

# How student engagement has been enhanced through research into factors affecting creativity

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## Abstract

Student engagement is critical in helping students learn effectively and achieve success (Towler and Towler, 2012). For students working in the areas of art and design, there is also a strong emphasis placed on the importance of creativity (Perry, 1987; Cropley and Cropley, 2010). Over recent years we have conducted research into the factors and processes affecting creativity and explored how these insights can help improve student engagement and student creativity (Loudon, 2019). The paper discusses the relationship between factors affecting student engagement and creativity; how our curriculum has been designed to develop student creativity; and how we have evaluated and refined our curriculum to enhance student engagement, based on our research into creativity. We present results highlighting areas where we have made a positive impact on student engagement. We also reflect on areas for further development and the possible impact our approach and curriculum design could have on other disciplines.

**Keywords:** creativity, student engagement, curriculum design

## Introduction

At the Cardiff School of Art and Design (CSAD) we put creativity at the centre of our curriculum design and believe strongly that creativity enhances student engagement. Over the last few years we have conducted research into factors and processes affecting creativity and used these insights to help create and refine our curriculum. In this paper, we describe some of the key findings from our creativity research and its relation to the student engagement literature; how this research has informed the refinement of our curriculum design; and the impact on student engagement based on the voices from our students. We also discuss the challenges that still lie ahead.

Mahoney, in Gibbs (2010, p. 2), states that “higher education should be a transformative process that supports the development of graduates who can make a meaningful contribution to wider society, local communities and to the economy”. However, the knowledge and skills needed by graduates are changing because the global economy is moving from an industrial economy, based on labour and capital, to a creative economy driven by innovation, technology and creative ideas (World Economic Forum, 2016). Leading educationalists, such as Zhao and Robinson, highlight that students need to learn how to be creative, innovative and entrepreneurial to be prepared for the economic challenges that lie ahead (Robinson, 2001; Robinson & Aronica, 2015; Zhao, 2012). Consequently, the strategic plan for our own university champions “creativity, diversity, freedom and innovation” and emphasizes the need to create a new model of curriculum delivery that will enable students to develop “ethical, digital, global and entrepreneurial skills” (Cardiff Met, 2017, p. 1).

At the Cardiff School of Art & Design (CSAD) we offer a range of courses including Fine Art, Ceramics, Artist Design Maker, Illustration, Graphics Communication, Product Design, Textile Design and Architectural Design Technology. Our aims as a school are to:

1. Integrate art and design thinking in the contexts of science, technology, engineering and maths (STEAMD);
2. Allow for transformative transdisciplinary opportunities;
3. Develop our students as creative and critical thinkers;
4. Integrate research, innovation and teaching using a human centred approach;
5. Prepare our students for a changing world;
6. Think globally through international partnerships; and
7. Act locally and make a positive contribution to society and industry.

Deiningner (2013) defines creativity as “the ability to come up with ideas or artefacts that are novel, valuable and substantive within a psychological or historical context” (p. 39). For a student, this might mean the creation of new ideas or artefacts that are valuable and substantive to the student themselves in the context of their learning. But it might also mean that the student creates novel work of value to a broader community.

### **Literature review**

Initially we present key findings from the research literature on student engagement highlighting some of the main factors that have been found to enhance student engagement. We then present findings from our own research, and others, into factors and processes affecting creativity and discuss how these ideas relate to student engagement.

#### *Student engagement*

Student engagement is defined by Kuh (2009a) as “the time and effort students devote to activities that are empirically linked to desired outcomes of college and what institutions do to induce students to participate in these activities” (p. 683). Towler and Towler (2010) also highlight that key aspects of engagement include student “involvement, time on task, and quality of effort” (p. 8). However, Kahu and Nelson (2018) give a slightly different definition of student engagement and define it as “an individual student’s psychosocial state: their behavioural, emotional and cognitive connection to their learning” (p. 59).

