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Design educators interrogating the future of design knowledge, research and education.

The Imperative for Developing Critical and Creative Thinking Competencies in Postgraduate Design Education

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Abstract

Design education has an integral association with engaging both critical and creative thinking. While the previous critical cross-field outcomes explicitly fostered both critical and creative development (SAQA 2000), the newer level descriptors (SAQA 2012) focus almost exclusively on critical thinking. This could be because critical and creative thinking are often regarded as synonymous. Authors like Macat International Limited (2017) support this understanding by including creative thinking as a component of critical thinking, while other authors differentiate between the two concepts. For example, the World Economic Forum 'Future of Jobs' Report (2016), clearly distinguishes critical from creative thinking and includes both as separate yet integral to future employability and emerging jobs, and the twenty-first-century framework includes critical thinking and creativity as part of its four Cs of interrelated competencies. These frameworks also position design education as highly relevant to future workplaces.

This paper argues that both critical and creative thinking are imperative to academic and future workplace success, particularly in relation to postgraduate studies in design. The revision of Bloom's taxonomy of learning objectives has acknowledged the cognitive complexity of creating (Anderson et al. 2001), but many design educators are ill-equipped to teach critical and creative competencies in tandem. The focus of the NQF level descriptors and assessment criteria are perceived as largely ignoring creative thinking as intrinsic to learning development. Creativity is, therefore, relegated as being part of the hidden rather than explicit curriculum. Though not necessarily specific to postgraduate studies, because the research and professional experience is more developed of the lecturers and supervisors, students often inherit a lack of confidence in engaging these competencies in tandem from their undergraduate learning experience. A less linear hierarchical framework that democratises critical and creative thinking is, therefore, required for the design education context: one that explicitly acknowledges the critical and creative thinking competencies in relation to each other and to design education; and one that is similar to the rhizomatic model proposed by Deleuze and Guattari (1980).

Keywords: Postgraduate studies, creative education, design education, academic integrity, design research

Introduction

Educational research, like all research activity, has been delineated by a specific process, and articulated through the inclusion of verbs such as ‘review’, ‘collect’, ‘analyse’, ‘interpret’ and ‘disseminate’. While educational research holds an important position in promoting evolutionary teaching and learning practices, the relationship that critical and creative thinking has within the scope of teaching and learning has been carefully regulated so as to prioritise critical thinking and use it as a means of objectively regulating creativity. Certainly, this is what is preferred within the undergraduate teaching and learning landscape. Much of this approach then filter into how educators develop their own teaching and learning practices within design education. This approach to objectively measuring achievement of learning outcomes is entrenched in the criteria used to measure development within the National Qualifications Framework (NQF), and was, until recently, also found to be reinforced in the traditional Bloom’s taxonomic model (1956).

Úlger (2016) concluded that there is a relationship between creative and critical thinking of students pursuing degrees within design education that originates from the tendency of these students to use non-routine problem-solving processes to achieve learning outcomes. In addition to this, Ingalls Vanada (2015, p. 22) observes that there is a deficit in research concerning “the development of a balance of creative, critical, and social/emotional thinking skills in the visual arts, with concern that fostering students’ creative thinking alongside their problem solving competencies has suffered neglect”.

Postgraduate design education is not exempt from this critical-over-creative preference. The significance of contribution in the measurement of postgraduate research output certainly emphasises design thinking, as encompassing both critical and creative thinking (Ingall Vanada 2015), as a means problem-solving. However, something of the essence of what design education should achieve is lost in prioritising critical thinking as existing separately from the creative initiative needed to identify and interact with the task or problem at hand. Design education, as functioning within this academic paradigm, has long been associated with the development of creative potential: where creativity has held an integral value within the discipline that has not been fully supported by the academic framework. Therefore, this deficit does present with an opportunity to recalibrate how we see the critical-creative thinking relationship playing out in design education. With the revised Bloom’s taxonomic model reprioritising the act of creating, there is now a greater opportunity for a critical-creative thinking ‘entanglement’ (Barad 2007) that is essential to develop in postgraduate design students: engaging in both creative and critical processes, and carrying this skill into the workplace as part of a critical-creative best practice approach.

