

# Quick, Quick, Slow: Making Time for Sustainable Photography Practices in Contemporary Higher Education

Tracy Piper-Wright<sup>id</sup> and Tabitha Jussa

## Abstract

As environmental awareness grows, so do questions about the environmental impact of photography, in particular traditional film development and processing, which includes the use of plastics, gelatine and other environmentally harmful chemicals notwithstanding water usage and waste. Pioneering practice and research into sustainable alternatives to conventional processes has quickly established, supported by organisations such as The Sustainable Darkroom. Students in Higher Education are environmentally aware and prepared to take action to mitigate their impacts where possible. As such, there is a coalescence of perceptions within and beyond the classroom which asks to be addressed in the curriculum. This paper draws upon the research project Under a Green Light: A Darkroom for the Future which investigated how university darkroom practices can pivot toward more environmentally friendly methods. The paper describes the learning environment of the darkroom as a space of slowness, immersion and experimentation and the pedagogic value of this for photography students. The paper argues that incorporating environmental awareness into day-to-day teaching through systemic changes to process and practice, rather than through short term curriculum interventions, contributes to transformative learning experiences and promotes positive long-term change.

## Keywords

art and design pedagogy, authenticity, communities of practice, habitual practice, photography, sustainability, transformative learning

---

This is an open access article under the terms of the [Creative Commons Attribution License](#), which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

## Introduction: Where we are—the environmental contexts of photography

Traditional film and darkroom photography has always relied on chemicals, papers and water, including plastics and animal products in film itself, and as such cannot be said to be a particularly environmentally friendly art form (Maughan Carr 2019). However, the notion that digital photography offers a more environmentally conscious alternative is not the case. Since the advent of the smartphone, it is estimated that 6 trillion photos are produced every year, and the energy required to store, share and publish those photos can run to 20 million MWh, or the equivalent of 5 million electric cars driving 20,000 km each (Sneyers 2023).

While the widespread use of analogue formats has waned since the arrival of accessible digital cameras in the early 2000s, film continues to be used by enthusiasts and professionals and still plays a central part in tertiary and higher education photography courses in the United Kingdom. Many students come to study photography at university because of the appeal of studying elements of craft skills that link their work to a historical continuum of lens-based practice. While digital photography makes up a substantial proportion of students' activity on undergraduate courses, the opportunity to work in a wet darkroom and to learn skills in developing and printing from film have a tangible pedagogic benefit in terms of photographic knowledge and skill acquisition (MacDonald 2012). Digital photography adopted the terminology of its analogue forbear entirely and in the case of post-processing software the terms used mimic those that can be experienced in the darkroom.

Thus, there is an expectation for HE photography students that they will experience the 'magic' of the darkroom (Miller 2023) and awareness from subject specialists that this experience can be critical to students' understanding of the medium and its creative potential. This pedagogic importance must however be set against the wider environmental and sustainability issues that surround the darkroom. Is it possible to work in a more environmentally conscious way in a university darkroom? What are the benefits and drawbacks of changing the way we do things? This was the challenge taken up by two members of staff at the University of Chester through a research project entitled *Under a Green Light: A Darkroom for the Future*. The project was carried out in the University of Chester Photography department, which comprises four academic staff, one technician demonstrator and approximately 60 students, from August 2023 to July 2024. The project was developed and led by the technician demonstrator and one academic from the department, who are the authors of this paper. The project took place within the existing darkroom module delivery for undergraduate students in order to evaluate how alternative methods might impact on student experience, staff workload and photographic quality.

The aim of the project was to shift the current darkroom practices at the University of Chester towards more environmentally friendly and sustainable alternatives. There were two motivations for this. Firstly, there is a significant movement in analogue photography practice towards the exploration and use of alternatives to traditional darkroom chemicals. The chemical components of black and white film and print processing are largely unchanged from the original formulations used in the early 19th century and this is increasingly at odds with the awareness of the damage to aquatic life that is entailed by their disposal, as well as the human health risks of close contact and inhalation of these compounds. The use of

alternatives draws attention to the 'givens' of photography practices and traditions (Bateson 2000), and influences practitioners to think about what they are using to make their pictures and what the environmental and social impacts might be of their choices.

This broader ecological standpoint is political in that it calls into question the large-scale production of chemicals and the impact of waste and animal by-products in the production of black and white analogue photos (Fletcher 2022). As film photography practitioners, both authors were aware of these debates and already using and experimenting with ecological alternatives in their respective practices. It seemed pertinent to bring this aspect of our practice into our teaching and introduce students to the contemporary debates and challenges occurring in their subject.

Secondly, the availability of film and chemicals is becoming increasingly constrained by a combination of reduced manufacturing capacity and better than expected demand from consumers who have discovered a love for analogue photography. As forementioned, in the early 2000s, digital cameras became normalised and well-known manufacturers ceased production and beloved film stocks become obsolete as a consequence (Brachmann 2014). However, the Covid-19 pandemic inadvertently increased the demand for film as 'isolation projects' involving analogue photography became valuable means for creative escape. This new demand coincided with the decommissioning of large chemical plants which reduced the availability of raw materials required to make film, developer and other analogue products. This combination of events during and since the pandemic has resulted in severe global shortages of colour film stock and most recently, black and white film developer (Madison 2021).