In terms of the importance of student engagement, there seems to be general agreement in the literature that student engagement is critical in supporting learning, achievement and retention (Kahu and Nelson, 2018; Krause and Coates, 2008; Thomas, 2012). As Towler and Towler (2010) put it, “the value of engagement is no longer questioned” (p. 9). The literature highlights several key factors that can affect student engagement:

**Purpose / Relevance:** One of the most important factors affecting student engagement is the “perceived relevance of the learning task” (Kahu, Nelson and Picton, 2017, p. 55). If students understand the purpose of the topic being covered

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they are more likely to emotionally engage. This emotional engagement is strengthened further if the curriculum links to the student's personal interests, their personal experiences and their future plans and goals (Kahu, Stephens, Leach and Zepke, 2015). When students engage in activities they regard as purposeful, this leads to improved outcomes (Towler and Towler, 2010). When students do not see the relevance of the learning task, their interest and engagement is negatively affected.

**Academic Challenge:** Students have improved cognitive engagement if they are set tasks that are academically challenging and there is a balance between the student's skill level and the task at hand (Gibbs, 2010; Parajes and Schunk, 2001; Towler and Towler, 2010).

**Interaction:** Interaction between students and staff has a positive effect on student engagement (Pascarella and Terenzini, 1991; Towler and Towler, 2010). More extensive quality interaction between staff and students leads to better student engagement (Gibbs, 2010). In addition, student engagement is improved when students interact more with other students whether that be in an academic context or otherwise.

**Belonging:** A student's sense of belonging in the higher educational environment is linked to their academic engagement (Osterman, 2000). Thomas (2012) suggests that students have a sense of belonging when they feel "relatedness or connectedness to the institution" (p. 12); when their sense of purpose is aligned with the purpose of the academic curriculum; and when there are regular, stable contacts with staff and peers.

**Self-Efficacy:** Pajares and Schunk (2001) define self-efficacy as a student's belief in their abilities to perform well in a task, and state that the level of self-efficacy relates to the level of student engagement. Students "who feel efficacious for learning or performing a task participate more readily, work harder, persist longer when they encounter difficulties, and achieve at a higher level" (pp. 2-3). Kahu and Nelson (2018) highlight that self-efficacy increases student engagement, which in turn increases self-efficacy, therefore creating positive reinforcement. Student feedback is also an important way to increase a student's belief in their abilities (Kahu and Nelson, 2018), therefore the use of formative assessments and rapid quality feedback to students is crucial in enhancing student engagement (Hattie and Timperley, 2007; Gibbs, 2010).

Kuh (2003, 2009b) created the National Survey of Student Engagement (NSSE) to help measure the level of student engagement and used very similar factors (themes) in the survey: academic challenge; learning with peers; experiences with faculty; and campus environment. The 'academic challenge' considers the level of engagement in "challenging intellectual and creative work"; the relevance of course material to a student; and whether students actively engage in learning course work rather than learning passively. The 'learning with peers' considers the level of student collaboration and the level of interaction with people from different backgrounds. The 'experiences with faculty' considers the level of interaction with staff and the quality of teaching practice including effective student feedback. The

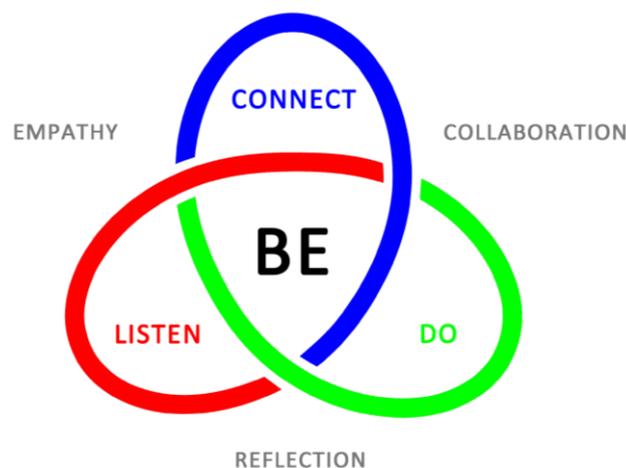
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'campus environment' considers how the social environment supports interpersonal relations and how committed institutions are to helping students succeed. Pascarella, Seifert and Blaich (2010) provide supporting evidence that the NSSE scores have a strong relationship with educational achievement.

