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An action research project exploring ecology in Art & Design with Year 10

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Abstract

Drawing on contemporary ecological theory, this research project explores the extent to which a six-lesson intervention with a class of Year 10 Art & Design students in a maintained secondary school in Cambridge changed their perspectives on ecology and experimentation. The paper begins with a review of the relevant literature at the intersection of art, ecology and education, followed by an outline of the research methodology implemented. The findings are then presented and critically discussed, before conclusions are drawn, with implications for future practice and research. It is argued that working with unorthodox materials and processes in the art classroom can positively affect students' perspectives of both ecology and experimentation.

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Introduction

> ecology
>
> *noun*
>
> the branch of biology that deals with the relations of organisms to one another and to their physical surroundings.
>
> (Oxford Languages, 2023)

In a 2020 survey of child and adolescent psychiatrists working for the NHS, 57.3% had in the last year '"seen patients who are distressed about environmental and ecological issues"' (Watts & Campbell, 2020). Young people are anxious about the environment they will inherit. After the Swedish pupil Greta Thunberg protested outside of the Swedish parliament in August 2018, "school strikes for climate" have taken place around the world, including the UK. Despite their concern, however, young people are given very few opportunities to engage with environmental and ecological issues at school. Those opportunities tend to be clustered in the science and geography classrooms, where they *learn* about ecology and the environment, rather than perhaps *engage* with it. The difference is participation. Young people ought to be afforded the chance to meaningfully engage with their environment and ecologies of which they are a part of. What is needed, as Joy Bertling (2015) argues, is to build *empathy* with our environment and to understand ourselves as intrinsically linked to it. I propose that art and design can help develop that empathy. The art classroom can be, or perhaps already is, the site in which students experience a sense of connection between themselves and the materials they use. It is, therefore, fertile ground in which to explore ecology.

Specifically, I will investigate whether a class of Year 10 art and design students at an 11-18 secondary school in Cambridge experienced changes in their perspectives of ecology and experimentation following a six-lesson intervention. Ofqual states that GCSE specifications in art and design must encourage students to "become confident in taking risks and learn from experience when exploring and experimenting" (Ofqual, 2021, p.3). I felt that a willingness to experiment was needed to explore ecology in art and design, so experimentation itself became part of my

investigation, alongside ecology. I was therefore inspired to deliver an intervention in which the students and I would explore ecology through experimentation.

I will begin by reviewing the available literature in the field of ecology in art education, examining the key literature from which my research questions arose. I will then outline my research methodology, consisting of a small-scale action research project from which I generated quantitative and qualitative data for analysis. Finally, I will present and critically discuss my findings, before reaching conclusions with implications for future practice and research.

Literature Review

The literature around ecology, or related subjects, such as sustainability and the environment, in art education is sparse. It is, however, a burgeoning field, with various emerging strands of theory and educational research. I will begin the literature review by summarising and critiquing recent policy documents, before moving onto educational research and theory that has informed my research.

Policy

In *The National Curriculum in England: Key stages 3 and 4 framework document* (Department for Education [DfE], 2014) the words "ecosystem" and its plural, "ecosystems", appear in key stage 3 and 4 biology, teaching children about the interactions between, and interdependencies of, organisms. Elsewhere, the "environment", its plural, "environments", and adjective, "environmental", appear in the other scientific disciplines, chemistry and physics, as well as in design and technology, geography and physical education (ibid.). "Ecology" is entirely absent from the document, despite being the branch of biology that deals with ecosystems. It may seem pedantic to suggest, but I would argue the language used to study ecosystems and environments denotes the persistence of the dichotomy between humanity and the "natural world" in the national curriculum. The *study* of the "natural world" implies a detachment from it.

In April 2022, the DfE published *Sustainability and climate change: a strategy for the education and children's services systems* (DfE, 2022). Led by the former Secretary for State Education, Nadhim Zahawi, the vision of the paper is for "the United Kingdom [to be] the world-leading education sector in sustainability and climate change by 2030" (ibid.). The document outlines four strategic aims to achieve this vision:

> 1. Excellence in education and skills for a changing world: preparing all young people for a world impacted by climate change through learning and practical experience.
>
> 2. Net zero: reducing direct and indirect emissions from education and care buildings, driving innovation to meet legislative targets and providing opportunities for children and young people to engage practically in the transition to net zero.
>
> 3. Resilience to climate change: adapting our education and care buildings and system to prepare for the effects of climate change.
>
> 4. A better environment for future generations: enhancing biodiversity, improving air quality and increasing *access to, and connection with, nature* in and around education and care settings.
>
> (DfE, 2022, my emphasis)

Whilst the second and third aims are concerned with the practicalities of reducing emissions and resisting climate change, the first and fourth aims are concerned with educating young people about climate change and giving them "access to, and connection with, nature" (DfE, 2022). Though the wording reinforces the dichotomy between humanity and "nature", as indicated in the national curriculum, my research is particularly concerned with facilitating this "connection" by situating a curriculum *within* "nature", giving students the opportunity to orient themselves in their environment through experimentation.

