The impact of visual posts on creative thinking and knowledge building in an online community of educators

Abstract

This paper presents data from an Erasmus + project entitled Digital Leaders Across Boundaries (DLAB) to suggest ways learning is facilitated by engagement with collaborative online tools, and specifically through the use of creative visual posts. The DLAB project that informs this paper invited academics, teachers and students from four European countries to work together on a three-year project. The first year, which the data from this article refers to, focused on the theme of Technology Outdoors and resulted in three intellectual outputs, a four-week Massive Open Online Course (MOOC), a creative online community and a project website. This paper focuses on the online community, and demonstrates how the visual nature of the online community posts aided creative thinking and provided a hook for community members to adapt, develop and repurpose ideas. Using a visual ethnographic approach, the content of creative visual posts in the online community were tracked and coded to elicit how connections spread. This analytic process revealed observable ways in which ideas were developed and disseminated online. The paper findings exemplify, by exposing idea mapping, how the most effective posts allowed ideas to evolve by drawing relationships between creative outputs, participant thinking, learning cultures and practice. Sharing ideas facilitated creative thinking and collective knowledge building in the online community as the participants' posts amplified the ideas seeded in the original MOOC content. The findings suggest that it would be beneficial for learning designers and educators to understand these processes in social online communities so as to nurture creativity within them.

Keywords:

Creativity, Collective Thinking, Knowledge Building, Online Communities of Practice, Technology, Visual ethnography, Creative Thinking

1. Introduction and Rationale

1.1 Introduction

This paper explores the impact of creative visual posts on idea evolution in an online community of practice associated with a Massive Open Online Course (MOOC) exploring the theme of Technology Outdoors. The MOOC disseminated the first year's collaborative work from the three year Digital Learning Across Boundaries (DLaB) Erasmus+ project (http://dlaberasmus.eu/), involving pre- and in-service teachers and university lecturers in 4 European countries. The project promoted digital

learning across the boundaries of creative physical spaces through Technology Outdoors, before focusing on integrating subjects through STEAM (adding the Arts to STEM) in year 2 and crossing language and cultural boundaries through CLIL (Content and Language Integrated Learning) in year 3, see Figure 1.

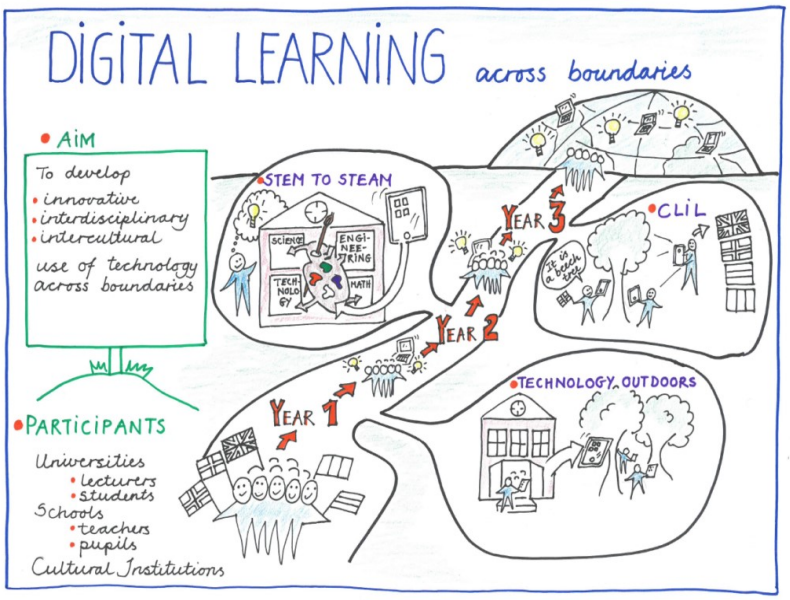


Figure 1: Digital Learning Across Boundaries Visual project representation.

At the end of each year, the project team developed and hosted an international MOOC based on their collaboration. MOOC participants were invited to try DLaB ideas in their own practice and use the creative online community to browse, reflect and share experiences. Data for this paper comes from the creative online community associated with the Technology Outdoors MOOC, which allowed for comments to build up around visual posts, an affordance we felt was key to developing creative thinking, collective knowledge building and transfer to practice in an educational context. The aim of the data analysis is to describe the process of social learning in an online environment and show how the visual posts facilitate the construction of new meanings. We define a creative visual post as an online post that goes beyond the presentation of text as a communicative form. Visual posts may use, interpret, explore and experiment with artistic content, and may adapt, develop and repurpose ideas using arts-informed and creative means (see Figure 2). Creativity is a diverse term, and in art and digital education has been variously expressed as possibility thinking, change, development, content creation, play and cognitive endeavour to touch the surface (Craft, 2010; Black and Browning, 2011; Heaton, 2019; Schmoelz, 2018). When applied to visual online posting we looked for evidence of these attributes in participant contributions, and considered how the individual posts helped the collective understandings evolve. We also sought evidence of transfer to practice or intention to transfer to practice as a measure of MOOC success.