### *Creativity research*

Over the last few years we have conducted research into the factors and processes affecting creativity and this has resulted in the creation of a new model for creativity called the LCD (Listen, Connect, Do) model (Loudon and Deiningner, 2014). See figure 1 below. The model builds on the ideas from 'Design Thinking' (Kelley and Kelley, 2013), Theory U (Scharmer, 2009) and others including Csikszentmihalyi (1997) and Amabile (1996). At the heart of the model is the person's 'state of being' (labelled as 'BE' in Figure 1 below), which we define as "the emotional, mental and physiological condition of a person" (Deiningner, 2013, p. 35). Therefore, creativity is not just about a set of important activities, such as listening, connecting and doing, but the state of being of a person while doing such activities, i.e. you need to BE creative. A state of being that is conducive to creativity we define as a 'coherent' state and is associated with attention, mental stillness, openness and cohesiveness (Deiningner, 2012; Loudon and Deiningner, 2016; Loudon and Deiningner, 2017; Loudon, Zampelis and Deiningner, 2017).

The other key element of the model is its non-linear and spontaneous nature. We do not believe creativity is a linear process, and a person should dynamically move between a range of activities to help create novel ideas or artefacts that are valuable and substantive.



**Figure 1.** The LCD (Listen, Connect, Do) Model.

One factor that affects a person's state of being is intrinsic motivation for an area of work or study. One of the commonalities amongst people who are creative is that they are intrinsically motivated (Amabile, 1985; Amabile, 1997; Csikszentmihalyi, 1996). Intrinsic motivation is defined as "the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn" (Ryan and Deci, 2000, p. 70). Key factors underlying intrinsic motivation are the human desire to improve one's competence and mastery of skills; to have autonomy

in deciding what to do and how to go about doing it; and to have a sense of purpose (Amabile, 1988; Amabile and Kramer, 2011; Ryan and Deci, 2000). Another key factor that affects a person's state of being is the social and physical environment that they interact with (Groves and Marlow, 2016; Rhodes, 1961).

The dynamic interplay between activities in the LCD model can help a person's state of being by building self-efficacy through gaining feedback on ideas or things tried or made. In addition, conscious reflection can help a person recognise and acknowledge key insights gained, developments made, learning and progress.

**Listening:** The listening activity is about gaining inspiration and ideas by going out and observing people and places of interest and listening to what people have to say, while being in a coherent state of being, i.e. being attentive, sensitive and open-minded. The listening activity is also about questioning one's own behaviours, attitudes and thoughts, and listening to one's own emotional and physiological state, to gain new insights. In a recent study, we found that people could improve their level of 'relaxed concentration' by seeing real-time biofeedback of their own psychophysiological state, through analysing their heart rate variability (Loudon, Zampelis and Deininger, 2017).

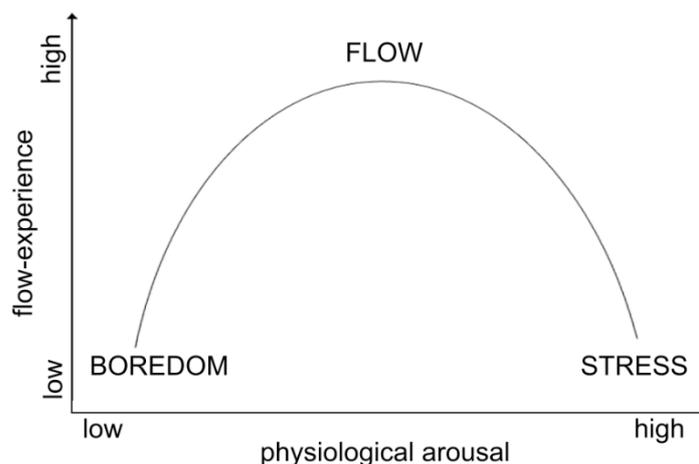
**Connecting:** The connecting activity is about connecting with people of interest in relation to the work of study, but also with people seemingly unrelated to the current area of focus. Connecting with others provides the opportunity to gain new perspectives, ideas, insights and knowledge (Kelley and Kelley, 2013). The connecting activity also encourages the co-creation and co-development of ideas through collaboration, as multi-disciplinary collaboration brings together people with different skills, knowledge and ideas to help enhance creativity (Kelley and Kelley, 2013). The connecting activity is not just about connecting with others, but also about connecting seemingly unrelated ideas and exploring their possibilities to help create new ideas (called divergent thinking). Divergent thinking is recognised as a key component of creativity (Guilford, 1950; Runco, 2010). As with the listening activity, the connecting activity should be done while in a coherent state, i.e. being attentive, sensitive and open-minded.