Research led by Elizabeth Rushton and Lynda Dunlop (2022) shows "that [the policy paper] does not go far enough to meet what young people and teachers want" (para.1). They write that "teachers and young people in our research wanted environmental sustainability to feature across the curriculum, not just in geography (which not all students study after the age of 14) and science" (para.5). As a current PGCE trainee, I would agree, because I can see that environmental sustainability, or ecology, is barely touched upon outside of the geography and science classrooms in schools. Opportunities to learn about and engage with sustainability and the environment will remain largely optional unless they are integrated into the curriculum, Rushton and Dunlop argue. The paper is an empty gesture without policy change that sees *every* student learning about sustainability and the environment across the curriculum. Since it is extracurricular, the discourse around environmental and ecological issues in schools can be inconsistent and superficial; I would not deny that encouraging students to recycle, for instance, is laudable, but there is a lack of understanding about *why* we recycle and the structures of power that shift responsibility to the consumer. This sentiment is echoed by a young person in Rushton and Dunlop's research:

> a lot of greenwashing goes on with big companies making individuals feel as if they are solely responsible… Education should empower us to demand change and to demand the rights we should have.
>
> (Rushton & Dunlop, 2022, para.11)

I would argue that the curriculum ought to take a more critical, or even philosophical, approach to teaching children about ecology, sustainability and the environment, opening up new ontological spaces in schools with the depth to explore what it means to be ecological; without it, we may remain ignorant to the interconnectedness of things. The art and design classroom, I believe, has the potential to develop this understanding. At the moment, however, I would argue that dichotomous thinking about nature and humanity found across the curriculum lends itself to the didactic approaches to making often found in the art classroom. In their year-long study of the English art curriculum at key stages 3 and 4, the National Foundation for Educational Research (NFER) found "the prevalent use of painting and drawing as the medium in which pupils work" (Downing, 2005, p.122). Art is so much more than drawing and painting, yet they are the predominant mediums in classrooms across the country. The rote learning and assessment of the traditional fine art mediums leads to an orthodoxy of outcomes that is out of step with movements in contemporary art. I would suggest that a more holistic approach to learning about ecology across the curriculum, and particularly in art and design, could counteract this.

Educational research

Whilst educational policy may not perceive the opportunities to develop a cross-curricular approach to teaching ecology, a number of scholars (Anderson & Suominen Guyas, 2012; Bertling, 2015; Bertling & Moore, 2020; Bertling & Moore, 2022; Clarke & Hulbert, 2016; Girak et al., 2019; Graham, 2007; Hollis, 1997; Inwood & Kennedy, 2020; jagodzinski, 2020; Jokela, 2019; Jónsdóttir, 2015; Taylor, 1997) have seen the potential of art education to respond to ecological issues. Over the past few decades, different pedagogies have evolved to include critical place-based art education (Bertling, 2015; Graham, 2007), art education informed by Education for Sustainability (EfS) (Girak et al. 2019; Jónsdóttir, 2015) and E*art*h Education (Anderson & Suominen Guyas, 2012), amongst others. These sometimes competing theoretical frameworks have been put into practice in isolated contexts at different stages of education in a small selection of countries.

Though not necessarily exhaustive, my review of the available literature suggests there are gaps to be explored. Firstly, it seems that there has been limited research in the United Kingdom, with research

emerging mostly from the United States (Anderson & Suominen Guyas, 2012; Bertling, 2015; Bertling & Moore, 2020; Bertling & Moore, 2022; Graham, 2007; Hollis, 1997; Song, 2009; Taylor, 1997), Canada (Inwood & Kennedy, 2020), Australia (Clarke & Hulbert, 2016; Girak et al., 2019) and Scandinavia (Jokela, 2019; Jónsdóttir, 2015). Secondly, the research has tended to focus on undergraduate students (Clarke & Hulbert, 2016), trainee teachers (Bertling & Moore, 2020; Bertling & Moore, 2022; Inwood & Kennedy, 2020; Jónsdóttir, 2015) or artists themselves (Song, 2009), with comparatively little research in secondary (or middle and high) schools (Bertling, 2015; Girak et al. 2019; Taylor, 1997). I will briefly summarise and critique the three papers whose research took place in secondary schools.

In her conversational paper, *It All Started with the Trash: Taking Steps Toward Sustainable Art Education* (1997), Pamela G. Taylor relays how, after reading David Orr's *Ecological Literacy*, she suddenly began "to question how [the] refuse from a single day of sharing [her] love and admiration for art was affecting our planet" (p.15). She recalls the "overwhelming amount of copies" she had handed out the day before, "the student with six feet of paper towels used to dry his hands" and the "discarded sculptures" (ibid.), which now horrify her. She questions how she may be negatively influencing her high school students' values (ibid.), so begins a curriculum to develop "ecological literacy" in her classroom. Taking inspiration from historical artists, such as Georges Seurat, and contemporary ones, such as Mierle Laderman Ukeles and Andy Goldsworthy, Taylor's students create work from the trash in an effort to develop the ecological literacy she hopes to instil. Over twenty-five years later, I can empathise with Taylor's horror at the waste of a single day teaching art, but I would argue that it is not the root cause of ecological illiteracy.

Like Taylor, the research presented by Sue Girak, Geoffrey W. Lummis and Jackie Johnson (2019) "grew from an artist/teacher's personal inquiries to reduce her environmental impact" (p.371). In their paper they ask "whether 12 year olds would question their ecological footprint if they creatively reuse discarded art materials in their artmaking" (p.369). However, in the more than two decades that elapsed since Taylor published her paper, the field of "ecopedagogy" in art education had grown, which Girak, Lummis and Johnson make reference to. A visual arts programme was delivered to the students over ten weeks, during which the researchers gathered qualitative data in the form of interviews and artworks. Through their interpretivist epistemological stance, they find that students experienced paradigm "shifts in four areas: environment, environmental impact, environmental message and creative reuse" (Girak et al., 2019, p.374). However, the researchers find that the burden

of personal responsibility weighs heavily on the students, yet they see that burden as fundamental to raising environmental consciousness (ibid., p.378). I would argue that they overemphasise the point, with the outcomes reflecting a superficial engagement with the materials themselves. Significantly, the researchers acknowledge the potential for "a superficial approach to creative reuse and EfS" (ibid., p.380).