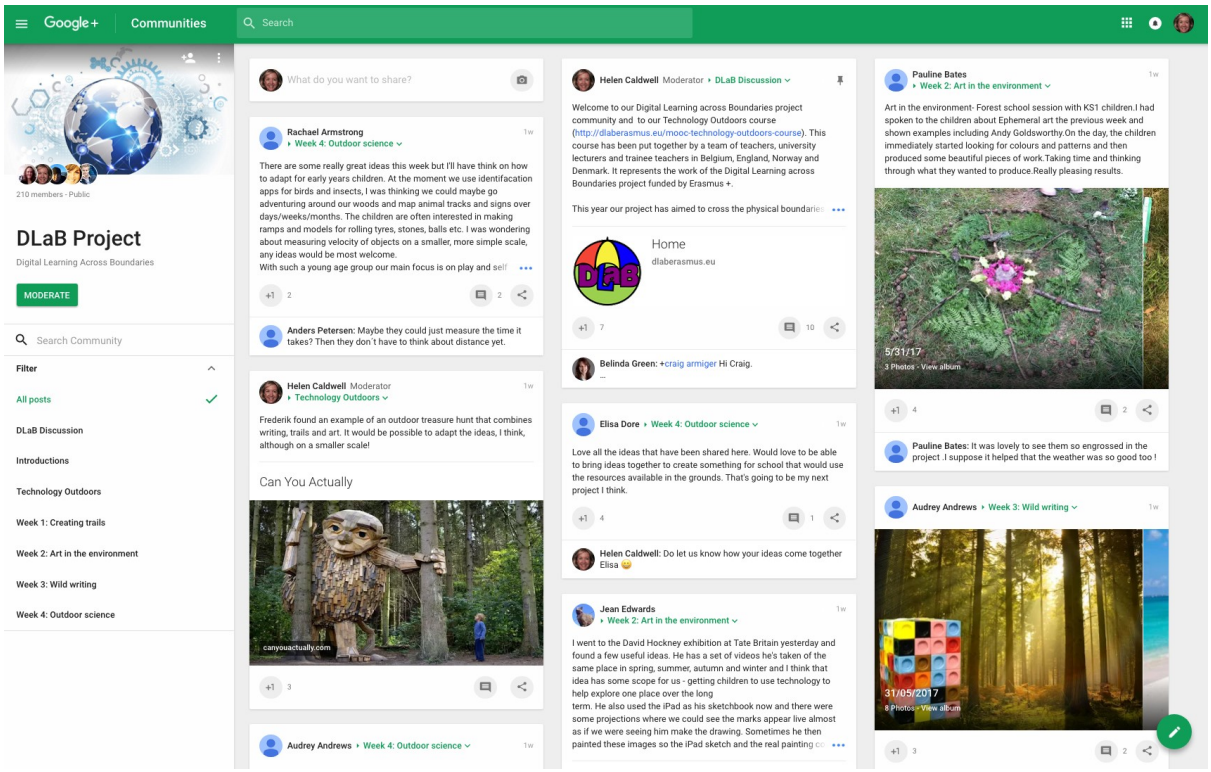


Figure 2: Example creative visual posts

1.2 Rationale

Since it was proposed by Lave and Wenger in 1991, the construct of communities of practice (CoPs), has provided a useful lens for looking at social learning (Lave and Wenger, 1991). The term has been repeatedly applied to teacher Continuing Professional Development (CPD), and a substantial body of research now focuses on online teacher communities as a constructivist platform for teachers to connect and share across time zones, removing geographical boundaries and allowing learners control over the pace and place of engagement (Somekh, 2008; Schlager et al. 2009; Lock, 2006; Wenger et al., 2002; Gannon-Leary and Fontainha, 2007). This form of community engagement draws upon thinking skills, and the addition of visuals offers creative ways of being and interacting online, acknowledging the power of the collective voice. Many definitions of online communities retain Lave and Wenger's original notion that CoPs are groups of people learning together in a shared domain;

> 'a collective intention - however tacit and distributed - to steward a domain of knowledge and to sustain learning about it.' (Wenger et al., 2011, p.11).

In 2017 Smith et al. carried out a critical review of 41 studies that shared CoP characteristics. In their conclusion, they call for a new phase of analysis to provide a more complex understanding of the CoP learning process:

> 'We…believe that more attention is needed to highlight the specialized ways of knowing, thinking, and doing that people need to internalize to participate in a particular social practice' (Smith et al, 2017, p.221).

Smith and Rowe (2005) echo this, mooting there is no guarantee that adding interactive spaces will result in the communal meaning-making which characterises a CoP. Our paper contributes to this debate by analysing the relationship between creative visual posts, media, thinking and comments in an online community, and examining their impact on teachers' practice.

In recognising the importance of creative visual posts, we acknowledge that social online learning often involves an interplay of 'thinking,' 'talking,' and 'making'. This has an affinity with the duality described by Wenger (1998) as 'participation and reification', in other words 'making something real'. Goggins et al. (2011) describe this duality as:

> 'Participation involves acting and interacting, and reification involves producing artifacts (such as tools, words, symbols, rules, documents, concepts, theories, and so on) around which the negotiation of meaning is organized.' (Goggins et al., 2011 p.210).

An area to consider further, suggested by Goggins et al. (2011, p.224), is the role of technology tools in enabling the process of participation and reification. Our rationale for focusing our research on creative visual content in the community posts is to study the way visual content enabled by technology tools supports relational idea exchange in interconnected cognitive, physical and digital domains. In our experience, visual content helps to unite the activities taking place in these domains and facilitates movement between them, creating conditions for collective knowledge building. For example, a creative visual post might prompt discussion leading to physical action using technology outdoors, which might then prompt a visual reply reflecting development of the original ideas, followed by discussion that further advances understanding. This process has much in common with socio-constructivist knowledge-building theories (Garrison et al, 2001; Scardamalia and Bereiter, 1994).