With our responsibility to stock and to teach with these materials in our university darkroom, the authors realised that not only a socio-political change but also an economic one was looming and that rather than lose the darkroom as a teaching resource, we needed to create a 'darkroom for the future'. In this context, the main objectives of the project were:

- To research alternative substances that can be used in place of traditional chemical developer, stop and fix solutions for black and white film and print processing.
- To trial the reduction of water consumption at the washing stage in black and white film and print production.
- To introduce alternative photography processes into the curriculum to increase options for students to engage in sustainable practice.

While this project was initiated on pragmatic lines, the authors soon recognised that the shifts in practice and process that were being proposed were situated within and influenced by the time-pressured realities of the university education system and the perceptions and expectations of students pursuing analogue photography. This prompted a wider consideration of how we teach and learn practical processes in art and design, how signature pedagogies of ambiguity and experimentation (Orr & Shreeve 2018) can be lost or affirmed by the learning environments we create for students and how questioning our existing habits and frames of reference (Mezirow 2000) can lead to transformational experiences for learners and teachers alike. The following sections elaborate on these thoughts and note the outcomes of the research project as part of this discussion.

## The darkroom as unique learning environment: Time, materials and mistakes

In the face of the issues outlined above, one might question the benefit of retaining the darkroom and analogue processes within contemporary university education. However, far from being anachronistic, learning these processes unlocks understanding of the principles of photography in ways that working with digital media does not (MacDonald 2012). Pedagogically, the darkroom offers students a unique learning environment which is unlike many of their other experiences at university. It is also a place where the disciplinary habits of mind in art and design such as iteration, uncertainty and experimentation (Sims & Shreeve 2023) can be foregrounded and experienced. This in turn has value for the development of a professional understanding of what it means to be a photographer or creative practitioner (Shulman 2005).

While there is emerging research into the historical, cultural and technical aspects of the photographic darkroom (Dominici 2024), there is little research into the pedagogic impact of the darkroom on students. As both authors are practising photographers and teachers, we reflect upon our own experience as participant-observers in this environment, from which we draw some conclusions in what follows. A central observation, that grounds all others, is that there is a marked change in tempo when working with analogue processes in and out of the darkroom. This aspect of slowing down or extension of time is, we believe, significant and informs the pedagogic value of the darkroom.

### Flow and Slow

The photographic darkroom is a quite different space from other campus rooms and studios. It can be a disorienting space to enter, normally via a double-chambered entrance which is dark enough to prevent the ingress of light and which might prompt a momentary pause on the threshold. Once inside, slow adjustment is needed to the dim red light which illuminates the workshop area. Thus, in its very construction, the darkroom requires us to slow down.

Once acclimatised, working in the darkroom proceeds at a conventional pace, however, the process of creating prints is time-consuming. From focussing a negative in the enlarger, creating a test strip to ascertain correct exposure, developing that strip (through the four stages of development, stop, fix and short wash) and evaluating the results, it can be up to 30 min before one is ready to make a final print. Therefore, when we refer to time slowing down in the darkroom, we mean this in concrete terms. For students, this slowing down can seem very unnatural in comparison to their digital photographic practice, or other experiences of studentship and general campus life. This difference can result in frustration and a reluctance to return to film photography. For others, it can be a positive motivator to work in the darkroom and invest in the process of making photographs on film.

In this specialist space, only one form of practice can take place, immersing the student in the matter in hand, free from distractions, because even the light of a smart phone is enough to ruin light-sensitive emulsion. This quality of immersion can help students slow down their creative process, become more observant and attentive. As one gets used to counting seconds rather than milliseconds for photo development, the time spent in the darkroom expands, becoming mindful and restorative. Both authors have observed sessions where students begin in a rush

and then slow down, becoming engrossed in working towards a good exposure for their print, losing themselves to the process.

This aspect of ‘losing yourself’ was identified by Csikszentmihalyi (1990) as a key characteristic in his theory of ‘flow’ in which our engagement with a challenging but rewarding task can cause us to become absorbed in the process. Flow theory does not only relate to creative practice, but is also most keenly felt in tasks which are both pleasurable yet challenging, which would characterise much of student learning in art and design, and certainly that for novice darkroom printers. For a generation who have experienced, since birth, a fast-paced internet-driven world full of the distractions and stimulations of social media and instant messaging, the opportunity to experience flow in the context of the darkroom can be especially rewarding (Figure 1).

### Materiality and agency—making mistakes

Within this unique learning environment, students engage with the tactile aspects of photography that are often lost when working with digital formats alone. The tacit knowledge (Polanyi 1966) developed through the deliberate steps of adjusting a focus point or handling delicate film or papers focusses attention on the essential constituents of photography: film, chemicals, paper and light (Henning & Mikuriya 2021). The material encounter with photography in the darkroom can often forge pathways for students into new areas of practice or awaken in them the wonder of what is possible using the simplest of means, such as the delight of making a first photogram (MacDonald 2012). The sensorium of the darkroom, the necessity to work by feel in low light and to traverse carefully in and out of this dimly lit space, makes us acutely aware of our body in space and our body in relation to materials.