Taking an interpretivist stance with a mixed methods approach to data collection through a case study of middle school students, Bertling (2015) likewise finds paradigmatic shifts towards ecology and the environment (p.1). Drawing on place-based educational literature, she identified a heightened *empathy* with the environment, which was developed through an eighteen-week experimental curriculum that incorporated nature walks, plant cultivation and a trip to a local landfill. She suggests that this empathy is crucial, because it is tied to "a deep recognition of the interconnectedness of living things" (ibid.). Unlike Taylor, and Girak, Lummis and Johnson, Bertling takes a more holistic approach to developing an ecological paradigm by avoiding focus on the individual environmental "footprint" of students. As such, it could be argued that the paradigm shifts she notes are perhaps deeper, rather than superficial.

Theoretical perspectives

To bridge the gap between the perceived polarities of "humanity" and "nature", my research draws on Object-Oriented Ontology (OOO) (Bogost, 2012; Bryant, 2011; Harman, 2017), which presupposes an ontological equality, or "flatness", of things; humans, orangutans and sandstone, for example, all have the same ontological "weight". In a rejection of scientific naturalism, which assumes things as the aggregation of ever smaller parts, OOO is non-hierarchical, equating different things of different scales - atoms with organisms, for example, and organisms with planets. In the context of this research paper, I will focus on its application to art (Harman, 2019) and ecology (Morton, 2018; 2021), exploring its pedagogic potential in the art classroom. Through this paradigm, I will assume the art classroom as the site in which to research how materials (objects) can be used to understand ourselves as *ecological*.

Thanks to the rising costs of maintaining state schools (Adams, 2022), art and design departments across the country face budgetary cuts. Combined with the orthodoxy of assessment exemplars given by exam boards, drawing and painting predominate, whereas three-dimensional artwork barely features (Pearson, 2022). I would not deny that both drawing and painting can indeed be constructive

means by which to make sense of the world, but without sculpture something is lost. According to Vilém Flusser (1991), the gesture of making "is one of the ways of getting beyond our basic human constitution" (p.32) because it develops our phenomenological understanding of objects. It is, therefore, paramount that art students have the opportunity to experiment with materials in three-dimensions.

Paraphrasing Donald Winnicott's theory of transitional objects, Bill Leslie (2020) argues that "it is essential to our psychic development… to understand the world of objects as external phenomena" (p.219). Building on this logic, I hypothesise that playing with objects and materials can help develop empathy for non-humans. Nicholas Addison (2010) argues for a heuristic approach, because "art is a productive process through which beliefs and identities are created" (p.45), so it is essential that students are given the opportunity to develop beliefs and identities that extend beyond anthropocentrism, "not representing how things *are* but envisaging how they *might* be" (Addison, ibid., p.46, my emphasis). "It is only by working with concrete materials", Addison suggests, "that students can harness creative processes… to affect and transform the physical environment" (ibid., p.56). In other words, to address the environmental and ecological issues, students need to be given the opportunity to work with concrete materials.

Research questions

Reflecting on the literature above, as well as my own classroom experience, I have identified two specific perspectives I would like to chart within my students: their perspectives of ecology and of experimentation. By focusing on the process of making, rather than on finished works, and using unorthodox materials, I posit that a haptic approach, focusing on their sense of touch, might help students better understand their relationship with their environment. As such, my research questions (RQs) are as follows:

RQ1. How can working with unorthodox materials and processes in the art classroom affect students' perspectives of ecology?

RQ2. How can working with unorthodox materials and processes in the art classroom affect students' perspectives of experimentation?

Methodology

Action Research

Jean McNiff (2013) presents action research as "practitioner research, or practice-led or practice-based" research (p.23), because its central aim is to *change* the practice, whatever that might be, through critical self-reflection. Gary Thomas describes the process as a "coil or spring, where you are continually moving forward up the coil by reflecting on action and changes you have made" (Thomas, 2023, p.152). Ideally, that process of change is informed by multiple cycles of action (Thomas, 2023), but due to the small-scale nature of this project, I was only able to complete one cycle of interventions, with scope to enact further cycles in continued research.

The intervention took place over the course of six one-hour lessons in just over two weeks (as presented in Table 1 next page). Whereas the first three lessons focused on scaffolding students' understanding of ecology with short tasks inspired by the work of contemporary artists, the second three gave students the opportunity to develop their own work based on what they had learnt about art and ecology. All these six lessons are also summarised in Table 1.

For the third lesson, I had intended to take students into the school grounds for an outdoor lesson, but poor weather prevented me from doing so. As such, I did not have the opportunity to explore the place-based aspect to the research as much as I would have liked; it would have been a chance to discuss the ecology of the school beyond the art classroom.

Participants

I selected a Year 10 art and design class of 27 students aged between fourteen and fifteen years old, comprising 25 girls and two boys. Three of the students experience specific learning difficulties and one a mild physical disability. At least six students use English as an additional language. I chose to conduct my research with Year 10, because they were coming to the end of their so-called "foundation course", before embarking on an independent project. Since they had not worked in three-dimensions during their foundation course thus far, my intervention gave them the opportunity to do so.

