LEARNING AS A SPATIAL PHENOMENON – PART 1

"An online art school isn't an art school", he said.
Yet, given an entire academic year had been successfully mediated through the web, was there any truth in this statement? As much as hours and hours of Zoom tutorials, lectures, crits, seminars, meetings, and assessments were exhausting. One cannot forget that without technology, and our combined efforts, entire year groups across the world would not have been able to continue their education. Rather than dismiss what had collectively been achieved, could we not, instead, take this statement and view it as a genuine opportunity to consider what had been learned before reverting to past ways of thinking and working?

The catalyst for this paper is therefore the desire to challenge the notion that an online art school isn't an art school. Importantly, by focusing upon the art school studio. Chosen principally, due to its significance as a space that enables the development of 'independent creative practitioners' (Shreeves, et al., 2010). As such, I will therefore begin by highlighting its uniqueness as a location for learning, and conclude by moving the discourse surrounding material space outwards, and beyond the tangible. The rationale for this particular focus has been driven by several observations. Firstly, the studio's importance as a multifaceted learning and teaching site (Vyas & Nijholt, 2012). Secondly, an acknowledgment of how precarious the studio has become as a result of managerialism, and the massification of higher education (Corazzo, 2019). And lastly, research relating to increased (online) student attendance as a result of lockdown restrictions driven by COVID-19 (Grover & Wright, 2020). When considered as a whole, it becomes clear than an opportunity now presents itself to explore 'site' beyond the physical. Specifically, if a virtual studio could function in the same way as the traditional studio. However, as this site is also a place for making, new ideas surrounding the immaterial artwork will also be considered.

To assist in the development of this proposal, I will firstly seek to articulate the complex nature of the studio within art, design, and architecture education. Secondly, I will look beyond this context to identify a suitable educational philosophy; one that will translate seamlessly from the real world into the virtual world. Thirdly, I will consider the benefits of Studio VR and the appeal of neomateriality. And lastly, I will propose a new curricular model that will accommodate change.

<u>The Spatial Ontology of the Studio</u>

"Where shall we look for explanations of human cognitive accomplishment?" (Hutchins, 1995)

When something we hold dear to us is under threat, the only real course of action is to delve deep, pull on every one of our resources, and speak unequivocally on the merits of our passions. In 2019, and in an attempt to save the studio from further uncertainty, James Corazzo, Principal Lecturer in Graphic Design at Sheffield Hallam University, did exactly this.

Troubled by the precarious nature of the studio, as a result of new managerial strategies, and the growth in student numbers driven by changes in funding (Jarvis, 2014). Corazzo diligently carried out a systematic review of literature on the subject of the studio in art, design, and architecture education. Subsequently, identified a number of themes. These were as follows;

1. The studio-as-making: understood as a place where artefacts and selves are made
2. The studio-as-bridging: understood as a bridge between the academic and the professional art, design, and architecture contexts
3. The studio-as-meaning: understood to confer meaning/s on educational activities
4. The studio-as-enabling: understood as a place that constrains activities, experiences and interactions
5. The studio-as-backgrounding: understood as the background to the activity of learning
6. The studio-as-disciplining: understood as the place that expresses and shapes disciplinary identities

However, extensive as this search was, Corazzo concluded his research by acknowledging that none of the authors had taken time to consider the significance of the '*material space*' itself. Importantly, the contribution material space makes in the thinking process (Corazzo, 2019). It is with an acknowledgment of what was discovered missing from the discourse surrounding the studio in art, design, and architecture education that I'd like to now develop further. Crucially, if one considers the six separate functions of the studio, identified by Corazzo, as an interconnected whole, I believe the material space of the studio, and those who occupy it can therefore be representative of a multifaceted knowledge system. Importantly, one that helps facilitate, support, and embodies cognition. Having reflected on the six themes previously identified, I'd therefore like to further the studio debate by inclusion of the following observations.

The Studio-as-Framework for Distributed Cognition

"….environments create the emotional tenor of the learning experience" (Mann, 2001)

If one considers Soviet psychologist Lev Semyonovich Vygotsky's Zone of Proximal Development theory (Cole, et al., 1978) and locates it within the context of the studio in art, design, and architecture education, what subsequently occurs is of particular interest when attempting to theorize what takes place within this site. Additionally, what becomes evident when one studies ZPD is that it contains several characteristics that are strikingly similar to qualities associated with the studio. In order to highlight the significance of this correlation, one must firstly understand the schema of the art school/academic studio.