This paper argues that there is an intrinsic relationship between critical and creative thinking that is integral to the professional development of the South African postgraduate design student. Based on the analysis of these competencies, the paper proposes a revised educational taxonomic model that better aligns to the needs of design education, and dissolves the linear, hierarchical model previously used to allow creativity the scope it needs to challenge boundaries. This less linear hierarchical framework that democratises critical and creative thinking is similar to the rhizomatic model proposed by Deleuze and Guattari (1980). In so doing, this fosters the development of critical and creative thinking within a more self-directed outcome-based postgraduate teaching and learning context.

Positioning critical and creative thinking within postgraduate design education

Postgraduate education is synonymous with the academic development of professional expertise. Though this definition is simplistic, what is interesting to note is the way in which the Council of Higher Education (CHE) identifies the particular skill-set required by postgraduate students. In their 2009 report 'Postgraduate Studies in South Africa: A Statistical Profile', the CHE indicate the following:

The production of university graduates – and especially postgraduate students – is an essential component of the *national system of innovation* of modern industrialised societies. Such graduates have acquired the necessary knowledge and skills that underpin the modern knowledge economy and are able to *produce new knowledge* (2009, p. 1, own emphasis).

In the context of an outcomes-based approach, which requires an evidence-based assessment process, defining and measuring creativity has been considered problematic because of its inherently subjective nature. And yet, the imperative by the CHE to produce postgraduates that demonstrate 'innovation' and 'new knowledge' production (2009, p. 1) requires creativity but finds difficulty in promoting the objective measurement thereof. This difficulty presented as early as the 1950s, where American Psychologist JP Guilford, in his essay 'Creativity', avers that measuring creativity is dependent on other factors inherent in the creative's personality. He writes:

Creative abilities determine whether the individual has the power to exhibit creative behaviour to a noteworthy degree. Whether or not the individual who has the requisite abilities will actually produce results of a creative nature will depend upon his motivational and temperamental traits (1950, p. 444).

What Guilford suggests is that the ability to determine the merit of creativity relies on a relational paradigm that is derived from and feeds back into the creative personality. As a discipline, design has been characterised by a practical, cognitive and creative engagement in problem solving. Indeed, this is what sets the design profession apart from the other disciplines within art, science, business and technology. This traditional archetype of designer as creative in their capacity to engage with and transform the world they encounter has had to insert itself into an educational landscape that has traditionally fostered a reverence for the critical over the creative. And so, in relation to this need, the process of developing the design student as professionally capable has, more often than not, had to compromise and silence aspects of creativity to receive accreditation. Design education has suffered the hierarchies of this higher education paradigm in which boundaries of what is and is not considered academic are exclusively entrenched by the critical. Therefore, the relationship between critical thinking may be simplistically represented in Figure 1 taken from Australian Curriculum, Assessment and Reporting Authority (ACARA 2019), shows creative thinking working with critical thinking as central to meeting learning outcomes in the postgraduate design education growth path. In the past, this has allowed for creativity to be measured through the critical lens.