Lesson title	Lesson aims	Content	References
Lesson 1: Introduction to research	To explore how art can be conceived as actions, or processes, rather than finished outcomes. To consider what ecology means in the context of art.	Class discussion about what art can be. *One Minute Sculpture* task. Plenary and critique, followed by write-up.	(Leslie, 2020) (Addison, 2010) Erwin Wurm's *One Minute Sculptures*
Lesson 2: Introduction to ecology and art	To expand the definition of "ecology" to include objects. To explore the ecology of the classroom.	Class discussion about ecology and art. *An Ecology of Objects* task. Plenary and critique, followed by write-up.	William van Boesschoten's *Ecology of Objects* (Harman, 2017) (Morton, 2018) Richard Serra's *Verblist*
Lesson 3: Reflection and write-up	To reflect on the decision-making process thus far. To explore the potential of plant cultivation as art.	Class discussion to recap key concepts. Planting sunflower seeds. Reflection and write-up. Homework: collect ten objects.	(Bertling, 2015) Joseph Beuys' *7,000 Oaks* (Morton, 2018)
Lesson 4: Synthesis	To synthesise what students have absorbed into a sculpture.	Class discussion about David Kefford's practice. *Table Sculptures* task. Plenary.	(Harman, 2017) David Kefford's *In Search of a Higher Shelf* (Morton, 2018)
Lesson 5: Reflection and documentation	To finish the Table Sculptures and to reflect upon its "ecology".	Class discussion about the "ecology" of sculptures using student examples. Documentation of finished work. Plenary.	(Bertling, 2015) David Kefford's *In Search of a Higher Shelf* (Morton, 2018) (Prosser, 1998)
Lesson 6: Exhibition and write-up	Lesson 6: Exhibition and write-up To exhibit finished work. To recap and reflect.	Class discussion to recap. Further documentation of finished work. Plenary.	(Bertling, 2015) David Kefford's *In Search of a Higher Shelf* (Morton, 2018) (Prosser, 1998)

Table 1: Summary of Intervention and Lessons

I had co-taught the class throughout the previous half-term, so I was familiar with the general disposition of the group, as well as individual characters and friendship groups within it. I found them to be a chatty, sociable group marked by a wide range of abilities, which seemed ideal for the collaborative tasks I had planned. I will refer to all students by pseudonyms in this paper.

Generalisability

The generalisability of my findings are limited by the small-scale nature of the project. As Cohen et al. (2018) summarise, teachers often research in their own institutions (p.440). Situated in a specific time and place, the project could be developed with further cycles of research in different geographic contexts over longer periods of time. Additionally, with a wider participant base, broader conclusions could be made about students' perspectives on ecology in art and design. As Margaret Etherington (2013) finds, "art and design is still a gendered school subject" (p.34) at GCSE and A-Level, so it would be difficult to make any generalisations without a more balanced gender sample. Nevertheless, the lack of generalisability need not be an issue, because, from an interpretivist paradigm, I make no claims to it.

Ontology, epistemology and positionality

Before beginning the project, it was crucial to consider the paradigm through which I would conduct my research, because it is fundamental to the methodology I chose and the epistemology that defines it (Crotty, 1998). The project was built upon a belief in interpretivism, which assumes that "knowledge is everywhere and is socially constructed" (Thomas, 2023, p.111). It is, therefore, subjective, accepting that "all kinds of information are valid and worthy of the name 'knowledge'" (ibid.). In its subjectivity, it is necessary "that the knower's own value position is taken into account in the process" (ibid.), particularly as a researcher who occupies multiple roles. As such, I will briefly outline my positionality.

My role as an educational researcher is just one of four "pedagogic identities" (Addison, 2010) I have occupied during the project, which also include teacher, student and artist. In an effort to tie these disparate identities together, especially teacher with artist, I attempted to incorporate some of Jorge Lucero's "modes of operation", as summarised by Bremmer, Heijnen and Kersten in their paper, Teacher as Conceptual Artist (2021). These included "school as material", in which, literally or metaphorically, teachers use the school and its structure in their lessons, and "co-construct", which involves collaborative practice between pupils, colleagues, partners, locations or situations (Bremmer et al., 2021). I also integrated Paulo Freire's notion of the "student-teacher", co-opting my "teacher-students" as researchers through praxis to create new knowledge (Freire, 1970). As such, the outcomes of the lessons were the subject of critical reflection, both in and out of the classroom.

It is worth noting these identities and positions, because they may influence the data. As their teacher, I am also involved in students' assessment, so they might have been affected by "prestige bias" (Thomas, 2023, p.221) to give a good impression of themselves ahead of parents' evening, which was held the day after the end of my intervention. Furthermore, having introduced students to my art practice in the first lesson, they may have attempted to emulate my work in an effort to please me. Conversely, it is also possible that I may have been drawn to the responses that most closely resembled my own work. Similarly, as an educational researcher, I may have focused on students who responded well to the intervention. Finally, my transitory position as a student teacher in a placement school may have affected students' engagement. The inherent subjectivity of my positionality must therefore be considered significant to the findings. This subjectivity, however, is integral to the research and should be embraced.

Data collection and analysis

Research questions	Data collection methods	Participants
RQ1. How can working with unorthodox materials and processes in the art classroom affect students' perspectives of ecology?	Pre-intervention questionnaire	22/27 students
	Semi-structured interviews/visual data	Ten students in seven groups: Willow and Colette; Violet and Daphne; Giulia, Dolly and Sarah; Kevin; Maddie; Lydia
	Post-intervention questionnaire	24/27 students
RQ2. How can working with unorthodox materials and processes in the art classroom affect students' perspectives of experimentation?	Pre-intervention questionnaire	22/27 students
	Post-intervention questionnaire	24/27 students

Table 2: Research questions, with data collection methods and participants

Data was collected in three forms: questionnaires; semi-structured interviews; and visual data. Initially, a pre-intervention questionnaire was used to determine students' perspectives on ecology, art and experimentation. Towards the end of the intervention, after they had completed the final sculpture task, semi-structured interviews were conducted to ask students about their work. Simultaneously, visual data was gathered in the form of photographs of said work. Finally, a post-intervention questionnaire was used to ascertain whether students' perspectives had been affected.