Visuals often acted as the point of unity for community participants or as stimuli for their idea movement. Our focus on creative visual content developed from our ideas about unity and movement, and builds on two themes from previous work:

i) A theoretical awareness that in ethnographic studies, such as that by Sigenthaler (2013), educational research needs to understand idea exchange through creativity and aesthetics in social and relational scenarios, specifically those transcending physical and digital worlds and the personal and professional lives of participants.

ii) Our previous work in creativity, cognition and social online learning (Caldwell and Heaton, 2016; Heaton, 2018), which highlights the effect of visual engagement in enabling reflection on practice and the redirection of practice.

These two considerations helped to unpick exactly what our participants' creative visual posts contributed to i) new media research ii) individual and collective learning journeys, and iii) transfer from an online learning community to educational practice.

Our research objectives were:

- To identify ways creative visual posts in our online community enhanced ideas seeded in the MOOC content.
- To examine how community members transferred ideas to practice in response to creative visual posts.
- To document the interplay between cognitive, physical and digital domains in social online learning, as evidenced by the creative visual posts.

2. Methodology

Our study adopted an ethnographic research approach that was visual, digital and multi-sited (Pink, 2013; Murthy, 2008; Pierides, 2010) to understand how 292 online community members engaged creatively in an intercultural educational community of practice (Bresler, 2016). Visual ethnography (Pink, 2013; Given, 2008) enabled us to identify how the group, that is our organisation and culture of study, used online rituals creatively to transfer ideas to practice, to connect cognitive, physical and digital ideas, and to add value to each other's contributions. Our selection of visual ethnography is connected with visual arts as a way of knowing (Sullivan, 2005) because we anticipated that

creative visual posts, and our community, would become a place through which participants expressed their thoughts through language, medium and context. These are the facets of visual arts knowing and ultimately of learning in this creative, digital context. Visual ethnography, as a site for visual knowing, provided three viewpoints from which to observe and study the phenomena of online learning in a social community and its impact on practice.

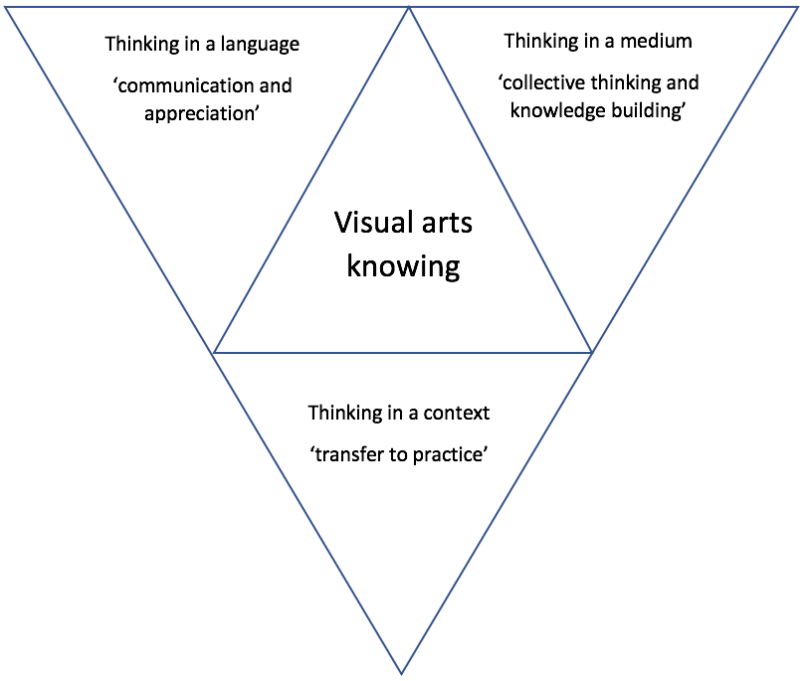


Figure 3: A conceptual framework that uses visual arts knowing to analyse visual data

Visual ethnography as a methodology, underpinned by the conceptual framework of visual arts knowing, enabled us to use distanced and close lenses to interpret a sample of thirty community posts where participants used creative content to share and build educational ideas and experiences. Three key categories for describing creative online community interactions and behaviours emerged from our thematic analysis of the data: 'Collective Thinking and Knowledge Building', 'Transfer to Practice', and 'Communication and Appreciation' (see exemplifications in the results section 3). As shown in Figure 3 above, in a digital context these categories connect with the facets of visual arts knowing. In addition to the three categories, from our sample posts, which contained photographs, digital artefacts and collages with accompanying text-based interactions, we deduced eight concepts that revealed how our participants used creative content to interact online. These are outlined in Figure 4.