**Doing:** The doing activity is about exploring, making, experimenting, prototyping and experiencing while in a coherent state. We found that people's natural approach to solving problems is to interact and play with objects and the external environment to gain feedback (Deininger, Loudon and Norman, 2012). We also found that play helps people solve problems even when the play activity is not related to the task at hand (Loudon, Deininger and Gordon, 2012) as it helps put them into a more coherent state. Play is a naturally engaging, joyful activity where a person gets immediate feedback on their actions (Lieberman, 1977; Brown and Vaughan, 2010). Play also provides people autonomy to explore without fear of failure (Bateson and Martin, 2013). When people play, their self-consciousness disappears (Gordon, 2014). Therefore, we believe that play is a natural way people explore through doing while in a coherent state. However, people can only play in a safe environment, therefore it is important to set boundaries so that people feel safe (Gordon, 2009). This includes putting boundaries on the area of exploration in terms of time and

scope. If the areas of exploration are too wide or for too long a time this can cause anxiety or a drop in motivation (Loudon, 2019).

### *Creativity and student engagement*

The core factors affecting student engagement, i.e. purpose / relevance, academic challenge, interaction, belonging and self-efficacy have a strong overlap with the factors affecting creativity, particularly in relation to the student's state of being. There is also similarity between our definition of a person's state of being and Kahu and Nelson's (2018) definition of student engagement. However, it is important to recognise that purpose is part of the broader concept of intrinsic motivation, and other factors affecting intrinsic motivation are autonomy and mastery of skills. If students have more freedom in what to work on and how to work, they will be more intrinsically motivated. The mastery of skills also links to the academic challenge, and the balance of skills and task. Csikszentmihalyi (1997) found that people enter a state of "immersion in concentrated activity" during a creative activity, that he defined as 'flow', however a key requirement for entering this state is that there is a balance between the skills and the challenge (pp. 111-113). Based on the Yerkes-Dodson law (Kahneman, 1973, p.34), Peifer, Schulz, Schächinger, Baumann and Conny (2014) mapped a person's level of flow to different levels of physiological arousal and highlighted how the flow state relates to other emotional states (see Figure 2 below). We also found similar results in our own study (Loudon and Deininger, 2017). In the context of student engagement, if a task is too easy, or the time allocated to the task is too long, students will get bored and disengaged. Conversely, if a task is too difficult, or the time allocated to the task is too short, students will get stressed and anxious. In both cases, it will also affect their level of creativity.



**Figure 2.** Physiological arousal and its relation to flow, based on Peifer et al. (2014).

Other requirements for being in a flow state include having clear goals, getting "immediate feedback to one's actions", having "no worry of failure", and excluding distractions (Csikszentmihalyi, 1997, pp. 111-113). These flow attributes are very similar to the attributes for play. Play can provide a mechanism for getting students to engage, to help them take on academic challenges, and to help them build self-efficacy. Play also provides a natural way of supporting student autonomy.

The student engagement factors of interaction and belonging link to the creative activities of listening, connecting and doing (playing) to help support the student's positive state of being and to provide new insights. The LCD creativity model also has close similarities with the cyclic model of learning, known as the 'Kolb Learning Cycle' (Fry, Ketteridge and Marshall, 2008), which emphasizes that learning requires concrete experience, reflective observation, abstract conceptualization, and active experimentation.