Questionnaires

Pre- and post-intervention questionnaires were used to capture student perspectives, because they are a quick way to gather both quantitative and qualitative data (Wilson, 2013). Although neither questionnaire was subject to pre-testing due to the small-scale nature of the study, the structure of each was influenced by comparable literature in the field of ecology in art education (Bertling, 2015; Girak et al., 2019). A mixture of multiple choice, dichotomous closed questions and discursive open-ended questions were used to account for divergent abilities (Thomas, 2023). The dichotomous questions were useful to separate students into two groups - those who thought that there was a difference between humans and nature, for instance, and those who did not - with subset questioning to explain their answers. By contrast, the open-ended questions provided the opportunity to gather rich data about students' perspectives, before and after the intervention.

Three students were absent during the first lesson and two elected to withdraw their answers for a total of 22 responses for the pre-intervention questionnaire. Again, three students were absent from the final lesson, though there were no withdrawals, for a total of 24 responses for the post-intervention questionnaire. Both questionnaires were triangulated along with the semi-structured interviews and visual data to provide what Thomas terms “corroborative evidence” (Thomas, 2023, p.151).

Semi-structured interviews and visual analysis of work

As far as interviewing is concerned, “the semi-structured interview provides the best of both [structured and unstructured interviews]”, according to Thomas (2023, p.207), because it combines “the structure of a list of issues to be covered together with the freedom to follow up points as necessary” (ibid.). Semi-structured interviews of between 2-5 minutes were conducted during the fourth and fifth lesson of the intervention. Only one interview was held during the fourth lesson, so the majority were held in the fifth lesson, as and when students finished their sculptures. As such, I did not interview all students, instead capturing a sample of students who had completed their sculptures on time. It could not, therefore, be considered a representative sample of the class.

Since students were given the choice of whether to work independently or collaboratively, these interviews were with individuals or groups of up to three students. The interview schedule centred on the meaning they ascribed to their sculptures, if any. To protect students’ identities, I decided not to record interviews for transcription. Instead, I jotted down answers in the form of isolated words,

phrases and short sentences, which I then showed students to verify their answers. Though I was keen to avoid the "interviewer effect", as defined by Denscombe (2010, p.178), which can be a barrier to objectivity and consistency, I embraced the subjectivity of the process.

As mentioned above, photographic documentation of students' sculptures constitutes visual data, or image-based research (Prosser, 1998). In this paper, I will use the images to complement the semi-structured interviews, which revolved around the finished sculptures, rather than as data points in and of themselves. They will be triangulated alongside the questionnaires and interviews.

Ethics

Before constructing the methodology for this project, it was crucial to adhere to *The Ethical Guideline for Educational Research* (BERA, 2018). I therefore adopted an "*ethic of respect*" (p.5) in which trust between researcher and participant was paramount. Approval was sought and received from the placement school and mandated by the Faculty of Education, University of Cambridge. Consent was gathered from all participants and parents/guardians prior to intervention, and participants were reminded of their right to withdraw consent before the pre-questionnaire, intervention, interviews and post-questionnaire.

Participants remained anonymous and data confidential, as stated in the consent form. Interviews were held in a photography studio in the art department, which remained open and accessible, adhering to the school's safeguarding procedures. As mentioned above, no audio recordings were made and visual data did not include images of students or anything that could possibly identify them. Every effort was made to ensure the intervention would have no adverse effect on the students, academically or otherwise. As such, the intervention and data collection took place during timetabled art and design lessons and was designed to enhance their experience of GCSE art and design, rather than hinder it.

Data analysis

With an amalgamation of predetermined (deductive) and emergent (inductive) themes (Evans, 2013, p.163), thematic analysis was used to interpret the data. The predetermined themes were student perspectives of ecology and experimentation in the art classroom, as defined in the research questions. To uncover the emergent themes, I used the constant comparative method of coding (Thomas, 2023,

p.246), which involved analysing my qualitative data again and again, before identifying the following binaries: meaning as opposed to meaninglessness; representation as opposed to abstraction; and safety as opposed to risk-taking. These themes were subject to a process of review, before being discussed along with the findings below.

Findings and discussion

The research yielded a rich set of data. The findings are presented in the discussion under the respective research questions, so that interpretations may be given simultaneously. Furthermore, the findings and subsequent discussion are presented chronologically, from pre-intervention questionnaires to semi-structured interviews and, finally, post-intervention questionnaires. The semi-structured interviews and visual data are used to address the first research question exclusively. The findings and discussion of the second research question, therefore, draws only on pre- and post-intervention questionnaires.

RQ1. How can working with unorthodox materials and processes in the art classroom affect students' perspectives of ecology?

Pre-intervention questionnaire

Before the intervention, participants were asked whether they could define the word "ecology". Three ticked "yes", whereas the overwhelming majority of nineteen ticked "no". Only one student ventured a guess at what ecology means, defining it as "the study of living things", which is closer to a definition of biology. Of the majority that could not define ecology, one suggested it is "maybe something to do with nature." In the following question, participants were asked whether they consider themselves "ecological". Two ticked "yes", four ticked "no" and the majority of fourteen ticked "unsure". One left the question unanswered and another drew and ticked another box, next to which they wrote "my parents are". Of those that answered in the affirmative, one referenced her mum's gardening and the other dryly wrote, "dont [sic] want everything to melt", which implies an awareness of the climate crisis. It is important to point out that not being able to define "ecology", or its adjective, does not necessarily mean that students are "ecologically illiterate", as Taylor (1997) might have put it; they may simply lack the vocabulary to articulate their thoughts and opinions on the subject.