Our sample posts and emergent concepts and categories demonstrate ways knowledge building occurs in response to visual content shared in a social online community. Visual ethnography and the framework of visual knowing enabled us to see our research data differently as researchers who were also active community members. This insider involvement afforded an immersive view that helped us to understand the practices, challenges and cognitive connections our participants made. For example, we could see the impact of creative visual posts stimulating discussion in real time and we observed that a delay between postings often inhibited idea development. Being active in the community meant that we could foster the development of shared thinking and understanding, whilst gaining tacit understanding of the knowledge building process. Such involvement has the potential for researcher bias, however we took the view that a goal of a creative online educational community is to nurture the progression of thinking, knowledge, belief and practice through a learning process that might be described as rhizomatic. Rhizomatic learning is a metaphor used to describe the way learning can evolve in multiple directions and systems (Deleuze and Guattari, 1988; Bozkurt et al, 2016). Rhizomatic relations are also a means to understand theory, practice, product and processes in visual, arts-based and artographic research (Irwin et al., 2006).

Our research data is gathered from a set of 30 online community posts publicly shared by participants and randomly sampled from two of four Technology Outdoors MOOC weeks, which focused on the sub themes of 'art in the environment' and 'wild writing'. These weeks were chosen to fit with the theme of creativity in arts education. Each post was analysed in terms of units of meaning and these are quantified in relation to the emerging concepts in Figure 4.

In terms of ethics, public posting provides participant consent according to the British Psychological Society ethical guidelines for Internet-mediated research (2017). We used this as evidence for consent in our study but we also considered that truth and transparency are contentious in virtual data (Kuhn, 2007; Mewburn and Thomson, 2013), and so gave our registered participants an opportunity to opt out by email after signing up to MOOC and community involvement.

3: Results

In the section below we present an analysis of the whole sample of 30 posts. Then with a closer lens, we look at a unit of 13 posts in section 3.2, and finally we analyse one individual post in section 3.3, to draw conclusions about the nature of creative thinking and knowledge-building within the sample.

3.1 Analysis of a sample of 30 posts

Our initial analysis looked at our thirty sample posts and associated comments with a distant lens to gain an overview of the impact of the creative visual posts and comments, utilising the conceptual framework outlined in Figure 3 as a guide. An objective was to examine the process of idea evolution to practice transfer within a digital context. This was expressed in the creative visual posts through engagement in our three categories of visual arts knowing: 'Collective Thinking and Knowledge Building', 'Transfer to Practice', and 'Communication and Appreciation'. We also considered how posts document the interplay between cognitive, physical and digital learning domains.

The interpretation followed an iterative process through which three researchers reviewed and retagged the data in relation to the conceptual frame, allowing for repeated elements and commonalities to become apparent. Initial interpretations were grouped into 8 concepts, which align to our three categories of visual arts knowing. Our three concepts and eight categories were then used to draw out and track the development of participant creative thinking, pedagogy and practices, to identify how the posts facilitated knowledge building. The concepts and categories were useful in that they helped us to manage and reduce our large data set. They acted as a conceptual thread to guide our research as they came from participant contributions, and they have assisted us throughout this paper to frame our discussion. From a methodological position the concepts and categories have acted as an anchor within our ethnographic work to enable tracking of movement between cognitive, physical and digital spaces.

The 8 concepts that emerged from interpretive engagement with visual posts are:

1. **Response to MOOC**: the creative visual post is a *replication* of the MOOC ideas or an *adaptation* that extends the ideas and provides evidence of self-directed learning.
2. **Applying Ideas:** Evidence of applying ideas to a teaching context in the creative visual post or comments. This may be *previous, actual* or *intentional* practice. It could be in response to the MOOC content or to the post itself.
3. **Cognitive, Physical, Digital**: evidence of moving between cognitive, digital and physical environments in the creative visual post and/or comments.
4. **Thinking and Knowledge Building**: moving beyond the MOOC content through thought, discussion or demonstration prompted by the creative visual post.
5. **Techniques and Tools**: the creative visual post prompts discussion of techniques and tools that extends participants' thoughts or understanding.

6. **Pedagogy**: discussion or demonstration of the method and practice of teaching within the post.
7. **Communicating Understanding**: using the activities to communicate with others. This may be within *intercultural* or *local* communities and in a variety of media.
8. **Peer Appreciation**: supportive and positive comments or creative visual postings in response to the initial creative post

Our initial analysis identified a range of interactions between the participants across the sample, such as participants modelling or exemplifying to another through the community how they approached or reworked a particular concept in their classroom before and after feedback.. Figure 4 demonstrates that the most common occurrence was Response to MOOC (27 posts), which highlights a direct relationship between the MOOC content and the community. Being introduced to and trialling an idea through the MOOC gave participants the skills and confidence to transfer the idea to practice. There is also strong evidence of intention to or actual transfer to practice in the concept of Applying Ideas. The application of ideas occurred through strategies such as providing instructions for a specific pedagogical approach, lesson idea or piece of software. Intention to practice occurred when participants used the community as a safe space to articulate an idea or approach they wanted to implement in the future. The spread of occurrences across each of these concepts suggests that the concepts are a good set of descriptors for the creative and social online learning behaviours within the community.

Response to MOOC	Applying ideas	Cognitive, Digital, Physical	Thinking and Knowledge Building	Tools and Techniques	Pedagogy	Communicating Understanding	Peer Appreciation
27	25	21	19	20	22	19	19

Figure 4: Frequency of posts demonstrating evidence of each interpretive concept (n=30 posts)

Further analysis allowed us to connect the concepts with the three broader categories as shown in Figure 5: Transfer to Practice, Collective Thinking and Knowledge Building, and Communication and Appreciation. These categories link to the visual arts ways of knowing (Sullivan, 2005). The first, Transfer to Practice, combines three concepts, Applying Ideas, Response to MOOC and Cognitive,

Digital and Physical, to provide evidence that participants actually did something in response to the MOOC, suggesting that active engagement has an impact on individuals' learning.