To begin with, the academic studio is a designated space within the institution, where every student is given a place to think, to reflect, and to make work (Brandt, et al., 2011). This will also include; partitioned walls, a desk, a chair, and access to power (Fallam, 2007). Historically, the design of the academic studio has been based around a large room with a number of windows that let in natural light. The size of the studio space may vary depending on the institution, and will also vary depending on the size of the group occupying the studio space. However, regardless of its overall size, the total area will be carved up into smaller spaces to provide a place for students to work, think, and make. Fairly rudimentary facilities yet, the studio has been acknowledged as the only space where the artists/students thought process is made evident and seen through the actions of the artist/student themself (Vyas & Nijholt, 2012).

To understand ways in which Vygotsky's theory of cognitive development assimilates itself into the discourse of the studio, it is important to begin by considering Vygotsky's theory of socio-cultural development (Vygotsky, 1978). Notably, the very principle of ZPD is understood to represent the distance between the actual development level as determined by independent problem solving, and the level of potential development as determined through problem-solving under adult guidance

(McLeod, 2018). In other words, the educational collaboration that occurs with what Vygotsky described as a 'more knowledgeable other' (MKO). As the studio space within the context of art, design, and architecture education is occupied by students and staff of differing interests and skill levels, those who occupy the material space of the studio quite clearly represent the basic principle of Vygotsky's understanding of 'more knowledgeable others'. In terms of how this idea relates directly to individual learning, as understood by Vygotsky, we must carefully consider the basic premise of how cognition occurs through the presence and support of MKOs.

For Vygotsky, the emphasis here is what takes place during the 'inter-mental' process. Crucially, the cognitive activity that occurs at the point where the learner and the MKO reach a shared understanding. Defined as 'intersubjectivity'. For the learner, by achieving 'intersubjectivity', 'internalisation' subsequently occurs. This cognitive process develops further through thought and is later expressed via language (Verenikina, 2003). However, in terms of cognition within the studio context, an additional aspect in the process of inter-mental, intersubjectivity, and internalization occurs, and purposely through a range of physical effects. These include; the artists' preparatory sketches, their visual research, their desktop paraphernalia, and the artefacts they make (Vyas & Nijholt, 2012).

Scaffolding

"…whatever happens there is part of a larger computational system" (Hutchins, 1995)

Vygotsky was not alone in understanding the important role others play in cognition and learning. Clear parallels can also be drawn with the American cognitive psychologist Jerome Bruner's (1915-2016) social constructivist theory (Verenikina, 2008). Like Vygotsky, Bruner understood the importance of others in the process of learning. However, to understand Bruner's learning theory, it is important to acknowledge that his interests lay firstly in language acquisition. Importantly, how a child's language developed with the assistance of another; identified as a parent or caregiver. In this instance, Bruner was specifically interested in how a child's. language develops whilst learning to read with support from a parent or caregiver. This 'other' can therefore be understood to represent Vygotsky's MKO. It was through this joint activity that Bruner believed a process of 'scaffolding' took place. For Bruner, scaffolding was understood as the process that occurred due to the reciprocity that developed between parent (or caregiver) and child. Identified as cognitive development, established at the precise point where the child's reading and language skills were understood to have progressed through the process of assistance. It was a recognition of this pivotal stage in a child's cognitive development that subsequently allowed the parent or caregiver's role as educator to lessen (Willinger, et al., 2003).

Within the discourse of the studio in art, design, and architecture education, it is therefore an acknowledgment of the manner in which cognition occurs with the assistance of a supportive relationship that is of note (Belluigi, 2013). Notably, that scaffolding occurs within this site as a result of the interactive role played by others in a student's learning.

Understanding ways in which space and others, inform, support, and enable cognition is not a new phenomenon. Take for instance the crucial role the navigation bridge and team of Palau, a US naval ship, played in Professor Edwin Hutchin's theory of cognition (Hutchins,1995). In this instance, both location and crew were considered to collectively represent a cognitive and computational system. In my mind, this system conceptually is not too dissimilar to that of the studio, those who occupy it, and the learning activities contained within it. What does differ, however, is that within the studio environment cognition and computation is made visibly manifest through preparatory sketches, visual research, desktop paraphernalia, and artefacts. This observation is key when attempting to understand the multifaceted educational complexity of the studio environment.