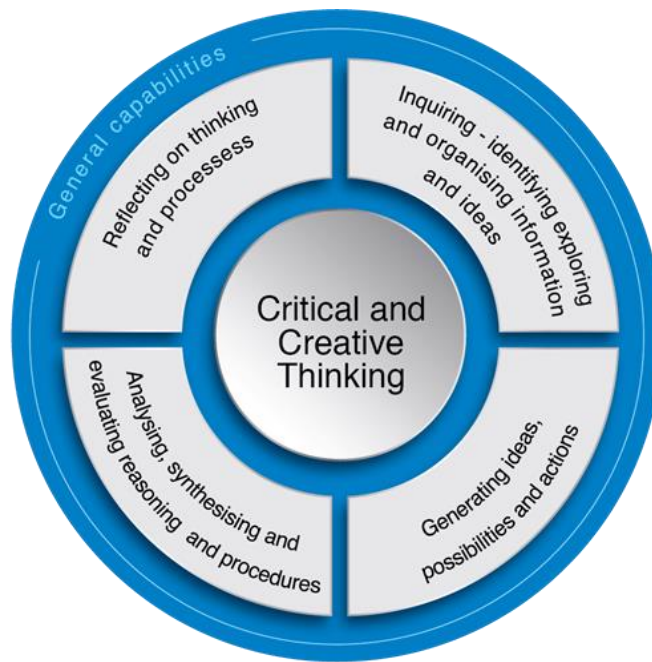
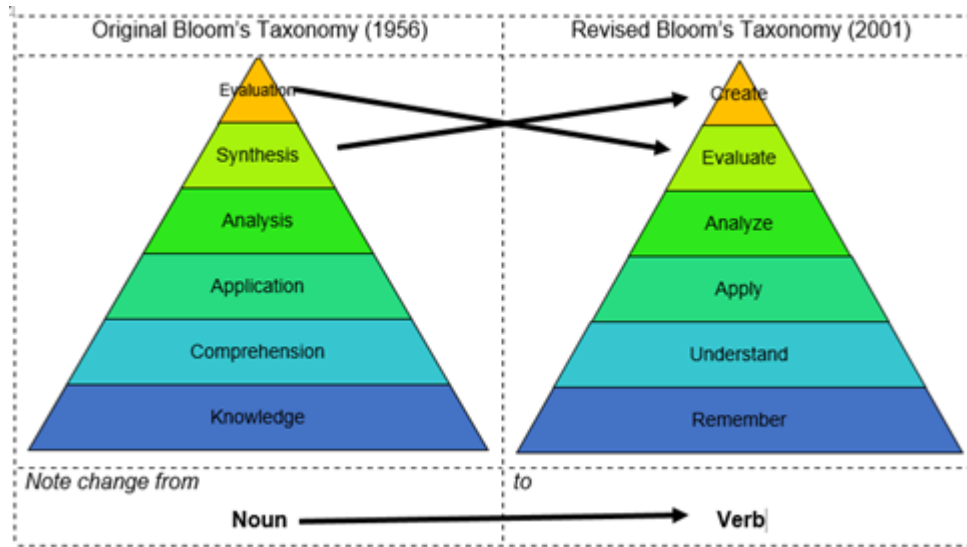


Figure 1: Organising elements for critical and creative thinking (ACARA 2019)

Developing a discipline-centred body of knowledge is emphasised to align design education within mainstream academic curricula. The context of the twenty-first century requires an acknowledgement of the more subtle negotiations between cognitive and experiential aspects that inform professional design practice which incorporate learning from experiential, iterative and reflective practice. This further informs how a postgraduate design student encounters and develops their creative practice within their professional context. In *21st Century Skills Development Through Inquiry-Based Learning: from Theory to Practice*, Chu et al. (2017) observe that subject knowledge cannot be prioritised as constituting the learned curricula. While they refer to a more universal educational context, the intrinsic, implied aspect of critical-creative engagement that marks design education is finding acknowledgement more and more within all educational contexts. Chu et al. (2017, p. 22) writes that soft skills “[including] critical thinking and problem-solving skills, communication, and collaboration skills, and creativity and innovation” are important in fostering connectedness to the world and to the pace of technological advancements, and they promote this as an essential part of learning. Chu et al. (2017, p. 22) zoom in on ‘creativity and innovation’ as skills that extend beyond learned curricula and align to the CHE’s description of postgraduate competencies that will allow South African graduates to become globally relevant.

Given that assessment is an attempt to measure, or measure proxies of, competencies, knowledge and aptitudes, how these competencies are described and articulated in a hierarchical taxonomy is constrained by the intended purpose of measuring. Within the field of education, Lai (2011, p. 8) refers to Bloom (1956) and his taxonomy of cognitive competencies as the most widely cited sources for educational practitioners when it comes to teaching and assessing higher-order thinking competencies. Bloom’s taxonomy was revised to place ‘create’ at the highest level. The figure below gives a brief overview of the levels in the original taxonomy (Bloom 1956) and that of the revision (Anderson et al. 2001).