The second category, Collective Thinking and Knowledge Building, subsumes the concepts Thinking and Knowledge Building, Tools and Techniques, and Pedagogy, providing evidence that the online community is moving forwards together, and that it provides an environment for creative thinking and learning to evolve through collaboration. This category acknowledges that creative thinking and learning might evolve around the testing and recommending of practical technology applications as well as pedagogic strategies.

The third category, Communication and Appreciation, unites the concepts Communicating Understanding and Peer Appreciation, demonstrating the importance of creative online interaction in building shared understandings, and of building trust within the community as a necessary condition for communication.

Categories		
Transfer to Practice (73)	Collective Thinking and Knowledge Building (61)	Communication and Appreciation (38)
Concepts		
Response to MOOC (27)	Thinking and Knowledge Building (19)	Communicating Understanding (19)
Applying Ideas (25)	Tools and Techniques (20)	Peer Appreciation (19)
Cognitive, Digital and Physical (21)	Pedagogy (22)	

Figure 5: Concepts combined into three overarching categories

Figure 5 demonstrates that creative visual posts and comments prompt thought and action that leads to further posts and subsequent reflection and discussion. The visual posts and comments help

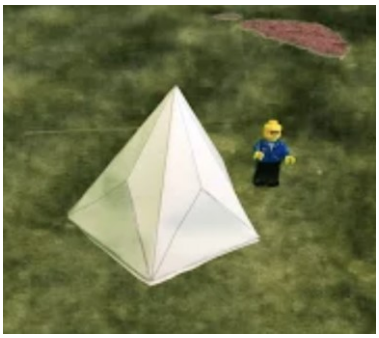
to verify and enhance the ideas presented in the original MOOC because they demonstrate alternative teaching and learning approaches, and illustrate the application of ideas across a variety of contexts and settings. In this way, learning evolves in new directions beyond the original MOOC content, via creative cycles, akin to the facets of rhizomatic learning and creativity in education referred to above.

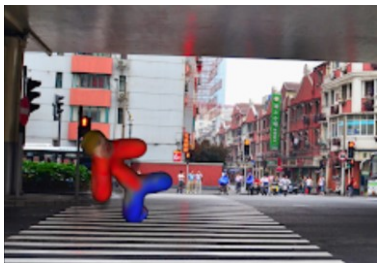
3.2 Analysis of a unit of posts

In addition to our close consideration of the sample of 30 posts outlined above, we took a closer viewpoint and made qualitative observations of 13 posts and comments associated with the Technology Outdoors MOOC unit on the theme of Virtual Sculptures using the same concepts and categories as descriptors. The Virtual Sculptures posts were chosen as an example unit that was rich in visuals. They comprise a set of 13 posts consisting of images, description and comments. The MOOC examples showed children creating mini sculptures and swapping them with their peers in other countries using green screen techniques. The aim of this activity was for children to be able to build intercultural understandings of place using the medium of art.

Figure 6 below provides a selection of examples showing how the concepts and categories were applied to this sample of creative visual posts and comments. This is followed by consideration of each category.

Categories		
Transfer to Practice	**Collective Thinking and Knowledge Building**	**Communication and Appreciation**
Concepts		
Response to MOOC 'My year 1 children loved this activity.' 'I set a small group a challenge of...creating 3D models in our local environment.	**Thinking and Knowledge Building** 'We need to acknowledge different ways of making meaning through multi-modal artefacts.' 'We used Sculpt+ on the iPads	**Communicating Understanding** 'Love the creativity of your Y6s. Will share their work with our Y4s as it may encourage them to continue exploring surrealism.'

This is what they came up with.' 'I have already posted some work done earlier this year on Google+ and feel that my current practice sits very well alongside the Virtual Sculptures case study.' 	to create virtual sculptures. These are fully rotatable and are manipulated like digital clay. We then placed these in our 'real' environments within the app itself.' 'The photographs they create can then be used to inspire their writing.' 'Following my last reflection, where I raised a concern that the technology could stop children interacting meaningfully with their environments, I believe this addresses it very well indeed' 	'I've been using book creator in Year 1 to make drawings. It would be nice to see how working with marks on an existing image would inspire that group too. They also added speech recordings so they could do the same with a voice for the characters.' As promissed, here are my students creations. 
Applying Ideas 'Nightingale Class have been exploring Surrealism…they have begun to use green screen imaging to place their trees in a range of settings both real and imaginary.'	**Tools and Techniques** 'Putty3D for iOS…is more intuitive than SculptGL and the tactile quality of sculpting on a tablet is much better. It will also export the sculpture with transparency which makes it ideal for layering into landscapes in other apps or with green screen.'	**Peer Appreciation** In response to the post content: 'Wow! □□ Great pictures+idea! □ I will certainly try GIMP!' 'Excellent idea, I am going to look into this one and give it a go'.