The Studio-as-Apparatus for Visual Cognition and Computation

"It does not seem possible to account for the cognitive accomplishments of our species by reference to what is inside our heads alone. One must also consider the cognitive roles of the social and material world." (Hutchins, 2000)

The difference between site for learning and site of learning can be seen quite clearly the moment one enters the studio setting. Even an empty studio has a story to tell. Is it the beginning of a new academic year, or is it the end of one? Regardless of occupancy, the material space of the studio; its walls, desks, and floors play important roles in cognition and computation. Considered '*artful surfaces*' (Vyas & Nijholt, 2012), these rudimentary planes provide the artist, designer, and architect space for thought to be made manifest, and through a variety of means that includes visual and textual research, sketchbooks, drawings, images, sound, and objects. A multidirectional semiotic system if you will: one that provides tangible insight into the inner workings of the creative mind, whilst also assisting further internal computation due to outward representation and display. In essence, a cyclical process from internal cognition to external processing and back again. What occurs between both sites forms a complex process of reciprocity that leads to the development of new ideas, that once more become visibly manifest. An iterative process that feeds back on itself in perpetuity. However, as the studio is a shared learning environment, this visual information can cut across space. Therefore, acting as further stimuli in the cognitive process of creative individuals and, as a result, plays a part in the learning experience of others (Galzek, 2011).

The parallel being drawn here is the correlation between site for learning and site of learning. In other words, the relationship between the function of the studio, and the function of the brain. Notably, the prefrontal cortex; a part of the brain associated with creative individuals.

THE STUDIO FUNCTION	PREFRONTAL CORTEX FUNCTION
The studio-as-making: Understood as a place where artefacts and selves are made.	Organising thoughts and problem solving. Ability to balance short-term rewards with long term goals.
The studio-as-bridging: Understood as a bridge between the academic and the professional art, design, and architecture contexts.	Shifting/adjusting behaviour when situations change.
The studio-as-meaning: Understood to confer meaning/s on educational activities.	Forming strategies and planning. Focusing attention. Considering future and making predictions.
The studio-as-enabling: Understood as a place that constrains activities, experiences and interactions.	Impulse control and delaying gratification. Inhibiting inappropriate behaviour and initiating appropriate behaviour.
The studio-as-backgrounding: Understood as the background	Simultaneously considering Multiple streams of information when faced with complex and

to the activity of learning.	challenging information.
The studio-as-disciplining: Understood as the place that expresses and shapes disciplinary identities.	Foreseeing and weighing possible consequences of behaviour. Modulation of intense emotions.

Table 1: The relationship between the function of the studio and the function of the brain

When attributes associated with both sites are considered side by side it becomes clear that a distinctive form of symbiosis occurs, underscoring the unique relationship between the artist and the studio. The bond between both is undeniable; they are inextricably linked. Before any more arts institutions are forced to choose economics over studio provision it is, therefore, crucial that this important connection is not eroded further. A possible solution to the dilemma faced by many arts institutions today is to fully embrace Charles Renfos' 2009 proposition, that "*walls will be a thing of the past*" (Renfo, 2009). Afterall, Aristotle understood the meaning and value of an education experienced beyond walls (Young, 2012). Innovatively and conceptually speaking, is the institution of art not then the precise place where the very meaning of studio walls can be challenged and reconsidered further?