When asked whether they thought there is a difference between humans and nature, eight ticked "yes, humans are separate from nature", nine ticked "no, humans are a part of nature" and five left the question unanswered. Of those who answered "yes", few explained their answers. One wrote, "everything… we has [sic] a link that originates from the Earth", but that we have perhaps severed our link with the Earth. Another boldly wrote that "we have separated ourselves from nature and in turn we are destroying it", which evidences a keen awareness of environmental breakdown thanks to human activity. Similarly, few respondents offered explanations to their negative answers. Those that did suggested a connection to animals, with one writing that "we are basically animals who live off nature and impact it". Another summed up their answer succinctly: "We on earth / earth = nature". Like Bertling, I "refrained from making overarching statements about the environment" (Bertling, 2015, p.9l) throughout the project, because I did not want the lessons to become weighed down by discussions about the climate crisis or environmental collapse. I wanted to build *empathy*, rather than *apathy*, which Taylor (1997) encountered with her students. Unlike Girak, Lummis and Johnson (2019), I felt that students need not bear the burden of their individual environmental footprint to experience a paradigm shift. I worried it might prevent them from engaging with their materials on a deeper level.

Semi-structured interviews/visual data

During the fourth lesson, I held a brief semi-structured interview with Willow and Colette, whilst their classmates got on with the task at hand. I asked them if the project had changed their opinion about whether there is a difference between humans and nature, to which they answered no:

> *Willow:* *I always thought that there was no difference.*
> *Colette:* *Yeah, but art helps you think about the relationship between them.*

In the fifth lesson, after they had finished their sculptures, I asked Willow and Colette what their sculpture was about. Two pillars rise from a cardboard sheet, one festooned with foliage and natural motifs and the other with plastic straws, bottle caps and Styrofoam, the word "remember" written on a Post-It at its base (see Figure 1 next page). Between the two pillars a fabric bridge links them. They described their sculpture as the meeting of two worlds, human and natural, the former relentlessly encroaching onto the latter, polluting it with plastics and other waste. There is hope, however, in the form of a bridge that would unify the two worlds. I noted the contradiction between what they had told me last lesson, about how there was no difference between humans and nature, and what they

had just told me about their sculpture, that there were two distinct worlds, the natural and human. What I would suggest this implies is a cognitive dissonance between what they believe and what they made. It may be that students hold contradictory perspectives about ecology, which they are able to explore in art and design.

Figure 1: Willow and Colette's sculpture

A log wrapped in yellow, orange and red fabric forms the base to the sculpture on which a plume of netted smoke billows upwards, lifting with it a now ubiquitous facemask (see Figure 2). Similarly, when asked about the meaning behind their sculpture, Violet and Daphne described the impact of humanity on nature, alluding to forest fires caused by rising temperatures. They touched on a culture of "disposability", which they felt had been worsened by the COVID-19 pandemic. Whereas Willow and Colette's sculpture is metaphorical, albeit obvious, in its meaning, Violet and Daphne's is representative - the natural world is on fire and our waste fuels the flames.

Figure 2: Violet and Daphne's sculpture

On a cardboard and wooden base, leafy berries and a gnarled branch emerge from a plastic jar surrounded by a plastic bag, the words "recycle me" stuck to the container (see Figure 3). Like their peers, Giulia, Dolly and Sarah's sculpture incorporated plastic waste, emphasising the impact of human "consumption". Importantly, however, they described how plant life is growing *out* of the plastic, implying that nature could overcome the wastes of consumerism. Through material experimentation, Giulia, Dolly and Sarah have not shown how things are, but perhaps how they "*might* be", as Addison (2010) put it, beyond humans, as nature reclaims the human world. Like their peers' work discussed above, it is to a certain extent representational.

Figure 3: Giulia, Dolly and Sarah's sculpture

Other students, whose work is not illustrated, touched on related issues. Kevin, for instance, incorporated now defunct technology into his sculpture, including a VHS tape, remote control, compact digital camera, walkie-talkie and joystick. Maddie, however, took a more holistic view of her sculpture, which included a stringless violin and artificial flowers. She said that, although it is manmade, the violin is made from natural materials and that "art, music and nature are all related", perhaps manifesting the empathy I had hoped to build with students. Similarly, Lydia, who made no reference to ecological or environmental issues in her sculpture, told me hers was about "protection and love", perhaps the most abstract explanation of all. I would argue that Maddie and Lydia demonstrated an awareness of the interconnectedness, or "ecology", of things, though this might be best described as an expression of existing opinions, rather than the discovery of new ones.

Post-intervention questionnaire

In the post-intervention questionnaire, participants were asked if their opinion had changed about whether there is a difference between humans and nature. A minority of six ticked "yes", whereas the majority of fifteen ticked "no", with two left unanswered and one who drew and ticked their own box labelled "I don't know". Those that offered an answer to why their opinion had not changed suggested that they already believed that "humans are intertwined with nature". Few explanations were offered from those that reported that their opinion had changed, though one wrote that "I can create art using both aspects of the world, creating sculptures with humans as the base." Without further questioning, it would be inaccurate to assume that those six respondents who said that their opinion had changed had experienced profound ecological paradigm shifts, but it nevertheless demonstrates that the project had changed their opinions about humans and nature.

When again asked about whether they could define the word "ecology", a majority of sixteen reported that they could and a minority of four reported that they could not, with four left unanswered. Of those that confirmed that they could define the word ecology, almost all respondents gave a correct definition, referring to the "connection" or "relationship" between living organisms and their surroundings. In a follow-up question, participants were asked whether they thought ecology has a place in the art classroom. An overwhelming majority of nineteen felt that it did, compared to just two who felt that it did not. Three left the question unanswered. Two made a connection between the material culture of the art classroom with ecology: one wrote that "there's alot [sic] of things you can use in art room" and the second simply stated "save everything could be art". Their responses

demonstrate that Jorge Lucero's "modes of operation" (Bremmer, et al., 2021) have value in the art classroom, particularly using the "school as material", as it allowed students to explore the "ecology" of the department. One commented on the relationship "between artist and material", suggesting a growing awareness of the connection between themselves as artists and their materials.