**Figure 1**  
The Darkroom is a Place of Immersion and Exclusion From the Rest of the Campus-world.

In contemporary art and design teaching and learning the desire for tactile, physical and material outcomes is as strong as ever. While the digital is embraced and perhaps foregrounded, the opportunity to produce physical artefacts remains at the forefront of student engagement with the subject. Photography holds a precarious position in relation to other disciplines in that its digital character is ubiquitous for all, regardless of specialism or training. As each student and member of staff has a camera-equipped mobile phone, digital photographs are within the reach of everyone, and students of photography can often complain of 'screen overload' as they upload and edit their images on computers. To overcome the exhaustion of the digital and to differentiate themselves from the 'masses', some photography students turn to film photography as a mean to reconnect with a different form of practice.

However, film photography's greater potential for error can present a challenge to students who are used to getting perfect results every time. For both authors, the material agency of analogue photography is the very reason for using it, and introducing the darkroom to students can be a way of breaking down expectations about image making and the creative process which are almost impossible to do in a digital context. While we always strive for the best exposure, we also recognise that the happy accident is an important part of the creative process (Piper-Wright 2022). Art and Design pedagogy centres on experimentation and the exploration of unknown outcomes through the individual pursuit of practice (Orr *et al.* 2014). Increasingly, however, students struggle with the transition to a university environment which requires and expects independence and risk-taking, values which are often in marked contrast to their school experiences (Thomas 2019). Working in the darkroom can help students experience uncertainty, mistakes and iteration because the medium they are using has its own agency. Encouraging students to play and work out the parameters of the material can be a first step, and this can take place through the use of alternative processes such as lumen printing and photograms where the interaction of light and emulsion cannot be predicted but are generated by the material interactions themselves.

### From red light to green light

The physical space of the darkroom creates affordances for particular types of learning to take place (Mäkelä & Löytönen 2017, 251). The qualities of slowness, immersion and experimentation inherent to this environment open up possibilities for new forms of practice, knowledge and understanding to emerge. The darkroom becomes a material resource as important to students' learning as working with papers and film in the making of analogue pictures. With this importance in mind, it is appropriate to consider the barriers to using this space over time. Prolonged exposure to the chemicals involved in film photography can be detrimental to health. Ilford recommend wearing protective breathing apparatus, gloves, eye wear and an apron while preparing and using photographic chemicals (Safety Data Sheets 2017). Extended contact with stop and fix can lead to contact dermatitis. In addition, darkrooms and film processing spaces have to be well ventilated to reduce the risk of headaches or breathing-related difficulties. Although Ilford does not specify these issues, they are well-known in practitioner circles and research (Tucker 2023).

So, as we acknowledge the inherent pedagogic value of the darkroom, we can see how the shift to environmentally conscious materials and processes will be of benefit not only to the environment, but also the long-term health and well-being

of students and all darkroom users. In addition to mitigating the health and safety risks associated with photography chemicals, more environmentally friendly alternatives provide options for self-sufficiency, circumventing our reliance on large companies and manufacturers when working with analogue processes. Many sustainable film development processes use materials which are cheap and abundant. These methods open up film developing to students to work not just in the university darkroom, but at home where practice can continue throughout the vacations or when access to the campus might be limited. This could also encourage students to continue their film practice after graduation when access to a working darkroom is unavailable.

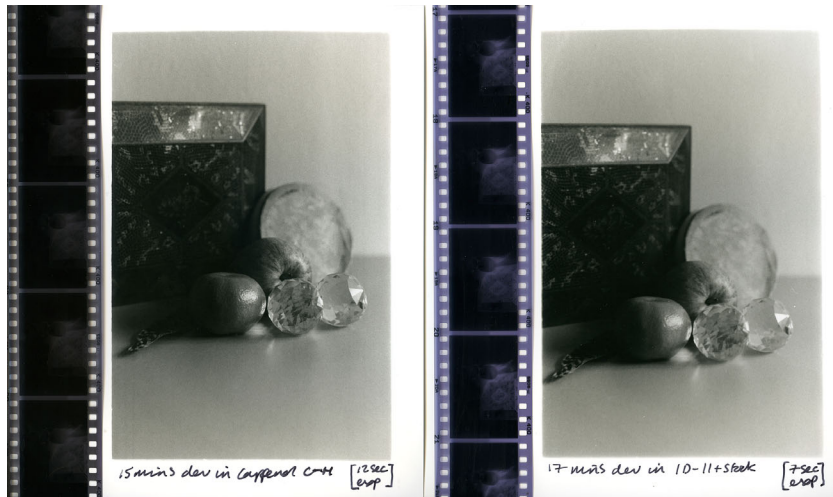
## Unlearning old ways: Changing practices and habits

To confidently work in a darkroom requires induction into the methods of developing film and printing which are standard and applicable to the materials and chemicals being used. It also requires some induction into the way that things are done in this particular darkroom, by which we mean the habits and practices that have been established by the tutors or workshop managers, and which are passed on to new darkroom users. Thus, there is a distinction between the procedural knowledge of how to process a film and the disciplinary habits that pertain to the methods that are used in any given darkroom (McCormick 1997). The authors recognised that fulfilling the aims of the research project would require more than just introducing chemical alternatives but would require systemic change to the habits and behaviours we modelled and taught in the darkroom.