The Many Benefits of Studio VR

A significant amount of change has occurred since the critic, Andrew McGettigan, wrote *The Great University Gamble* in 2013. Economics have worsened, student numbers have increased, student satisfaction is at an all-time low, rents have risen, energy prices have taken a hike, the cost of living has skyrocketed, mobility has become restricted, and the jobs market has become even more precarious. When laid out in this manner, the spreadsheet is clearly in deficit. However, for the art school, the prognosis has long been bleak (Beck, et al., 2012). But what if some of this uncertainty could be addressed by the inclusion of a simulated component? Where the provision of material space is no longer an issue, the pressure felt by institutions from students to provide greater access, more resources, and better value for money could be partially solved. If recent research asserts that learning in the virtual realm provides learners with an experience as tangible as learning in the physical world is indeed the case (Han, 2020).
What's stopping the very space where ingenuity and risk-taking are encouraged (Lauterbach, 2009) from extending their remit further? (Payne, 2004).
In other educational fields, it has become increasingly clear that there are many advantages to the immersive and interactive quality inherent to VR technology. Where the provision of simulated learning environments has been credited for helping improve and advance education. From improving concentration to enhancing creative performance through self-learning, whilst also increasing motivation and raising overall student satisfaction (Lau & Lee, 2012; Merchant, et al., 2014; Quitero, et al., 2019). In addition to this range, it has been suggested virtual engagement also helps stimulate positive states (Kitson, et al., 2018). The full extent of this proposition can be seen in why learning in VR has been described as a psychological process; where mental processing occurs via complete immersion activated through motor, spatial, and emotional engagement (Holopainen, Byork & Lundgren, 2003).
When attempting to formulate an appropriate VR learning philosophy for arts education, immersion as a psychological process must, therefore, be included as a necessary 3rd component. Identified specifically to help further highlight the connection between the function of the studio, and the function of the pre-frontal cortex.

Establishing a VR Learning Philosophy for Arts Education

THE FUNCTION OF THE STUDIO	PREFRONTAL CORTEX FUNCTION	IMMERSION AS A PSYCHOLOGICAL PROCESS
The studio-as-making: Understood as a place where artefacts and selves are made.	Ability to balance short-term rewards with long term goals. Focusing attention.	Sensory motoric immersion
The studio-as-bridging: Understood as a bridge between the academic and the professional art, design, and architecture contexts.	Impulse control and delaying gratification. Inhibiting inappropriate behaviour and initiating appropriate behaviour. Foreseeing and weighing possible consequences of behaviour.	Cognitive immersion
The studio-as-meaning: Understood to confer meaning/s on educational activities.	Shifting/adjusting behaviour when situations change.	
The studio-as-enabling: Understood as a place that constrains activities, experiences and interactions.	Modulation of intense emotions. Simultaneously considering Multiple streams of information when faced with complex and challenging information.	Emotional immersion
The studio-as-backgrounding: Understood as the background to the activity of learning.	Organising thoughts and problem solving.	
The studio-as-disciplining: Understood as the place that expresses and shapes disciplinary identities.	Considering future and making Predictions. Forming strategies and planning	Spatial immersion

Table 1:2 Further correlation between the function of the studio and the function of the brain

For the art school, I firmly believe the benefits of providing studio space negotiated through virtual reality are, therefore, manifold. The following are just a few of the many advantages that spring to mind.

1. 24/7 access
2. Economic hierarchies are flattened
3. Greater mobility
4. Provides greater accessibility
5. Inclusion rather than exclusion
6. Creates a geographically diverse student body
7. Supports a geographically diverse faculty
8. Generates intercultural communication and collaboration
9. Helps decolonise the curriculum
10. Gives access to a wider range of technical expertise
11. Running cost are reduced
12. The discourse surrounding materiality advances
13. Technical skills are further developed
14. Creative adaptability
15. Material costs for students becomes a thing of the past
16. The digital artefact is developed further
17. Richer networks are created both personally and professionally
18. Advances skill and knowledge for the changing labour market

Interestingly, many of these benefits supersede recent government policy on 21st Century learning skills, and graduate attributes (Bukley, 2017; Han, 2019), whilst also addressing a range of curricular, inequality, accessibility, and employability issues raised by our critically aware cash strapped students. However, the many benefits offered in the virtual realm for art students do not simply end there.

The Subjects of the Arts Institution & the Appeal of Immateriality

On May 7th, 2015 the American Art Historian, Lane Relyea, spoke eloquently on new developments within the art institution. Previously, the art school discourse fixated on what was made, how it was made, and the milieu in which this work was created. Relyea instead drew our attention away from the art object to focus firmly on the art subject. Namely, students. Why? Because a recent development within the art school debate was emerging, where greater emphasis upon decentralised activities, orchestrated by the postgraduate student body was being established. Defined as "*the low end*". This was a new movement driven by several key factors. Namely, a growing distrust in the art market, the nepotistic nature of gallery organisations, economic uncertainty, and greater production and distribution caused by advancements in digital technology. This emergent contra-generation was boldly disrupting the system, and at little cost. Beyond the art institution, new forms of decentralised activity were also evident. Precisely three months after Relyea identified this shift (Relyea, 2015), the very first NFT was minted on the Ethereum blockchain. Coincidence or not, the similarities in the need to usurp power dynamics, whilst also questioning value, authenticity, ownership, and accessibility are undeniable.