	‘I will be checking out Sculptris and Meshmixer and will report back.’ 	‘Sounds like the children will have had an amazing time creating some really original artwork. So liberating for them when they can just use their imaginations without worrying about whether there is a right or a wrong.’ 
Cognitive, Digital, Physical ‘Plan is to take the models outside and photograph them in 'real' places. Green screen could be another good plan too.’  ‘We can examine the suitability of the 3D designs in real settings in nature and the city. It should create an opportunity for reflection that’s more valid than ways we’ve tried before.’ ‘There is opportunity for authenticity as children have the possibility to "see" their artwork in the public space.’	**Pedagogy** ‘I also like the idea of ‘wondering’ to respond to the outdoor environment through layers of images. This is a thoughtful process that moves from representing to responding to the environment.”  ‘We can examine the suitability of the 3D designs in real settings in nature and the city. It should create an opportunity for reflection that’s more valid than ways we’ve tried before..’ ‘So liberating for them when they can just use their	‘That is spectacular. I think we may well work in something similar with forest school next term. Great snow too.’  ‘I love this idea and will definitely be using it in the future, your example is an inspiration.’

	imaginations without worrying about whether there is a right or a wrong.‘ ‘I’d like to do this as a collaborative challenge thats on a large scale. It’s unusual to do something really large. I want the children to explore the process of working together.’	

Figure 6: Applying categories and concepts to a unit of posts on Virtual Sculptures

Category 1: Transfer to Practice

All of the 13 Virtual Sculptures posts include practical examples that demonstrate movement between physical and digital spheres in the creative visual posts and comments, therefore exemplifying cognitive and mapping of concepts and practice around a specific theme (Heaton, 2018). They provide strong evidence of participants adapting ideas in response to the MOOC content. For example, 80% of participants in the posts applied ideas to a different context and developed the ideas further, whereas 20% simply replicated the original ideas. For educators, this reiterates the purpose of having a core theme or stimulus, such as a MOOC, to provide an impetus for community building. Examples of adaptations are the use of 3D models in maths, drawing in different environments, clay sculptures, layering images to create surprise elements in images, imagining ourselves in different environments, digital sculptures in physical environments, and 3D printed models. Two posts discuss the idea of ‘hybrid solutions’ that combine cognitive, physical and digital elements (see Figure 11).

Category 2: Collective Thinking and Knowledge Building

All posts show consideration of creative thinking, pedagogy and knowledge building by discussing themes such as greater freedom within a digital environment, meaningful interaction with the outdoor environment, collaborative opportunities, enhanced pupil creativity, increased authenticity in public spaces, and images inspiring thoughtful responses to the environment. Discussion of tools

and techniques is an underlying theme across the posts, which suggests community participation and reification are driven by core areas of interest (Wenger 1988, Goggins *et al.*, 2011).

Category 3: Communication and Appreciation

In this sample, 60% of the participants were keen to communicate results to a wider sphere: most often this was the local school community including parents. This shows that the community participants were motivated to continue engagement in the process of rhizomatic learning, mapping and curation (Deleuze and Guattari, 1988; Bozkurt et al, 2016; Heaton, 2018). In addition, 60% of the posts prompted peer appreciation (Wenger, 1998) from other participants, helping to maintain a positive climate for ideas to evolve through collaboration.

3.3 Analysis of one post

To further illuminate the thought and knowledge transfer process within the visual posts and comments, we examined online behaviour with a close lens by analysing one creative post in detail using the concepts and categories (see Figures 7-9 below).

Week 2: Viritual sculptures
Made with GIMP, working with layers. Take a picture outside, work with the picture and put in something in the picture who looks cool... Then use only the layer with skiers on, print out on transparent paper, place this between glassplates and place it outside so you can look through it. Maybe between to stakes.

Figure 7: Creative visual post on the theme of Virtual Sculptures

The surrealism project I do with Y6 is based around using layers. We tend to use paint.net but I prefer Pixelmator on the Mac or even sketchbook on iPads. I love freeing up the creativity in every child.

REPLY +1

Thank you for sharing! I believe your studenst enjoyed this acitivity very much!

REPLY +1

I'm inspired by this. I'm curious whether it would be a good contrast to use appropriate combinations vs peculiar ones. So this amazing skier vs a very different addition e.g. A skiing ballerina. Something graceful but in another context.

REPLY +1

Gimp is a great open source alternative to Photoshop and easy to learn. What you've created is really good.

REPLY +1

+1

I love this idea and am wondering how it would work with a less stunning landscape. In my mind I am thinking of a range of different windows into the play that goes on in the playground or as Liz mentioned creating the peculiar - that would maybe add a spark to a more basic background.

Figure 8: Comments from five different participants in response to the post

Figure 9: Virtual sculptures represented in the MOOC content

Category 1: Transfer to Practice

Comparison between Figures 7 and 9 show the participant has responded to the MOOC by applying the original creative idea of virtual sculptures to her own context. Rather than using green screening to post a physical object in a digital image as in the original example (Figure 9), she has experimented with layering acetate images between glass and manipulating photographs. This is an example of the interplay of cognitive, digital and physical making as the printed digital image initially devised internally by the participant is sandwiched between glass in the outdoor environment and then used to make further layered digital images, which prompt participant comments. Idea transfer and enhancement occurs here in different ways. The participant considers alternative making strategies in her choice of skills and resources. She moves between cognitive, physical and digital domains in the process of mapping and curating her artistic concept and practice (Heaton, 2018). This allows the direction of her learning to be creative and rhizomatic as it follows its own path (Deleuze and Guattari, 1988; Bozkurt et al, 2016), deviating from the ideas seeded in the MOOC.