Table 1: Comparing Bloom’s taxonomy (Bloom 1956) to the revised Bloom’s taxonomy (Anderson et al. 2001), adapted from Wilson (2016) by Goode (2019)



In their revision of Bloom’s taxonomy, Anderson et al. (2001, p. 30) define create as “putting elements together to form a coherent or functional whole; reorganise elements into a new pattern or structure”. When Anderson et al. (2001, p. 84) analyse learning objectives that are classified as ‘create’, they describe that students would have to make a new artefact by mentally reorganising some elements or parts into a pattern or structure not present previously. Furthermore, Anderson et al. (2001, p. 270) describe that ‘problem solving’ and ‘critical thinking’ are perceived as requiring cognitive processes in several categories of the taxonomy and therefore cannot be confined to one level. However, while the student’s ability to create is encouraged during the learning process, the measurement thereof is often shrouded in notions that assessing creativity relies on a more subjective framework, guided by the assessor’s own experience, sometimes, but not always, seconded by the moderator. The critical capacity of the student is more confidently assessed in an aligned manner against the NQF level descriptors.

At a postgraduate level, the NQF level descriptors (SAQA 2012, pp. 10-12) for levels 8 (honours), 9 (Master’s) and level 10 (doctorate) apply. At level 8, Critical thinking and Creativity are embedded in the descriptors for knowledge literacy, problem solving, ethics and professional practice; accessing, processing and managing information; producing and communicating information, and management of learning.

In a review of the literature, Lai (2011, p. 4) asserts that much of the literature on critical thinking is rooted in two academic disciplines: philosophy and psychology. There is correspondingly associated literature within the fields of educational philosophy and psychology. Authors like Bonnefon (2018, p. 113) contend that critical thinking is hard to define, but that this makes it easier for many to agree that critical thinking is an essential skill.

Macat International (2017) simplifies most definitions to state that “[c]ritical thinking is the ability to think clearly and rationally, understanding the logical connection between ideas”. They further clarify this by describing critical thinkers as those who seldom accept ideas and assumptions, rigorously question premises, seeking to determine whether the conclusions represent fact or opinion. In their discussion, Macat International (2017) points out that critical thinking should not be confused with ‘being critical’, as these competencies are about more than finding flaws in arguments.

When considering assessing critical thinking, Lai (2011, p. 2, 36) recommends using open-ended tasks, real-world or authentic problem contexts and ill-structured problems that require students to go beyond recall or restating prior knowledge. Lai (2011, p. 2, 40) further recommends that assessment tasks which have more than one solution and require using collateral materials to develop multiple perspectives are more successful. Such assessment tasks may be most useful to assess critical reasoning competencies where these make student reasoning visible in requiring the provision of evidence or logical arguments to support conclusions, judgements, choices or assertions (Lai 2011, p. 2, 40).

Authors like Macat International Limited (2017) support this understanding by including creative thinking as a component of critical thinking, while other authors differentiate between the two concepts. For example, the World Economic Forum Future of Jobs Report (2016) clearly distinguishes critical from creative thinking and includes both as separate yet integral to future employability and emerging jobs. Similarly, the twenty-first-century framework includes critical thinking and creativity as part of its four Cs of competencies.