The first aim of the research project was to find a suitable alternative to chemical developer. Caffenol is a tried and tested method of alternative development made from washing soda, coffee and vitamin C. The active ingredient of caffenol—coffee, where the name arises—can be interchanged with other phenol-rich substances such as tea, red wine and some plants. There are many different formulations for caffenol which are detailed in the *Caffenol Cookbook* (Reingold *et al.* 2012), a freely available community-authored resource for alternative developing.

Using this resource, the technician demonstrator planned to test a range of caffenol recipes to find one that produced consistent results when compared to standard chemical developer. This coincided with a critical shortage of Ilford ID-11 film developer which gave the research added impetus as our remaining stocks dwindled. After trialling several formulations, and different developing times and temperatures, she identified that a 'high speed' formula (known as Caffenol C-H) produced results that were comparable to ID-11 after 15 min of development (Figure 2).

With a developer alternative identified, the next step was to change the habits that were already in place in the darkroom. Normally, students can use the darkroom for developing their films at any time when the campus is open. Stocks of chemicals are made up in advance and kept ready to be used on demand. However, caffenol has to be used as soon as it is made, and so when moving to this developer, students had to plan their developing schedules carefully and work within the parameters of the technician demonstrator's other commitments. This change introduced a new aspect of forward planning and negotiation for students in their darkroom practice. It also made visible the work involved in preparing



**Figure 2**  
Completed Trials Show the Image Quality Benefits of Caffenol Developer Along With the Ecological Benefit.

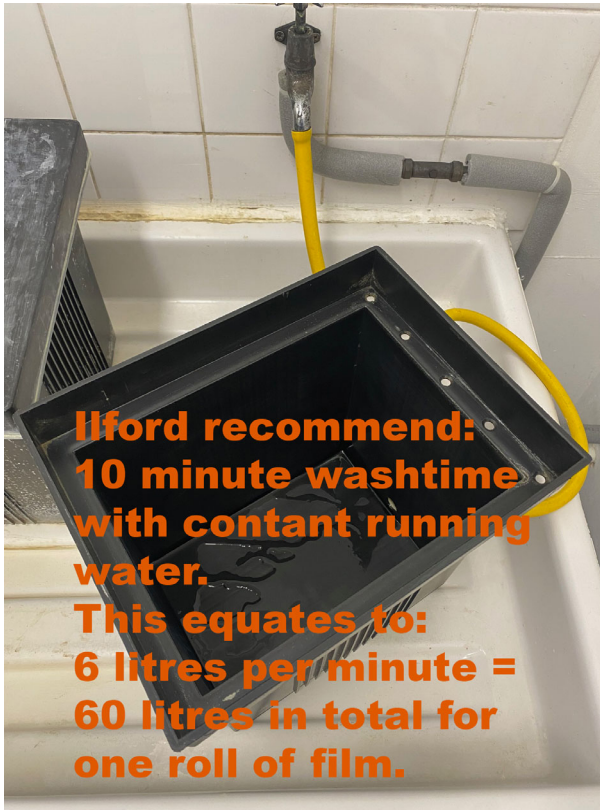
chemicals and stocking the darkroom that the technician demonstrator undertook on a regular basis: work which had not been consciously acknowledged by students or other darkroom users.

Alongside this major change to darkroom chemistry, smaller and seemingly less obvious changes have been made in the darkroom to improve the environmental impacts and increase sustainability. The washing regime used during film development has been changed from a continuous flow of water for 10–15 min to one where water is added to the film tank, agitated and discarded three times, reducing water use considerably. Likewise, print washing has been modified to remove continuously running water instead leaving prints to soak with periodic water changes. In addition to these savings on water consumption, we have introduced aprons and cloth rags to be used in the darkroom so that users can wipe their hands when moving from wet to dry areas (i.e. from developing trays to the enlarger). This has removed the need for paper towels, reducing paper waste and cost (Figure 3).

These basic and to all intents common sense changes might seem very obvious. But they are likely to impact our students' understanding of the way to work in the darkroom in significant ways. Teaching practical processes in art and design uses modelling, demonstration and explanation to convey the right way to approach a task (McLain 2017). In this instance, the demonstrator is the expert, and the tacit knowledge gained through the demonstration and subsequent repetition reinforces the student how to achieve a successful outcome. These habits are shared within the community of practice (Wenger-Trayner 2008) of a particular darkroom, creating a self-reinforcing set of disciplinary habits that those community members adhere to.

Therefore, changing our habitual behaviours in the University of Chester darkroom will have impact now and in the future. We tend to learn a method and stick to it, and in this case, the darkroom practices we teach at Chester will be those that graduates take with them beyond their studies and into other situations. These small changes have also made it apparent to staff how easy it is to get set





**Figure 3**

New Washing Regimes Make a Marked Difference to Water Usage in the Darkroom in Contrast to Established Methods.

in a particular pattern of activity and that a critical appraisal of systems and processes is always required. For our new first-year students, these changes were not changes at all, they were simply 'the way it's done'. For second- and third-year students, this change to our expectations of darkroom practice required more consideration, including explaining the rationale behind the move to sustainable methods and clearly indicating the changes to procedures in the darkroom through practical demos, a darkroom signage.

Introducing sustainable behaviour in the darkroom encourages all darkroom users to embody new habits in their approach to making pictures. This includes considering when to use the darkroom, the impact on others' time to facilitate this and taking time to wash film and prints sparingly, rather than turning on the tap and walking off. These new habits are not automatic but become formed through reflection on action and response to changes in the learning environment. For Dewey, habit is not repetitive or automatic but is 'based on sensitive and thoughtful responses to the environment, where there is a transition from naïve action to intelligent action based on thinking and deliberation on relevant experiences'. (Thorburn & Stolz 2023, 604).