Category 2: Collective Thinking and Knowledge Building

The discussion around the image (Figure 8) focuses initially on photo layering tools and techniques, extending participants' understanding and artistic cognition beyond the original MOOC content, 'We tend to use paint.net but I prefer Pixelmator on the Mac or even Sketchbook on iPads', 'Gimp is a great open source alternative to Photoshop'. Inspired by the creative images, the participants also consider how the technique might be applied to different contexts to inspire children's creativity. One idea is to add an unexpected element to the image, 'I'm curious whether it would be a good contrast to use appropriate combinations vs peculiar ones. So, this amazing skier vs a very different addition e.g. a skiing ballerina. Something graceful but in another context.' This idea is developed further by another participant wondering about the impact of adding unusual images into a familiar environment such as the school playground, 'I…am wondering how it would work with a less stunning landscape… different windows into the play that goes on in the playground…creating the peculiar…add a spark to a more basic background'. This discussion touches upon an intercultural aspect by considering how the idea might translate to an environment in a different country. A message we can take from this discussion is that when fostering community building we can suggest alternative ideas, ask deeper questions and show idea applications in different social, cultural or situational contexts to stimulate conceptual and practice-based mapping. We must however be mindful to allow time for community participants' ideas to evolve and ensure sensitive responses to intercultural postings so as to sustain the trust and motivation to post. Subsequent posts take forwards the theme of layered images initiated by this post (see Figures 10 and 11).

Figure 10: Further participant experimentation with the theme of layered images

Comment: '*This duckling made me think of Anthony Browne's books. He's a favourite of mine. It would be interesting to see if adding features to an image could be thought provoking. Either with real or imaginary elements. Hmmm now I'm thinking*?'

Figure 11: Post and comment on the theme of combining cognitive, physical and digital images

Category 3: Communication and Appreciation

In the example post and comment above (Figures 11), peer to peer learning occurs naturally, arising out of social behaviour as the participants are inspired by the idea of creating different views of the world by creatively manipulating images. Peer appreciation is a key aspect of this as it creates a positive environment encouraging further discussion, 'I love freeing up the creativity in every child', 'Thank you for sharing!', 'I'm inspired by this', 'What you've created is really good', 'I love this idea.' In this set of layered images and discussion, we can see that our participants are demonstrating active participation and reification as interaction methods (Wenger, 1988; Goggins et al., 2011). This takes place visually through production of multiple images around a core theme and textually through their motivational commentary. This directly connects to our research aim and to Sigenthaler (2013) and Wegerif's (2012) suggestions that we should seek to understand how idea exchange occurs in creative, social scenarios that unite, physical and digital worlds. In our experience, the joint exploration of a core theme of interest coupled with appreciation and reification has led to greater depth of community building.

4. Discussion

The set of categories and concepts that emerged from our analysis prove to be a useful tool for describing the nature of interaction taking place through creative visual posts and comments in our online community. It is evident that creative visual posts act as anchors for thinking, talking and making, playing a key role in articulating pedagogy and practice. They prompt participants to explore practical tools and techniques in cognitive, physical and digital domains, and then relate them to their own pedagogical thoughts, approaches and beliefs. This results in seams of learning that take ideas across different educational contexts beyond the original MOOC content. Such activity may cross boundaries of subject areas, age groups, countries and cultures. Sometimes it is the crossing of intercultural boundaries that provokes fresh ideas and insights, as in the example in Figure 7 where an English teacher is inspired by a post of skiers in Norway. In this way, the discussion process, punctuated by visual posts, fosters idea evolution and the development of communal thought and knowledge around shared understandings.

Figure 11 represents the process of thinking and knowledge building in our online community, as suggested by our analysis. We note an interaction between i) the MOOC content, ii) activity in cognitive, digital and physical domains, and iii) tools and techniques, that results in thinking, talking, making and posting online. Adaptations of the original ideas emerge through cycles of these activities across a range of educational contexts, prompting educators to transfer them to their personal pedagogy and practice. They subsequently share these experiences back into the

community. Peer appreciation ((Wenger, 1988; Goggins *et al.* 2011) is a key factor in creating a supportive climate in which participants feel confident to communicate and share creatively.