Re-positioning the relationship between critical and creative thinking within postgraduate design education

In the last 20 years, many scholars have articulated the terms ‘twenty-first-century skills’ to describe competencies believed to be critical for success. Authors such as Drake and Reid (2018, p. 31), Chu et al. (2017, p. 18) and Silva (2009, p. 631) have described these competencies as vital capabilities and while these are not new concepts, the relative importance of these capabilities has been growing which has resulted in increased inclusion in educational curricula. Organisations like Partnership for 21st Century Skills (2009) describe, “a focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future”. In this framework, learning and innovation competencies are seen as essential for preparing students for increasingly complex living and working environments of the twenty-first century. These competencies include creativity and innovation; critical thinking and problem solving; communication; and collaboration. The alignment between these four ‘Cs’ can be seen in findings like Chu et al. (2017, p. 164) who comment on research that shows a correlation between strong reading ability and more advanced critical thinking. Here critical thinking and creativity are described separately in that creativity is described as thinking creatively, working creatively with others and implementing innovations. However, critical thinking and problem solving are described as reasoning effectively, using systems thinking, making judgements and decisions and solving problems (Chu et al. 2017).

Developing these competencies in postgraduate students is not without its challenges. Consensus over the components of critical thinking and creativity, how they develop, and how a lecturer can contribute to developing these competencies, is lacking. While many lecturers agree that critical thinking and creativity are core to academic success (Goode 2019) and that these are developed during undergraduate studies, the practices of academic staff in postgraduate contexts often reveal an implied approach to teaching these aspects or reveal that academic staff assume these competencies are in place. While there are recommended practices to develop critical thinking, for example, Chu et al. (2017, p. 146) describe using inquiry-based learning or implementing peer evaluation. Furthermore, postgraduate studies are characterised by increased levels of self-directed learning, as described by Knowles (1970) in relation to adult learning, balanced against achieving qualification-learning outcomes, as required by the postgraduate NQF level descriptors.

Though critical thinking is more entrenched within the NQF level descriptors, there is a significant disjoint between the theoretical measurement of this skill, and the practical ability

of educators to articulate what critical thinking encompasses or how to describe the measurable attributes thereof, as confirmed by recent research undertaken by Goode (2019).

In discussing the merits or modes of engagement of creative and critical thinking, what is evident is that they demonstrate their agency within the system of teaching and learning, but are approached quite differently in terms of measuring their influence on the teaching and learning process. It is easy to offer critique of the systems that measure creativity and criticism as separate entities. However, it is worth noting both their potential to co-exist as agentially distinct from one another, but perpetually influencing one another in an entangled state akin to quantum entanglement. And so, in considering how to best approach developing the postgraduate design student's critical-creative competencies, we must explore a new taxonomic approach that is aware of the deficits evident in systems where objective measurement is applied to subjective, intangible qualities. In relation to the field of science, and particularly quantum physics, Rouse offers a particularly relevant point of enquiry, when he writes:

Why presume in advance that the bounds of the human organism are ultimately the boundaries of the scientific measuring system [...] rather than insisting that those boundaries should be specified from within the scientific practices of measurement interactions themselves? (2002, p. 273)

Like Cameron (1963, p. 13), who said that “[n]ot everything that counts can be counted, and not everything that can be counted counts”, what Rouse is proposing is that human capability is constrained by the systems that attempt to objectively measure, and thus describe it. Rouse is sceptical of this approach to analysis. For the purpose of our inquiry, this systematic, empirical approach would seek to keep creative and critical thinking as separate in their measurement, and to ‘hierarchise’ critical as being over creative thinking processes. However, Barad refutes this approach to scientific method by reformulating its relevance through a posthumanist lens and identifying the above as scientific fallacy when she writes that “we [must] understand ourselves as part of nature” (2007, p. 341). Barad is demonstrating an intrinsic connectivity between two entities often separated from each other for empirical purposes. Yet, they are intertwined, and to use Barad's own term, ‘entangled’ (2007). Adopting a more holistic approach proposes that creativity and criticism are perpetually influencing each other within what Deleuze and Guattari identify as rhizomatic: “open and connectable in all of its dimensions” (2004, p. 13). Experience within the design education context would seem to affirm this notion that a more holistic approach is needed, certainly within the context of postgraduate studies, where more organic systems of problem solving are required. Critical thinking cannot be prioritised within this new proposed paradigm, neither can a pendulum swing direct education towards prioritising creativity. However, what is required is the prioritisation of a clear understanding of what each constitutes both by educator and by the student. Old hierarchies should not be replaced with new ones. Instead, creativity and critical thinking should possess their own unique agency, engaged in dialogue with each other as promoting student competency. Rather than conceptualising competency progression as solely hierarchical, that it also takes its cue from the rhizomatic taxonomic model. Deleuze and Guattari explain this as follows:

A rhizome ceaselessly establishes connections between semiotic chains, organisations of power and circumstances relative to the arts, sciences and social struggles. A semiotic chain is like a tuber agglomerating very diverse acts, not only linguistic, but also perceptive, mimetic, gestural, and cognitive (2004, p. 8).