However, as student de-centralised activities grew, rapidly infiltrated undergraduate courses with a renewed DIY philosophy (Relyea, 2007), little change occurred in the need for the production of physical artefacts. Post conceptualism, one would have thought art-making and objecthood would have been challenged further. After all, advancements in digital technology had provided art students with a plethora of skills and output options for decades. Yet, within the fine art context, little progress has been made in terms of digital adaptability (Boyd, 2013). Given the level of scrutiny objecthood has been subject to through modern, and postmodern debate (Greenberg, 1959; Lippard, 1968; Krauss, 1979; Fried, 1998), one would have imagined the next obvious development as we entered a hypermodern epoch would have propelled the debate surrounding matter far beyond the 4th dimension. Indeed, this has been the case for subjects such as design, gaming, and architecture. However, from a fine arts perspective, the innovative technologies used in these 'other' fields have yet to be fully understood and, as a result, their capabilities remain under-explored (Paul, 2020).

Interestingly, one aspect that could halt this development further is an observation that the undergraduate fine art technophobe has returned. Since returning to campus after numerous Covid related restrictions, the demand for hands-on skills has increased exponentially. The need to touch and feel now seems crucial. One example of this is evident in the rise of analogue photography and alternative processes; mediums that are currently resurging within art school facilities.

For the purpose of this paper, this commentary may at first appear counterintuitive. However, as the driving force behind any hypothesis is to disprove or validate myths and assumptions, the proof will surely lie in the testing of such theories. If one considers recent advancements in haptic technology alone I, wholeheartedly, believe introducing a suite of virtual technologies that include Quest2 all-in-one headsets, Bhaptics VR haptic gloves, Gravity Sketch, Open Brush, SculptureVR, 3D scanning, and advanced 3D printing into the curriculum will be invaluable additions. Crucially, not only in helping to address the recent loss in hand-skills but, more importantly, in the development of arts education across the board.

The benefits of creating a VR studio component are indeed manifold; from helping to finally bridge the analogue/digital divide, to increasing studio engagement through technological and physical

immersion, extending students' educational experience and skill base, whilst also advancing the discourse surrounding neomateriality (Mauro-Flude & Penney, 2019).

How Will Studio VR Function in the Curriculum?

Professor Nicholas Houghton, the arts Academic, has long expressed his interest in the development of the fine art curriculum (Houghton, 2008; 2016). His most recent observations highlight an urgent need to re-consider its cumulative configuration. Identified as having six elements; apprentice, academic, expressive, formalist, professional, and conceptual. Concerned by its growth, Houghton, therefore, pondered its relevance in, and for, a new era. A necessary deliberation. However, over the last two years, having personally spent time interviewing academics, technical staff, and students from several art institutions in the UK and Europe on the subject of current fine art education, it quickly became clear that no one interviewee could agree on a definitive syllabus fit for there 21st Century. Houghton himself proposes the need to reconfigure. Yet, under scrutiny, all six elements still appeared to inform the ideas, theories, and work of the individual interviewed. As a result of these findings, rather than reduce curricular components I, instead, propose two additional elements. Crucially, immersive and meta. To articulate how their addition becomes a workable and sustainable eight-into-one model, I'd therefore like to suggest the following flexible curricular framework. A theory I'd like to refer to as 'elastic pedagogy'.
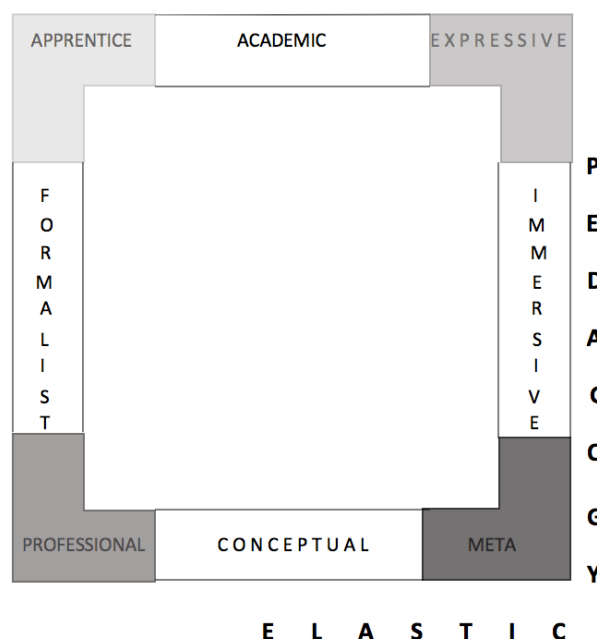