Educational research into creativity further supports the importance of the relationship between creative practice, student engagement and learning. For example, Robinson and Aronica (2015) highlight that "students learn best when they are actively doing things and not only studying ideas in the abstract; when their curiosity is aroused, when they are asking questions, discovering new ideas" (p.146). Robinson (2001) also talks about the importance of "thoughtful playfulness" and "learning through experimental play" to enhance the creativity of students (p. 172), and that effective learning comes from trial and error, and this must be supported in the curriculum (Robinson and Aronica, 2015). In addition, Robinson (2001) states that "more opportunities should be given to [students] to sense and define problems for themselves, as well as identifying solutions to given problems" (p. 37). However it is also important to note that students do have different learning styles (Kolb and Kolb, 2005),

Zhao (2012) talks about the importance of purpose for student engagement, "creating works that matter – matter to the students and to potential customers" (p. 204) and suggests a product-oriented learning approach where students are "makers, creators and entrepreneurs" rather than passive consumers (p. 209). Zhao (2012) also emphasizes the importance of intrinsic motivation and highlights that only when students "have the autonomy can they be driven enough to become great" and put in the necessary time, effort and practice (p.239).

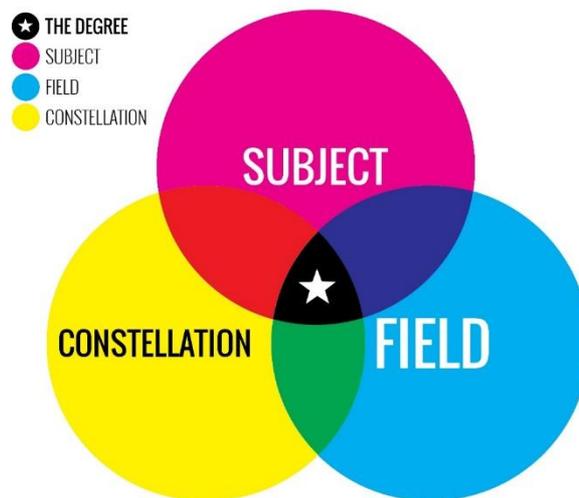
### **Approach**

Our colleague, Dr Steve Thompson, developed a new curriculum for CSAD in 2012 that applied many of the key principles of student engagement and creativity highlighted above. However, in 2015 (when the first cohort of the new curriculum graduated) CSAD only achieved an overall satisfaction score of 73% in the National Student Survey (NSS). Therefore, we decided to put in place a series of refinements to the design of the curriculum based on feedback from our students, and from our knowledge of student engagement and creativity research. Our overall approach followed our LCD model of listening, empathising and connecting more with students; trying out new ideas; reflecting on what worked and what needed further refinement; and iterating through this process.

In this section, we present the design of the curriculum created in 2012; explain how we then engaged more with students to gain key insights; highlight the refinements we made and the reasoning behind those refinements; and describe how we evaluated the effectiveness of those refinements.

### *Original curriculum design*

Since 2012, all undergraduate courses at CSAD have followed the same overarching curriculum structure. The curriculum comprises of three core modules (Subject, Field and Constellation) that run throughout the three-year course. See figure 3 below. The subject module covers the core skills and knowledge for the discipline and uses a product-oriented learning approach (to support intrinsic motivation including mastery and having a sense of purpose/relevance), where project assignments result in public exhibitions, and are often in collaboration with industry. The field module focuses on encouraging collaboration between disciplines, providing the opportunity for students to gain new ideas, skills and experiences together with other students from different courses in CSAD (i.e. listening, connecting and doing). A wide range of field module options are made available, including entrepreneurship, study trips abroad and work placements, so students have the freedom to choose the topics that most interest them. The constellation module is again transdisciplinary and underpins the creative practice by exploring ideas, theories and contextual studies. The constellation module helps students find areas that interest them and provides the support for students to explore and research these ideas (again considering autonomy and purpose).



**Figure 3.** The three key modules in the curriculum

Within each module, students are assessed on their skills, ideas and understanding of the context of their study. In 2012, the course was setup where each module was 40 credits (i.e. a third of the year). In terms of the timing of the teaching, the subject module was taught in the autumn and summer terms and the field module in the spring term. The constellation module was taught throughout the year. Students put forward their choices of which options they wanted to take in the field and constellation modules and were allocated an option on a first come first serve basis until the option was full up.