In contrast to this, Deleuze and Guattari oppose the arborescent hierarchical conception of knowledge to allow for multiple non-hierarchical interpretations of knowledge that favours a

planar approach, allowing for a nomadic system of growth. Though they do prefer the rhizomatic conception, as opposed to the arborescent, what they also acknowledge is an inherent interdependence between these: an entanglement, to use Barad's term (2007), of experience, feedback, context and knowledge. Deleuze and Guattari express this interdependence as follows:

The important point is that the root-tree and canal-rhizome are not two opposed models: the first operates as a transcendent model and tracing, even if it engenders its own escapes; the second operates as an immanent process that overturns the model and outlines a map, even if it constitutes its own hierarchies, even if it gives rise to a despotic channel. It is [...] a question of a model that is perpetually in construction or collapsing, and of a process that is perpetually prolonging itself, breaking off and starting up again (2004, p. 20).

Deleuze and Guattari propose that hierarchical (arborescent) and non-hierarchical (rhizomatic) taxonomic models can complement each other. Therefore, the interdependence can accommodate greater critical and creative thinking co-development. The impact of this allows postgraduate students the spaces to construct their own competencies and knowledge maps to achieve the learning outcomes through solving the required research and design problems. This approach positions design educators as space holders and facilitators, not as designated hierarchical instructors and assessors, and empowers them to collaborate democratically within these revised roles.

Conclusion

Though there is something to be gained from organising the measurement of these learning competencies in a hierarchical way, as evidenced in Blooms and the NQF descriptors, there is a loss in failing to acknowledge the entangled nature of the co-development of creative and critical thinking. This paper has argued that both critical and creative thinking are imperative to academic and future workplace success, particularly in postgraduate design studies. The revision of Bloom's taxonomy of learning objectives has acknowledged the cognitive complexity of creating (Anderson et al. 2001). While the focus of the NQF level descriptors and assessment criteria relegated creative thinking as being part of the hidden rather than explicit curriculum. A less linear hierarchical framework that democratises critical and creative thinking is required for the design education context: one that explicitly acknowledges the entanglement of critical and creative thinking competencies that coincides with the rhizomatic model proposed by Deleuze and Guattari (1980). This allows design educators to encourage the development of both sets of competencies explicitly in a more self-directed outcome-based learning approach aligned to the maturity required for postgraduate design studies.

References

- Anderson, L, Krathwohl, D, Airasian, P, Cruikshank, K, Mayer, R, Pintrich, P & Wittrock, M 2001, *A taxonomy for learning, teaching, and assessing: a revision of Bloom's Taxonomy of Educational Objectives*, New York, Longman.
- Australian Curriculum, Assessment and Reporting Authority (ACARA) 2019, Critical and Creative Thinking, australiancurriculum.edu.au, viewed 6 July 2019, <<https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/critical-and-creative-thinking/>>.
- Barad, K 2007, *Meeting the universe halfway: quantum physics and the entanglement of matter and meaning*, Durham, Duke University Press.