What has occurred in our darkroom can also be seen as a form of transitional learning in action for both staff and students. Initially, the authors examined their

existing frames of reference for darkroom practice through critical reflection on the environmental and health contexts of making analogue pictures (Mezirow 2000). This critical reflection was informed by broader social and cultural contexts (e.g. the use of alternatives as a counter measure to industrial pollution) and became demonstrated in our personal practice but needed to be enacted by changing the processes and methods being demonstrated and taught in our university learning community. Cranton & Roy (2003) argue that authenticity for teachers is 'the expression of the genuine self in the community' (p. 94) and as such we could not continue to espouse a set of values in one area of our practice and ignore them in another. We recognise, as Garber *et al.* (2020) describe, that our identities as photographers and teachers are porous and intertwined. Critical questioning of the existing knowledge that surrounds photography has occurred in an experiential way rather than a purely theoretical one. Daloz (1999) argues that transformative learning occurs when we are faced with a change to our world that requires us to relate to it in a new way and that transformation is driven by experience. The changes to darkroom methods for students have also been experiential at the outset because they are framed through modelling and repetition which reinforce them as ways of doing. Our challenge was to engage students with the context that informs these new ways of doing and encourage them to reflect on their sustainability actions within and beyond the darkroom.

## This is not a test: Taking the long view on educating for sustainability

Changing working practices in the darkroom should have a positive effect on our environmental impact. There is also potential for the new 'habits of mind' (Mezirow 1997, 5) being embodied in the darkroom to help students think more broadly about sustainability as they relate the practical activity of making pictures to the wider social, political and ecological drivers behind the changes.

Sustainability initiatives in management and business courses or design disciplines in higher education are common (Heiskanen *et al.* 2016; Delaney & Liu 2023). These studies provide useful indicators of how students are offered opportunities to engage with sustainability challenges through their studies or in campus life and point to ways in which these increasingly urgent issues are being addressed in educational settings. When photography is mentioned in relation to environmental education, it is most often in a depictive role (Scott 2014), such as illustrating the consequences of environmental damage, or documenting new approaches to sustainability in a given context. These roles of illustrating and documenting can hide the sustainability issues that affect photography itself and the challenges for photographers that need to be addressed. As forementioned, the ubiquity and ease of photography mean that it is rarely examined closely as a medium unless by its practitioners. This close examination falls to those teaching photography who must look critically and carefully at the messages they are sending to the next generation of professional photographers.

Fischer *et al.* (2012) argue that while we often have the knowledge to make sustainable choices, acting on that knowledge requires us to recognise the strong influence of value and belief systems. So, it is not surprising that most educational sustainability initiatives centre on the development of subjective knowledge and self-awareness through which students can engage in critical reflection and

transformational learning (Blake *et al.* 2013). Furthermore, Bentz & O'Brien (2019) articulate the necessity for participation, action and dialogue as components of transformative learning experiences. This 'head, heart, hands' (Singleton 2015) model is one that coherently fits within art and design pedagogy where practical skills, individual values and contextual awareness coalesce in the production of art works.

To foster contextual understanding, we have shared the project by discussing it with students during classes and introduced the work of sustainable photographers to show these new practices in action. Taking a dialogical approach moves the project out of the realm of theory and into practice and demonstrates that the photography world is always in a process of becoming, rather than a static or historic 'object' to be transmitted wholesale (Freire 1986). Introducing the project in class sessions enables students to contribute to the research because it is based on materials and processes that most students have become familiar with. Dirx (2000) and Mezirow (1997) state that transformational learning is most effective in the context of real-life experiences and ordinary occurrences, where our imaginative engagement with the everyday prompts new ways of thinking. Bringing the research project into conventional teaching and learning situations (module sessions, darkroom demos) contributes to its potential to be transformative.

While the changes made as a result of the project are still in their infancy, we have already seen how student engagement with the project can promote opportunities for critical reflection and increased awareness. One second-year student worked closely with us to test different caffenol formulations and in so doing tested his own assumptions about the purposes of the experimentation that he was engaged in. His interest stemmed initially from a curiosity about different substances and chemicals that could be used for film development. One of these is paracetamol which can be mixed with caustic soda and sodium sulphite to create a film developer known as ProRodinal. While we welcomed his enthusiasm, we discussed the need to make a critical appraisal of alternatives based on their environmental impact, not just their film developing efficacy. This helped the student realise that there was more at stake than the perfect exposure (the normative and instrumental reasons for making a photograph) and that the goals of the experimentation were to do with good exposure *and* environmentally friendly and readily available alternatives. This '*and*' became a pivotal moment in his understanding of the wider implications of the chemical impacts of film photography and led to a growing awareness of the life cycle of materials which does not just begin at the point where we pick them off the shelf. This student's involvement enabled him to reframe a point of view which was solely centred on the 'given' (Bateson 2000) of photographic image quality and to become open to the possibility of different photographic values.

