention, engagement, and inquisitiveness. Creativity can not only activate cultural knowledge and meanings but promote the externalisation of this knowledge, multiple meanings and forms of creative expression. It can provide the synergy for cross-fertilisation of ideas, subject areas and skills and adaptability to a changing classroom, society, and world. Curriculum tasks and teachers that elicit creative mindsets from students develop support for initiating, informed risk-taking and self-regulated learning that promote metacognitive capacity. The knowledge that is shared has the potential to change perspectives and assert the reconstruction of new cultural meanings. Well-trained teachers can foster creativity through improvisational knowledge of skill, classroom materials and students' minds (Sawyer, 2004). Yet schools need more. School administrators can make bold decisions to reshape curriculum pedagogies and learning spaces that enable and engage creative and critical thinking. Organisational reflection and self-assessment of creativity can be a significant step to analysing and enacting positive change. The Whole School Creativity Audit (Appendix 1) can be used by schools to evaluate their readiness and commitment towards developing creative environments, cultures, and ecologies within schools.

This study contributes to evidence in support of ecological approaches to creativity education, urging a revisioning in the way schools promote creativity and critical thinking within their communities. As evolving creativity discourses effect policy, practice and school/work matrices, schools will falter unless they adapt to flexible new approaches to creative work, and reconceptualise 21st-century education in secondary schools.

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Acknowledgements

Appendices

Appendix A: Whole School Creativity Audit

School policies and practices		
External policies		
1.1	Are we aware of the national economic and education policies that address creative education?	YES/NO/ Review
1.2	Are we aware of the state-based policies and initiatives that support creative education?	
1.3	Are we aware of the ways in which the national curriculum or department of education in our district addresses creativity in education?	
1.4	Do we effectively share these documents and visions with our students and staff?	
Internal policies		
1.5	Do we actively pursue ongoing development of internal evaluations of our creative capacities, rather than defer to external requirements?	
1.6	Do our creativity policies and structures reflect the uniqueness of our community and place?	
1.7	Do our students and staff have input into our creative strategies?	
Teacher professional development		
1.8	Do we demonstrate a commitment to creativity by proactively and universally offering creativity PD to all staff and students?	
1.9	Do we recognise creativity as a skill that must and can be developed, reflected in our PD program?	
Whole-school creative practices		
1.10	Do we actively program whole-school activities that foreground creativity as artistry or innovation?	
1.11	Do we have (or are we working toward) commitment to improving our creative skills and capacities as a learning community, including the leadership of the school?	
The Product (curriculum, assessment, timetabling)		
Individual creativity		
2.1	Do we actively reward setting creative outcomes across the curriculum?	
2.2	Do all teachers in our community share equally in offering more creative modes of student demonstration of knowledge, and incorporating assessment criteria that assess the creativity component of all student work?	
2.3	Do our school leaders prioritise creative education here by adjusting the timetable to allow both students and staff time for practicing creative skills and capacities including: curriculum innovation, cognitive creative exercises and games, tolerance for ambiguity, peer- and student-led brainstorming and information-sharing?	
Collective creativity		
2.4	Do we reinforce the notion that creativity is nurtured in collaborative and collective endeavour?	
2.5	Do we provide opportunities for students and staff to work collectively in creative ways?	
2.6	Do we value the outputs of collective creativity in our school community, rather than ignore or discard the outputs?	
Thinking creatively		
2.7	Do we provide opportunities for our students and staff to demonstrate their creativity in class or outside of class time?	
2.8	Do creative products and efforts receive as much academic status or value in our community as other subjects and outputs do?	
2.9	Do we actively articulate the belief that creativity is a thinking capacity, and is not the same as artistic ability?	

	Doing creativity	
2.10	Do we provide opportunities for our students and staff to demonstrate their creativity in class or outside of class time?	
2.11	Do students and staff ALL have opportunities (and an obligation) to practice creative thinking, doing and sharing in our school?	
2.12	Is creative endeavour reinforced as a core component of academic success at this school, not just a 'time out' of serious academic work?	
	The Process	
	Individual creativity	
3.1	Do we actively work against test-like activities as often as possible, knowing this inhibits creative thinking?	
3.2	Do we actively work toward re-balancing our assessment structures toward measuring process rather than product?	
3.3	Do we prioritise collectivity and collaboration?	
	Collective creativity	
3.4	Do we prioritise collectivity and collaboration in our timetable?	
3.5	Are we committed to timetable changes to enhance opportunities for collective creativity?	
3.6	Do we reward collective-developed original and innovative work at our school?	
	Thinking creatively	
3.7	Do we encourage thinking creatively as a crucial skill for all students and staff?	
3.8	Do we reinforce the tangible value of process over product in the creative lifecycle?	
3.9	Do we explicitly teach creative thinking as part of all subject areas?	
	Doing creativity	
3.10	Do we actively program whole-school activities that foreground creativity as artistry or innovation?	
3.11	Do we allow students to demonstrate creative thinking in non-arts-based areas of inquiry?	
3.12	Do we explicitly reward creative innovation as a workplace skill that this school champions?	
	The School Environment	
	In relationship with students	
4.1	Are we prepared to give students more autonomy, emphasising the need for self-discovery as a core creative skill, even as it impacts a change in the timetable, bells, or student movements throughout our school?	YES/NO/ Review
4.2	Do we reinforce the importance of communication in creative idea-sharing?	
4.3	Do we actively reinforce the importance of risk-taking and nonconformity in problem-solving, for both academic, creative and real-world successes?	
	In relationship with staff	
4.4	Do we make opportunities for staff to intermingle, talk informally, and share ideas?	
4.5	Do staff feel a sense of control and autonomy in their work?	
4.6	Do we encourage curiosity in our staff or compliance?	
	The physical environment	
4.7	Does the school site clearly provide collaborative spaces?	
4.8	Does the school site encourage both individual and collaborative brainstorming?	
4.9	Does the school layout work actively against centralising the standardised subjects and marginalising the creative subjects and practices?	
4.10	Does the school work to integrate a range of environments (eg outdoor, indoor, quiet, interactive).	

Creative Partnerships	
Local	
5.1	Do we creatively contribute to our local community, including parents, local organisations, and local government?
5.2	Do our school community members have a clear and creative vision of who we 'are' and what the school might be in 5, 10, 20 years' time?
5.3	Do our students and staff actively seek ways to break down the walls between our school and local community?
Global	
5.4	Do we pursue new opportunities to link to the non-local world?
5.5	Does our school nurture links between the local-global in our students?
5.6	Do we actively nurture creative global connections, or share the ones we already have in our student and staff body, as real world learning opportunities?
Artistic	
5.7	Are we proactive in recognising the creative value of artistic input into our school?
5.8	Do we pursue links with expert artists in the same way we pursue relationships with expert business, science, or industry professionals?
5.9	Do we as a school make explicit links between creative, artistic and marketplace success – and work against outmoded science/business/arts dichotomies?
Business	
5.10	Do we initiate opportunities for creative sponsorship, mentorship or project-based links?
5.11	Do we actively celebrate the creative potential of industry links, and share the responsibility of developing these links amongst the students and staff community?
5.12	Do we showcase the creative and innovative work in our school to local and global industry leaders, not just others in education?