### *Capturing the student voice*

As a school, we already had a system for capturing the student voice and gaining student feedback using a mixed method approach of qualitative and quantitative research methods. This included the use of termly course committees, the school's learning and teaching committee and a staff-student liaison committee. We also

asked students to complete a questionnaire in the middle of the academic year and at the end of academic year gaining feedback on what worked well and areas that could be improved. However, in 2015 we decided to expand ways of including students more, not just in terms of gaining more feedback, but also in terms of helping to formulate changes collaboratively to improve student satisfaction and engagement (i.e. improving staff-student interaction and applying the LCD model).

Weekly meetings were set up in each subject area between the year tutor and the entire year group to improve interaction between staff and students. Any issues that needed addressing were then acted on straight away, building student confidence that their voice would be heard and their views taken seriously.

We expanded our mid-year and end-of-year student questionnaire mirroring questions from the National Student Survey and included specific questions related to student engagement. Our questionnaire also included open questions to gain additional feedback on what students enjoyed about their course, what worked well and what could be improved. Students from all three years were asked to complete the questionnaires.

### *Analysis*

We analysed the qualitative and quantitative data collected and compared the data with the theory on creativity research and student engagement to help formulate proposals for changes to the curriculum. Analysis of the quantitative data provided us with insights into areas that worked well and areas that needed improvement. The analysis of the qualitative data provided us with a deeper understanding of key issues from a student's perspective. We studied the qualitative data collected from the open-ended questions in the questionnaires using a thematic analysis approach (Braun and Clarke, 2006). The themes used in the analysis were based on the key factors affecting student engagement and creativity.

### *Curriculum changes made*

To facilitate coherence between our research, enterprise and teaching, CSAD established the Centre for Research, Enterprise and Teaching (CREATE) in 2014. The purpose of CREATE is to enable research and enterprise to feed into the teaching and influence the student experience.

One of the first modifications we made to the curriculum, based on student feedback, was to move the teaching of the field module earlier in the year. The motivation for the change was to enable students to contextualise their learning more easily from their transdisciplinary field module back into their next subject module, i.e. to enable students to reflect and apply their learning via their practice. The change also aimed to help students understand the purpose of the field module more clearly in relation to the core subject area.

The second development was the creation of collaborative hubs in the first year field module consisting of 3 to 4 subject areas, for example Animation, Illustration and Graphics. Previously, first year students would link up with students from across the school. But first year students highlighted that this was too much too soon for them, as some students struggled to see the relevance of some of the new

connections/collaborations. This then had a negative effect on their state of being and their level of engagement. The idea behind this hub approach was that it would provide a clearer sense of purpose/relevance to the student. In addition, it would create clearer boundaries for them to explore, play and make new connections (critical for their creativity). As students gained self-efficacy in collaborating with students from other disciplines after the first year, they were not so restricted in terms of whom to collaborate with in the second year field module.

As the scheme matured it was evident that the staffing structure of the school needed staff with specific roles to facilitate and develop the scheme. Therefore, in 2016 'Academic Leads' were introduced, with two of the four leads focused on student experience and transdisciplinary work. As highlighted above, interaction is a key component of student engagement, and to drive change and maintain clarity of message across the school, dedicated staff were required to own these agendas. In addition to these roles, it was evident that students expected to be informed on all parts of the curriculum, therefore we developed a staff virtual information point. This was developed on the premise that all staff desired a central place to go to find information about each of the modules. Likewise, there was one central place that housed all current and timely information about the curriculum and its systems. Again, the aim was to improve the interaction between staff and students.

Navigating a student-centred curriculum and enabling the learners to shape their own journey is based on reflection and choice. However, when choice is introduced there can be the sense from students that they have missed out on their choice. We noticed that this was a hindrance early in the scheme and impacted on student motivation. We made a very subtle change in the language so that students no longer selected choices on a preference scale of 1 to 5, but instead selected based on 'what they really want to do', 'quite like to do' and 'really don't want to do'. The aim was to create a positive intent from the student and for them not to have the perception that they did not get their first choice. In addition, we wanted the students to feel that their allocated choice felt relevant and personal to them, heightening engagement and decreasing dissatisfaction.