Opportunities for transformative learning are guided by the learning environments and opportunities for dialogue and reflection that lecturers provide within their teaching. There is also the potential inherent in our discipline to foster transformative learning in all aspects of creative teaching and learning through the signature pedagogies of divergent thinking and risk taking which rely on a sense of exploration and embracing the unknown. The ability of artists, designers and photographers to 'think sideways' (Lipson Lawrence & Cranton 2009, 317) means that new possibilities can always be found if underlying assumptions and habits are questioned and challenged. The shift to sustainable photography practices is

evidence of this and points to how a combination of embodied practice, reflection and action can create new visions for a sustainable future. As Jaakkola et al, citing Grocott (2022) explain: ‘creative practices mobilize knowing that goes beyond the analytical and rational mind and promote a transcendence of the here and now through imagining’. (Jaakkola et al. 2022, 5).

### **Durational pedagogy**

Because the changes we have implemented in the darkroom are now part of that learning environment, the experience will go beyond the individual cohorts and year groups we teach and become evidence of how, as a community of staff and student photographers at Chester, we work sustainably as a matter of course. Changes to developer usage will not be rolled back when, or if, commercially produced developers become more readily available. The changes to washing and cleaning procedures in the darkroom will remain in place and we will continue to explore further ways to reduce the environmental impact of the darkroom.

If educating for sustainability is itself to be sustainable, then short-term interventions or project-based approaches are not the way forward. Studies such as Redman & Redman (2016) and Heinrich & Kørnøv (2022) demonstrate that learning which occurs over a short time frame lacks the continued practical application of sustainability principles into students’ ongoing experiences. By contrast, projects that include extracurricular aspects or encompass the environment in which students learn and practice are better at addressing students’ holistic understanding of their own environmental impacts generated through their course of study, and their personal agency in addressing and mitigating those impacts. Lee & Manfredi’s (2021) study explores staff and students’ perceptions of material usage and recycling behaviours in the context of the design studio. While being a short, 4-day project, the authors indicate the long-term impacts of changes to policy and process that could emerge in the studio environment. What is relevant to our project is the focus on the learning environment that students find themselves in which directs their attention towards their own actions rather than towards a theoretical problem ‘out there’.

Every photography student using the darkroom from now on will have new opportunities to evaluate their practice within a broader framework of environmental awareness and in so doing develop an understanding of their personal responsibility and impacts. By not hiding the material difficulties or shortages affecting the industry or shying away from discussing issues such as costs and time with students, we enable them to understand the bigger pictures that surround sustainability debates and their own individual empowerment. UNESCO’s Education for Sustainable Development manifesto indicates a number of competencies that are crucial to the advancement of sustainable development. Among the expected normative, critical thinking and problem-solving competencies is ‘self-awareness’: ‘the ability to reflect on one’s own role in the local community and (global) society; to continually evaluate and further motivate one’s actions; and to deal with one’s feelings and desires’. (UNESCO 2017, 9).

Encouraging students’ self-awareness when using the darkroom prompts them to consider the world beyond themselves and their role as future photographers. This focus on the future self is what Shulman (2005) refers to as a pedagogy of formation, which equips students with personal identities and values for professional practice (p. 23). In training the photographers and photography teachers of the future, we promote and model a way of being that will have future benefits. As

we embody the concepts of ecological, personal and social responsibility in our teaching, we aim to promote the formation of these values in our graduates. As Shulman points out 'a true professional does not merely practice: he or she performs with a sense of personal and social responsibility' (Shulman 2005, 18). The long-term results of our changes may be too far ahead to see at this point in time, but if we can encourage our students to be open to questioning their assumptions, and aware of their own power to change, we will have moved a step in the right direction.

## Conclusion

The foregoing discussion has outlined some of the main impacts arising from the research project *Under a Green Light: a Darkroom for the Future*. Our green light is a symbolic one, signifying the start of a new sustainable path for our darkroom at the University of Chester and giving permission for all those who use it to change and grow. Through the process of enacting practical changes in the darkroom, the authors have engaged in critical reflection on the importance and relevance of the darkroom as a learning environment and how our teaching in this environment manifests in the habits and values of our students. Coming to understand our own responsibilities to teach authentically, has given additional motivation and purpose to the project and helped us align our multiples selves—teacher, researcher, practitioner—into a coherent whole (Cranton 2001).

In this spirit of authenticity, we can also consider how pursuing a sustainable agenda might offer a counterpoint to the existing undergraduate experience which is increasingly rapid, compartmentalised and target driven. If we were, through our practices of making, learning and teaching, to reimagine a sustainable photography degree, we would be engaged in a slowing down and opening up: allowing more time for exploration, trial and error and mindful play to enter the equation. We would perhaps be less concerned with outcomes and more with process, and with the holistic experience of becoming a creative practitioner rather than the atomistic pursuit of grades. By spending time and connecting more meaningfully to each other and to the non-human world, we might better sustain our art form, and ourselves.

## Acknowledgements

The authors would like to thank the University of Chester for supporting us with this project and the staff and students in the Photography Department who have helped shape our understanding of the importance and magic of the darkroom.

**Tracy Piper-Wright** is a Deputy Head of Art and Design at the University of Chester and teaches on the BA Photography programme. She holds degrees in English and Philosophy (Hull), Fine Art (Wrexham) and a PhD in Fine Art (University of Wales). She is a practising artist using experimental analogue processes, collage and archives. Her research centres on photography as a socio-cultural practice which she explores through the lens of feminism and new materialism. She has written and researched on topics such as amateur photo-a-day projects, photographic errors and visual activism in women's documentary photography.