- Bloom, B 1956, *Taxonomy of educational objectives: cognitive domain*, New York, Longman.
- Bonnefon, J 2018, 'The pros and cons of identifying critical thinking with systems processing', *Torpoi*, vol. 37, pp. 113-119.
- Cameron, WB 1963, *Informal sociology: a casual introduction to sociological thinking*, New York, Random House, p. 13, viewed 6 July 2019
<<https://quoteinvestigator.com/2010/05/26/everything-counts-einstein/#note-455-1>.
- Council on Higher Education 2009, 'Postgraduate studies in South Africa: a statistical profile', viewed 3 July 2019,
<https://www.che.ac.za/sites/default/files/publications/Postgraduate_Studies_in_South_Africa.pdf.
- Chu, S, Reynolds, R, Tavares, N, Notari, M & Lee, C 2017, *21st century skills development through inquiry-based learning: from theory to practice*, Singapore, Springer.
- Deleuze, G & Guattari, F 2004, *A thousand plateaus: capitalism and schizophrenia*, (translated by B Massumi), London, Continuum.
- Department of Higher Education and Training (DHET) 2013, *White paper for post-school education and training*, Pretoria, Department of Higher Education and Training.
- Drake, S & Reid, J 2018, 'Integrated curriculum as an effective way to teach 21st century capabilities', *Asia Pacific Journal of Educational Research*, vol. 1, no. 1, pp. 31-50.
- Erwee, R, Harmes, M, Harmes, M, Danaher, P & Padro, F (eds.) 2018, *Postgraduate education in higher education*, Singapore, Springer.
- Goode, H 2019, *Development of critical thinking competencies in first year students*, Pretoria, Unpublished Thesis.
- Ingalls Vanada, D 2015, 'Practically creative: the role of design thinking as an improved paradigm for 21st century art education', *Techne Series A*, vol. 21, no. 2, pp. 21-33.
- Knowles, M 1970, 'Andragogy: an emerging technology for adult learning', in M Knowles, *The modern practice of adult education: from pedagogy to andragogy*, New York, Cambridge Book Company, pp. 53-70, viewed 5 July 2018,
<<https://www.nationalcollege.org.uk/cm-andragogy.pdf>>.
- Lai, E 2011, *Critical thinking: a literature review*, London, Pearson, viewed 22 March 2018,
<<http://www.pearsonassessments.com/research>>.
- Lawrence, J & Hokanson, B 2016, 'Beyond content to creativity: a life-changing MOOC course', *Educational Technology*, vol. 56, no. 6, pp. 36-40.
- Leman, J 2015, *What do taught post-graduates want? the postgraduate taught experience survey 2015*, York, Higher Education Academy, viewed 17 June 2019,
<https://www.heacademy.ac.uk/system/files/ptes_2015_what_do_pgts_want.pdf>.
- McIntyre, P, Fulton, J, Paton, E, Kerrigan, S & Meany, M 2018, *Educating for creativity within higher education: integration of research into media practice*, Cham, Palgrave Macmillan.
- Partnership for 21st Century Skills 2009, *P21 framework definitions*, viewed 8 June 2019,
<<https://files.eric.ed.gov/fulltext/ED519462.pdf>>.
- Rouse, J 2002, *How scientific practices matter: reclaiming philosophical Naturalism*, Chicago, University of Chicago Press.
- SAQA 2012, *Level descriptors for the South African national qualifications framework*, Pretoria, SAQA, viewed 20 March 2018,
<http://www.saqa.org.za/docs/misc/2012/level_descriptors.pdf>.
- Silva, E 2009, 'Measuring skills for 21st-century learning', *The Phi Delta Kappan*, vol. 90, no. 9, pp. 630-634.

- Úlger, K 2016, 'The relationship between creative thinking and critical thinking skills of students', *H. U. Journal of Education*, vol. 31, no. 4, pp. 695-710.
- UNESCO 2012, *International Standard Classification of Education (ISCED) 2011*, Montreal, UNESCO Institute for Statistics, viewed 17 June 2019, <<http://uis.unesco.org/en/topic/international-standard-classification-education-isced>>.
- Wilson, L 2016, 'Anderson and Krathwohl – Bloom's taxonomy revised', in *The second principle: the work of Leslie Owen Wilson*, EdD (revised), viewed 26 September 2018, <<https://thesecondprinciple.com/teaching-essentials/beyond-bloom-cognitive-taxonomy-revised/>>.