In the final question, participants were asked whether the scheme of work had changed their thinking towards ecology. Twelve ticked "yes", whilst seven ticked "no", with four leaving the question unanswered and one who drew and ticked their own box labelled "I don't know". Of those that said it had changed their thinking towards ecology, three wrote that they "didn't… know what it meant before", or a variation of that statement, showing that they had quite literally learnt something new. A further three suggested that the scheme of work had expanded their thinking, with one writing that they had developed a "broader definition of ecology", whilst another wrote that they are "more aware of it now". Few who answered in the negative offered an explanation, though one wrote that they "still have the same thoughts about ecology as before, such as nature in art."

RQ2. How can working with unorthodox materials and processes in the art classroom affect students' perspectives of experimentation?

Pre-intervention questionnaire

In a multiple-choice question, participants were asked what they enjoy doing most in art and design, with the option to select more than one. As an active, participatory subject, it seemed appropriate for the options to be present participle verbs. The responses are summarised in the pie chart below (see Figure 4). Only one respondent ticked all of the boxes, whereas most selected two or three boxes. Though the multiple-choice questions themselves could be argued to reinforce an orthodoxy of art-making, the traditional two-dimensional processes, drawing and painting, dominate, whilst sculpting was the least popular. Only one ticked "other", with "collage" given as the answer. My findings correspond with those of NFER mentioned in the literature review, in which drawing and painting were the favoured art mediums (Downing, 2005, p.122).

The reasons why they enjoyed their chosen materials included: preference; enjoyment; and confidence. One respondent mentioned "experimentation" as a reason why they enjoyed their chosen processes, whilst another commented on the creativity the materials afforded them. In the following open-ended question, participants were asked which materials they most enjoy working with and

why. At least three respondents cited their lack of drawing skills, implying a perceived hierarchy of techniques which drawing tops. It comes as no surprise, because, despite a varied curriculum in which students experiment with printmaking, sculpture and collage, students are regularly set drawing tests throughout key stage 3. These arbitrary assessments reinforce the perception that drawing is the most important technique. It is worth noting, however, that one respondent identified pens and pencils as the materials they enjoy using most because "they are easy to access at school and at home". Given the current cost of living crisis and of maintaining state schools (Adams, 2022), it is unsurprising that perhaps the cheapest materials are the most favoured.

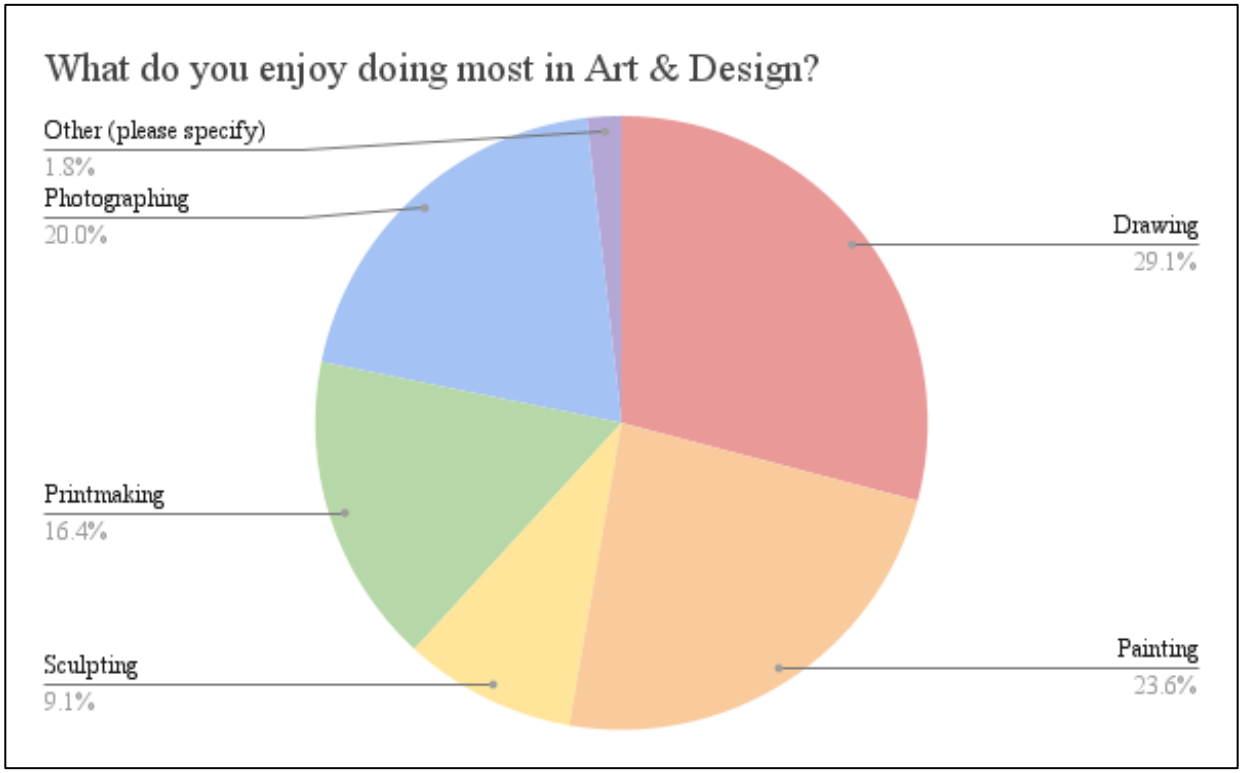

Figure 4: Pie chart illustrating what students most enjoy doing in Art & Design

When asked directly whether they enjoy experimenting with new techniques or ideas in art and design, a majority of seventeen ticked "yes" and a minority of three selected "no", whilst two ticked both boxes. Those that reported that they did not like experimenting with new techniques or ideas in art and design implied that they were afraid, either to make mistakes or to be pushed outside their comfort zones. Those that selected both expressed caution. It seems then that, although there is a perceived hierarchy of processes, most students like to experiment with new techniques and ideas. Participants were later asked whether they preferred working independently or collaboratively, because collaboration implicitly entails a level of experimentation (Green, 2001). The majority of

thirteen ticked "independently" and a minority of three selected "collaboratively". A further five ticked both boxes and one left the question unanswered. Some respondents who prefer working independently cited control as a key reason. Others suggested introversion or poor communication skills. Of those who preferred working collaboratively, respondents suggested they liked talking with people and that it was more fun. Those who ticked both boxes suggested it was dependent on the task.