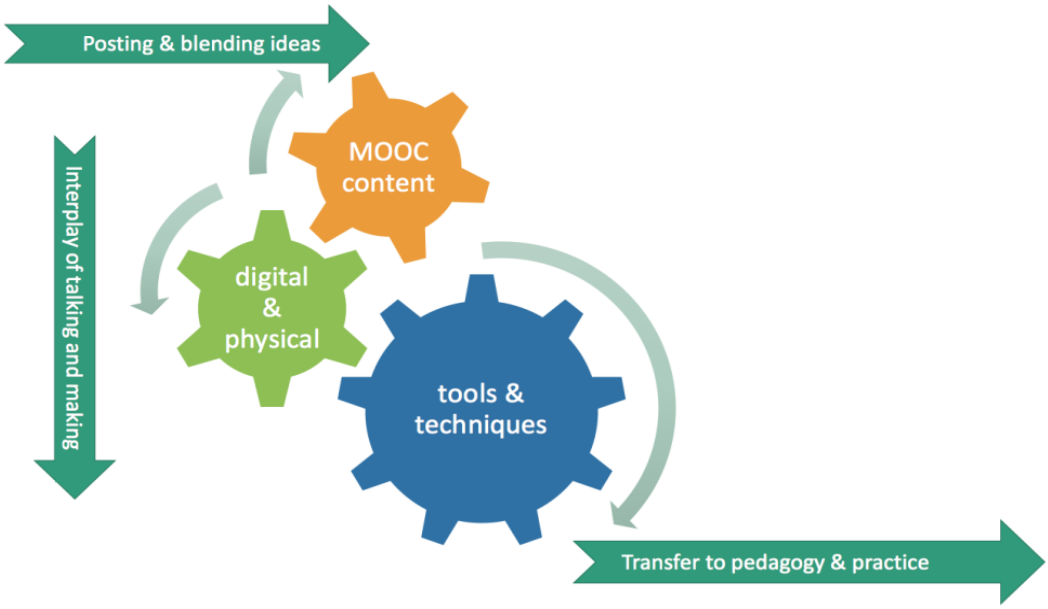


Figure 12: The process of collective knowledge building within a creative online learning community

The cyclical nature of the posting and responding leads us to summarise the thinking and knowledge building process as an interplay of three dualities: physical and digital, talking and making, and personal and collective (see Figure 12). Within any online learning community, we suggest that the dialogue between personal and collective learning journeys fuels creative thinking and knowledge building in the physical and digital spheres. This then influences pedagogical beliefs and results in transfer to practice.

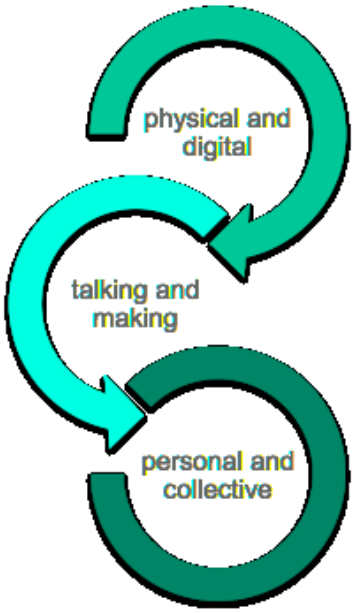


Figure 13: Thinking and Knowledge Building as an interplay of three dualities

Our analysis suggests that a typical learning journey within the online community moves in and out of cognitive, digital and physical domains, and engages in online thinking and making, in the sense of articulating ideas through modes of representation that include creative visuals as well as words. In this way it is both cognitive and practical. The multimodal medium of online posts appears to be crucial in enabling the evolutionary process to be visible and tangible, thus fuelling further reflection that results in creative thinking, and personal and collective knowledge-building. This is in line with the work of Moore et al. (2018), who suggest that multimodal learning, 'allows increased scrutiny and retrospective analysis, as learners can represent, record and reflect on their own learning through visuals, dialogues and written texts' (Moore et al., 2018, p. 45).

5. Conclusion

This paper contributes to understanding the epistemology of creative social online communities by taking a close look at the process of creative thinking and knowledge building within one example community that supported a 4-week MOOC. The research objectives were addressed through three key themes:

i) Identifying the core themes of participation and reification, and of dissemination of ideas and approaches to practice in a range of contexts, as ways creative visual posts in the online community evolved and were seeded by MOOC content.

ii) Exemplifying how community members creatively transferred ideas to practice by uniting ideas, replicating and adapting them and, through the process of visual posting and

commenting, demonstrated movement between cognitive, physical and digital spaces. Peer appreciation helped members to view the community as a safe place to voice and experiment.

iii) Documenting through a series of examples how cognitive, physical and digital domains were traversed by participants as part of the process of social online learning supported by creative visual posts.

Further research might focus on the knowledge-building processes of differently structured communities that evolve over a longer period.

Our experience demonstrates that in a creative and social online learning environment, rich collective content and shared understandings can quickly build up around creative visual posts that represent connections between thoughts, spaces, time and content. Creative visual posts can act as stepping stones for re-discussion, re-making and re-mixing content, resulting in an evolutionary, non-linear process of thinking and collective knowledge building and cognitive curation akin to rhizomatic learning (Deleuze and Guattari, 1988; Irwin et al., 2006; Bozkurt et al, 2016).

We recommend that online learning designers:

i) recognise the process of creative social online learning leading to knowledge-building and transfer to practice
ii) use technology tools that allow for repeated creative visual postings and multimodal responses
iii) nurture ideas-sharing to create a responsive atmosphere of interpersonal trust leading to creative thinking

Furthermore, our findings suggest it would be beneficial for learning designers and educators to gain an epistemic understanding of the knowledge-building processes within their social online communities from personal and collective viewpoints. This will enable them to make informed decisions about the information climate, the interplay of modalities, and the creative transfer of ideas to thoughts, pedagogy and practice. As we demonstrate in this article, creative visual posts within active online communities have the capacity to enhance creative learning opportunities, theoretically, methodologically and pedagogically, in rhizomatic directions for participants and researchers alike.

Link to project website:

http://dlaberasmus.eu/

Link to Technology Outdoors MOOC:

http://dlaberasmus.eu/courses/technology-outdoors-online-course/

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