Figure 1: A New 8-into-1 curricular model

If one configures the six curricular components identified by Houghton into a square, a portion of this construction, subsequently, becomes empty. As a result, I propose the remaining quarter becomes a transitory space; one that allows for curricular flexibility. However, the success of this additional facet will be in its futureproof nature, as this void can only ever be utilised for technical and theoretical expansion. Once its function and meaning have entered the mainstream, two new elements will act as technical and theoretical replacements. For progression and development to occur, the curriculum should always be under construction. I, therefore, believe this new 8-into-1 curricular model creates the space and understanding for this to become possible.

LEARNING AS A SPATIAL PHENOMENON – PART 11

To test the viability of Studio VR as a workable educational philosophy and model, beginning with a pilot study is the next obvious step. At present, the very foundations of Studio VR are being established. However, given the extent of this undertaking, further work will be required specifically, from a range of skilled practitioners. As a result of this need, it is therefore anticipated Studio VR will commence as a small-scale preliminary study in October 2022.

BIBLIOGRAPHY

Beck, J., Cornford, M., Kenning, D., 2012. The Art School in Ruins. Journal of Visual Culture 11, 58–83.

Boyd, V., 2013. Natives, Immigrants, Residents or Visitors? Developing a Student-led Understanding of the Role of Digital Literacies in the Curriculum. Presented at the International Enhancement Themes Conference, Crowne Plaza Hotel, Glasgow.

Bukley, A., 2017. From Being (a Student) to Becoming (a Graduate): Exploring Graduate Attributes in the 21st Century - Summary of Research Findings. University of Strathclyde.

Cole, M., John-Steiner, J., Scribner, S., Soubermann, E., 1978. L.S. Vygotsky- Mind in Society: Development of Higher Psychological Processes. Harvard University Press, United States.

Corazzo, J., 2019. Materialising the Studio. A systematic review of the role of the material space of the studio in Art, Design and Architecture Education, in: Running With Scissors. Presented at the 13th International Conference of the EAD, EAD, University of Dundee. https://doi.org/10.1080/14606925.2019.1594953

Fallam, D., 2007. Supporting Studio Culture in Design Research. Presented at the of The International Association of Societies of Design Research, Hong Kong Polytechnic University School of Design,.

Galzek, K., 2011. Visual and Motor Processing in Visual Artists: Implications for Cognitive and Neural Mechanisms. Psychology of Aesthetics, Creativity, and the Arts 6, 155–167. https://doi.org/10.1037/a0025184

Greenberg, C., 1961. Modernist Painting.

Grover, R., Wright, A., 2020. National Design Studio Survey.

Han, H.-C., 2020. From Visual Culture in the Immersive Metaverse to Visual Cognition in Education. Cognitive and Affective Perspectives on Immersive Technology in Education 67–85. https://doi.org/10.4018/978-1-7998-3250-8.ch004

Han, H.-C., 2019. Virtual World Construction and the Relationship to Creativity in Art Education. Canadian Art Review 46, 85–100.

Han, H.-C., 2015. Teaching Visual Learning Through Virtual World: Why Do We Need a Virtual World for Art Education? Art Education 68, 22–27. https://doi.org/10.1080/00043125.2015.11519344

Han, H.-C., 2011. Second Life a 3D animated virtual world An alternative platform for art education. Art Education 64, 41–47.

Holopainen, J., Bjork, S., Lundgren, S., 2003. Game Design Patterns. Presented at the Digital Games Research Conference 2003, University of Utrecht, pp. 1–13.