She has worked on a number of AHRC, Nesta and UKRI funded transdisciplinary collaborative research projects focusing on arts and health.

**Tabitha Jussa** is a Technical Demonstrator and Visiting Lecturer in Photography at the University of Chester. She holds a BA in Fashion (University of Westminster) and an MA in Documentary Photography (Newport). Tabitha's work bridges the gap between contemporary and traditional documentary photography and her knowledge of film and printing includes traditional darkroom techniques alongside digital processes. Tabitha's current research is centred around sustainable photographic process and practice. Her most recent publications include *Under a Green Light: A Darkroom for the Future* in NSEAD AD Magazine Art and the Earth Crisis Special Issue (September 2024), *100 Photographs: From the Collections of the National Trust* (Christopher Tinker, 2024) and *209 Women* by Hilary Wood published by Bluecoat Press 2019. t.jussa@chester.ac.uk

## REFERENCES

- Bateson, G.** (2000) *Steps to an ecology of mind* (University of Chicago Press ed). University of Chicago Press.
- Bentz, J. & O'Brien, K.** (2019) ART FOR CHANGE: transformative learning and youth empowerment in a changing climate, *Elementa: Science of the Anthropocene*, Vol. 7, p. 52.
- Blake, J., Sterling, S. & Goodson, I.** (2013) Transformative learning for a sustainable future: an exploration of pedagogies for change at an alternative college, *Sustainability*, Vol. 5, No. 12, pp. 5347–72.
- Brachmann, S.** (2014) *The rise and fall of the company that invented digital cameras*. Patents & Patent Law. 1st November 2014. Available from: <https://web.archive.org/web/20201114183710/https://www.ipwatchdog.com/2014/11/01/the-rise-and-fall-of-the-company-that-invented-digital-cameras/id=51953/>
- Cranton, P.** (2001) *Becoming an authentic teacher in higher education*, Original edn. Krieger Pub. Co.
- Cranton, P. & Roy, M.** (2003) When the bottom falls out of the bucket: Toward a holistic perspective on transformative learning, *Journal of Transformative Education*, Vol. 1, No. 2, pp. 86–98.
- Csikszentmihalyi, M.** (1990) *Flow: the psychology of optimal experience*. Harper & Row.
- Daloz, L. A.** (1999) *Mentor: Guiding the journey of adult learners* (1st ed). Jossey-Bass.
- Delaney, E. & Liu, W.** (2023) Postgraduate design education and sustainability—An investigation into the current state of higher education and the challenges of educating for sustainability, *Frontiers in Sustainability*, Vol. 4, 1148685.
- Dirkx, J.** (2000) After the burning bush: Transformative learning as imaginative engagement with everyday experience, in C. Wiessner, S. Meyer & D. Fuller [Eds] *Challenges of practice: Transformative learning in action. Proceedings of the Third International Conference on Transformative Learning*. New York: Teachers College, Columbia University.
- Dominici, S.** (2024) (Guest Editor.) The darkroom: chemical, cultural, industrial, *Journal Photo Researcher*, Vol. 41 Available from: <http://www.eshph.org/journal/photoresearcher-no-41-2024/> [Accessed 13th April 2024].
- Fischer, J., Dyball, R., Fazey, I., Gross, C., Dovers, S., Ehrlich, P. R., Brulle, R. J., Christensen, C. & Borden, R. J.** (2012) Human behavior and sustainability, *Frontiers in Ecology and the Environment*, Vol. 10, No. 3, pp. 153–60.
- Fletcher, H.** (2022) *Re-source*. The Sustainable Darkroom.