Post-intervention questionnaire

In the post-intervention questionnaire participants were asked if they enjoyed working with unusual materials and processes. A majority of twenty ticked "yes" and a minority of two ticked "no". A further two drew and ticked their own boxes, labelled "sometimes" and "kind of", respectively. Many respondents who enjoyed working with unusual materials and processes simply explained that it was fun. Some, who explained their thoughts in more depth, wrote that it was "stimulating" and "unusual and therefore exciting", (my emphasis) suggesting that because the intervention was out of the ordinary it was enjoyable. One specified that it was enjoyable because it was "different to the traditional styles we learn", suggesting an inherent orthodoxy to the GCSE curriculum. Another suggested that they enjoyed it because it "shows how everything can be art if there is a tought [sic] process", demonstrating a sophisticated understanding of contemporary art practice. One explained that they appreciated "the creative aspect of working with different materials".

The follow-up question asked participants what they had found challenging, with a few different themes emerging when analysing the answers. Firstly, at least five students struggled to find "meaning in the sculptures", which suggests that they believed meaning is a prerequisite for an artwork. Although I had asked students what their sculptures were about, at no point did I suggest that they ought to have meaning. Echoing this feeling, one student wrote that they found "the meaning quite pointless as my sculptures were random and didn't represent anything", implying that artwork needs to represent or mean something for it to be valid. Similarly, two students found it challenging to generate ideas about what to make and how to make it, inhibited perhaps by their conception of what art can be.

Secondly, in a scheme of work that embraced an unorthodox approach to art making, some found the freedom overwhelming. One respondent wrote that "it was hard to know what was right & wrong", which suggests that they believe there is a right and wrong in art and design. Thirdly, as many as eight students commented on the material challenges of the tasks: for some it was the practical

difficulties of binding materials together or assembling structures, whilst for others it was indecision about which materials to use. Fourthly, because the tasks were designed to create ephemeral works of art, documentation was an important part of evidencing the creative process, but at least two students reported that they were unsure about how to present their work. Finally, two students found the workload challenging.

Participants were also asked about whether their opinion had changed about what art can be. A minority of six answered that it had, whilst a majority of sixteen answered that it had not. Two left the question unanswered. Most of the students whose opinion had not changed about what art can be echoed one who wrote that "it has further solidified my opinion that art can be anything", with others specifically commenting on the "subjectivity" of art. Another wrote that "i [sic] still consider the same things art although maybe not the trees - i [sic] think now that they're art but i [sic] didn't before". This answer, which references Joseph Beuys' 7,000 Oaks, unequivocally demonstrates how some students experienced a shift in what they consider art to be, particularly with regards to art and ecology. Few of those whose opinion had changed gave explanations, though one wrote that "there is [sic] more types of art then [sic] I thought", whilst another wrote, "I realised that even rubbish can be art if there is thought going into its presentation". Another concluded, "it can be anything."

Conclusions

Being as embedded in the research as I am, my "pedagogic identities" (Addison, 2010) and the small-scale nature of the research prevent me from making generalisations, as stated above. Consequently, my findings cannot be considered significant in the wider context of ecology and art education. Upon reflection, the most fundamental limitation lies in the collection of data. In future studies it may be beneficial for researchers to interview students to understand their perspectives of ecology *before* the intervention. It could also be useful for others to lead the interventions, so that a researcher might observe students' engagement, whilst maintaining critical distance. Furthermore, in-depth post-intervention interviews could help to provide a more detailed picture of how students' perspectives have been affected. I propose that to expand its scope more cycles of research ought to be undertaken in different locations over longer periods of time.

Whilst educational policy may be slow to respond to the climate crisis and young people's concerns about it, I have found that within the art and design curriculum there is scope to explore ecology in

both a philosophical and emotional capacity. There is a desire for training, as Rushton and Dunlop (2022, para.8) recommend, from teachers, who would like to feel more confident teaching sustainability and the environment in the classroom. Though the research in the UK is scant, there is compelling literature from across the globe to suggest that ecology in art education can develop paradigm shifts. More research is needed, particularly in the UK. To my knowledge, this project is the first of its kind in the UK and provides a foundation upon which to build future research. As an educator, I will endeavour to continue my research into ecology in the art classroom within my own practice.

Based on my findings I would tentatively conclude that working with unorthodox materials and processes in the art classroom can positively affect students' perspectives of both ecology and experimentation. Most students had an implicit idea about what ecology meant, even if they did not have the vocabulary to define it, but that idea was *expanded* during the project. One respondent summarised their experience of the research in their post-interview questionnaire, eloquently writing that it encouraged "more thinking between material and art". Another respondent wrote that "it opened my mind to what ecology can also be aka art". These comments may not constitute a total reexamination of their relationship with the world around them, but they do signify a subtle shift in their thinking, demonstrating the potential for art and design to affect change in students' perspectives of ecology through experimentation. Students need to be shown that there is more to art and design than drawing and painting, and I would argue that a curriculum which explores artistic actions, or processes, rather than finished outcomes, is best placed to do so.

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