Houghton, N., 2016. Six into One: The Contradictory Art School Curriculum and How it Came About. The International Journal of Art & Design Education 35, 107–120. https://doi.org/10.1111/jade.12039

Houghton, N., 2008. The Art Curriculum: What is it? Where Does it Come From? Where is it Going? Presented at the 4th International CLTAD Conference, New York, United States.

Hutchins, E., 2000. Distributed Cognition. Creative Education 6.

Hutchins, E., 1995. Cognition in the Wild. MIT Press, Massachusetts.

Kitson, A., Prpa, M., Riecke, B.E., 2018. Immersive Interactive Technologies for Positive Change: A Scoping Review and Design Considerations. Front. Psychol. 9, 1354. https://doi.org/10.3389/fpsyg.2018.01354

Krauss, R., 1979. Sculpture in the Expanded Field. October Volume 8, 30–44.

Lau, K.W., Lee, P.V., 2012. The Use of Virtual Reality for Creating Unusual Environmental Stimulation to Motivate Students to Explore Creative Ideas. Interactive Learning Environments 23, 3–18. https://doi.org/10.1080/10494820.2012.745426

Lauterbach, A., 2009. The Thing Seen, in: Art School (Propositions for the 21st Century). MIT Press, Massachusetts, United States, pp. 85–97.

Lippard, L.R., 1997. Postface, in Six Years: the Dematerialization of the Art Object, 1966 to 1972, in: Six Years. University of California Press, California, United States.

Mauro-Flude, N., Penney, T., 2019. Neomateriality: Beyond the Textures of Post-Digital Aesthetics, in: Engagement. Australian Council of University Art and Design Schools, Victorian College of the Arts, Melbourne, pp. 1–15.

McGettigan, A., 2013. The Great University Gamble. Pluto Press, England.

McLeod, S.A., 2018. Lev Vygotsky. Simply Psychology. www.simplypsychology.org.

Merchant, Z., Goetz, E., Cifuentes, L., Keeney-Kennicutt, W., Davis, T., 2014. Effectiveness of Virtual Reality-based Instruction on Students' Learning Outcomes in K-12 and Higher Education: A Meta-analysis. Computer Science 70, 29–40. https://doi.org/10.1016/j.compedu.2013.07.033

Murdoch Mills, C., 2009. Materiality as the Basis for the Aesthetic Experience in Contemporary Art (Graduate Thesis). The University of Montana, United States.

Paul, C., n.d. Digital Art Now: Histories of (Im)materialities. International Journal For Digital Art History 21, 2.03-2.11. https://doi.org/10.11588/dah.2020.5.75504.

Payne, A., 2004. Lifting the Lid on Art Education, in: A Curriculum For Artists. The Laboratory, Ruskin School of Drawing and Fine Art, United Kingdom, pp. 52–57.

Quintero, J., Baldiris, S., Rubira, R., Ceron, J., Valez, G., 2019. Augmented Reality in Educational Inclusion. A Systematic Review on the Last Decade. Systematic Review 10, 1–14. https://doi.org/10.3389/fpsyg.2019.01835

Relyea, L., 2015. The Subjects of Art of the Institution of Art, in: THINKING THROUGH INSTITUTIONS. Presented at the THINKING THROUGH INSTITUTIONS International Symposium, Para Institution, Galway, Ireland.

Renfo, C., 2009. Undesigning the New Art School, in: Art School (Propositions for the 21st Century). MIT Press, Massachusetts, United States, pp. 159–176.

Verenikina, I., 2008. Scaffolding and Learning: It's Role in Nurturing New Learners.

Willinger, U., Brunner, E., Diendorfer-Radner, G., Judith Sams, M., Sirsch, U., Eisenwort, B., 2003. Behaviour in Children With Language Development Disorders. Canadian Journal of Psychiatry 48, 607–614.

Yang, Xiaozhe, Lin, L., Cheng, P.-Y., Yang, Xue, Ren, Y., Huang, Y.-M., 2018. Examining Creativity Through a Virtual Reality Support System. Education Technology Research and Development 66. https://doi.org/10.1007/s11423-018-9604-z

Young, D., 2012. In the Philosopher's Garden. Financial Review.