- Freire, P. (1986) *Pedagogy of the oppressed*. Continuum.
- Garber, E., Beckles, K., Lee, S., Madan, A., Meuschke, G. & Orr, H. (2020) Exploring the relationship between making and teaching art, *International Journal of Education Through Art*, Vol. 16, No. 3, pp. 435–57.
- Grocott, L. (2022) *Design for Transformative Learning A Practical Approach to Memory-Making and Perspective-Shifting*. Routledge.
- Heinrich, F. & Kørnø, L. (2022) Art and higher education for environmental sustainability: A matter of emergence? *International Journal of Sustainability in Higher Education*, Vol. 23, No. 3, pp. 728–47.
- Heiskanen, E., Thidell, Å. & Rodhe, H. (2016) Educating sustainability change agents: The importance of practical skills and experience, *Journal of Cleaner Production*, Vol. 123, pp. 218–26.
- Henning, M. & Mikuriya, J. T. (2021) Light sensitive material: An introduction, *Photographies*, Vol. 14, No. 3, pp. 381–94.
- Jaakkola, N., Karvinen, M., Hakio, K., Wolff, L.-A., Mattelmäki, T. & Friman, M. (2022) Becoming self-aware—How do self-awareness and transformative learning fit in the sustainability competency discourse? *Frontiers in Education*, Vol. 7. <https://doi.org/10.3389/educ.2022.855583>
- Lee, S. & Manfredi, L. R. (2021) Promoting recycling, reducing and reusing in the School of Design: A step toward improving sustainability literacy, *International Journal of Sustainability in Higher Education*, Vol. 22, No. 5, pp. 1038–54.
- Lipson Lawrence, R. & Cranton, P. (2009) What you see depends upon how you look: A photographic journey of transformative learning, *Journal of Transformative Education*, Vol. 7, No. 4, pp. 312–31.
- Mäkelä, M. & Löytönen, T. (2017) Rethinking materialities in higher education, *Art, Design & Communication in Higher Education*, Vol. 16, No. 2, pp. 241–58.
- Macdonald, I. (2012) Why throw the negs out with the bathwater? A study of students' attitudes to digital and film photographic media, *International Journal of Art & Design Education*, Vol. 31, No. 2, pp. 191–211.
- Madison, J. (2021) *How film manufacturers are making sure it doesn't make a comeback*. Fstoppers <https://fstoppers.com/film/how-film-manufacturers-are-making-sure-it-doesnt-make-comeback-582344>
- Maughan Carr, E. (2019) *An Ecology of Grain*. Royal College of Art. [https://www.researchgate.net/publication/341515258\\_The\\_Ecology\\_of\\_Grain\\_An\\_Ecological\\_Analysis\\_of\\_Gelatin\\_in\\_Photographic\\_Film](https://www.researchgate.net/publication/341515258_The_Ecology_of_Grain_An_Ecological_Analysis_of_Gelatin_in_Photographic_Film)
- McCormick, R. (1997) Conceptual and procedural knowledge, *International Journal of Technology and Design Education*, Vol. 7, No. 1–2, pp. 141–59.
- McLain, M. (2017) Emerging perspectives on the demonstration as a signature pedagogy in design and technology education, *International Journal of Technology and Design Education*, Vol. 28, No. 4, pp. 985–1000.
- Mezirow, J. (1997) Transformative learning: Theory to practice, *New Directions for Adult and Continuing Education*, Vol. 1997, No. 74, pp. 5–12.
- Mezirow, J. (2000) *Learning as transformation: Critical perspectives on a theory in progress* (1st ed). Jossey-Bass.
- Miller, G. F. (2023) *Dark room*, 1st edn. Bodleian.
- Orr, S. & Shreeve, A. (2018) *Art and design pedagogy in higher education: knowledge, values and ambiguity in the creative curriculum*. Routledge.
- Orr, S., Yorke, M. & Blair, B. (2014) 'The answer is brought about from within you': A Student-Centred Perspective on Pedagogy in Art and Design, *International Journal of Art & Design Education*, Vol. 33, No. 1, pp. 32–45.
- Piper-Wright, T. (2022) A trace of actions unseen: the photographic error as photography 'in performance', *Revista de*

História de Arte - Série W. No.9/2020  
ISSN:2182-3294.

**Polanyi, M.** (1966) *The tacit dimension*. NY: Double Day.

**Redman, A. & Redman, E.** (2016) Is subjective knowledge the key to fostering sustainable behavior? Mixed evidence from an education intervention in Mexico, *Education in Science*, Vol. 7, No. 1, p. 4.

**Reingold, G. et al.** (2012) *The caffennol cookbook & bible*, Community Spirit Publications.

**Safety data sheets for ILFORD photochemicals when made up for use** (2017) Ilford photo. Available from: <https://www.ilfordphoto.com/health-and-safety/safety-data-sheets-ilford-photochemicals-made-use/>

**Scott, R.** (2014) Education for sustainability through a photography competition, *Sustainability*, Vol. 6, No. 2, pp. 474–86.

**Shulman, L. S.** (2005) Pedagogies of uncertainty, *Liberal Education*, Vol. 91, pp. 18–25.

**Sims, E. & Shreeve, A.** (2023) Signature pedagogies in art and design, in I. A. Haynie, N. L. Chick, R. A. R. Gurung & A. A. Ciccone [Eds] *Exploring more signature pedagogies*, 1st edn. Routledge, pp. 55–67. <https://doi.org/10.4324/9781003444725-6>

**Singleton, J.** (2015) Head, heart and hands model for transformative learning: place as context for changing sustainability values, *Journal of Sustainability Education*, Vol. 9.

**Sneyers, J.** (2023) *History and environmental impact of digital image formats*. Unthinking Photography; The Photographers' Gallery Available from: <https://unthinking.photography/articles/history-and-environmental-impact-of-digital-image-formats>

**The Sustainable Darkroom** (n.d.) Xxxx Available at: <https://sustainabledarkroom.com/>

**Thomas, J.** (2019) And shift! A review of approaches that support transition from a-level art and design to fine art undergraduate study, *Art*, Vol. 8, No. 2, p. 46.

**Thorburn, M. & Stolz, S. A.** (2023) Where merleau-ponty meets dewey: habit, embodiment, and education, *Studies in Philosophy and Education*, Vol. 42, No. 6, pp. 599–615.

**Tucker, J.** (2023) "Diseases of the Darkroom" in the Long Nineteenth Century. Paper presented at *In the Photographic Darkroom Conference* 8-9 June 2023 University of Westminster.

**UNESCO** (2017) *Education for Sustainable Development Goals: learning objectives*. Available from: <https://unesdoc.unesco.org/ark:/48223/pf0000247444>

**Wenger-Trayner, É.** (2008) *Communities of practice: Learning, meaning, and identity* (18th printing). Cambridge University Press.