One of the other modifications we introduced was the creation of a centralised electronic system for providing formative and summative feedback to students, including both typed and audio feedback. The aim was to provide clear, consistent and timely feedback to all students. As noted above, responsive feedback, particularly formative feedback, is important in supporting student self-efficacy and their sense of belonging. In addition, it encourages students to take risks and try out new ideas without fear of failure (i.e. to play and be more creative).

## **Results**

Table 1 below shows the results from our student questionnaire on student engagement and creativity, conducted at the end of the 2016-2017 academic year, covering responses from students from all three years in the school. 770 students completed the questionnaire, representing 69% of the students in the school. Note that the questions we used mirrored questions used in the NSS in 2017 to evaluate key aspects of student engagement and creativity. Over 80% of the students agreed with five of the seven statements, however only 75% of students agreed that they felt

part of a community of staff and students. In addition, only 64% agreed that they understood how to apply the constellation module teaching to their subject work (i.e. theory to practice) and therefore the purpose/relevance of the constellation module was not always clear.

<b>Question</b>	<b>Agree</b>
My programme is stimulating and challenging	87%
My course has provided me with opportunities to bring information and ideas together from different topics	89%
My course has provided me with opportunities to explore ideas or concepts in depth	84%
My course has provided me with opportunities to apply what I have learnt	84%
I understand how to apply Constellation teaching to my Subject work	64%
I feel part of a community of staff and students	75%
I have had the right opportunities to work with other students as part of my course	84%

**Table 1.** Questionnaire results for 2017 covering students from all three years.

It is also worth noting that the overall NSS scores for the school also improved from 2015 through to 2017, with overall student satisfaction increasing from 73% in 2015 to 88% in 2017. This compares with a sector median of 82.1% for art and design courses in the UK in 2017. In addition, for the NSS questions more specifically related to student engagement, i.e. learning opportunities, student voice, and learning community, CSAD achieved scores of 90%, 90% and 88% respectively.

To analyse the findings in more depth we reviewed all the student responses from the open-ended questions from our own internal questionnaire at the end of the 2016-2017 academic year. The qualitative responses were analysed based on key aspects of student engagement and creativity including purpose/relevance; being part of a community; autonomy, exploration and self-efficacy; and the enabling of new insights and connections.

**Purpose/Relevance:** Many of the students commented that the linking of theory with practice in the field and subject modules, through the use of a product-learning approach, worked very well. The students placed particular emphasis on the benefits of using real briefs set by industry to provide clarity on the purpose and relevance of the topics being studied. Examples of common comments made by students were: “really enjoyed working on a live brief, with opinions from consultants helping me to understand what industry are looking for”; “I’ve liked the contact we have had with real world clients and the potential for our work to be applied to the real world”. Similarly, many students saw how the theory taught in the constellation module informed their practice and helped in challenging their thinking and in sparking new creative thinking and practice: “Constellation ... has been the revelation ... informative, captivating, thought provoking and challenging”; “Constellation has been particularly stimulating. I’ve been able to apply what I’ve learnt to my practice; to contextualise my practice.” However, some students struggled to see the relevance

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of the constellation module: “throughout Constellation there were parts that I felt could link into my subject work, however most of it seemed very far removed from my subject work.” Students also suggested ways to improve the constellation module in terms of its purpose/relevance: “I think it could be improved by it being explained better at the beginning of the year so students can realise early on why it can benefit them.”

**Belonging/Community:** Even though the quantitative data stated that only 75% of students felt that they were part of a community of staff and students, there seemed to be only positive comments by students in this regard. Typical comments were: “I like how there is a strong sense of community between everyone”; “one of the best things about the maker course is the sense of community between years, staff and students.”

**Autonomy, Exploration and Self-Efficacy:** Generally, the students’ comments were very positive with regards to the freedom given to them during their studies: “I’ve really enjoyed the freedom of the course this year and the control I have had over my own learning”; “we have the freedom to explore our own ideas and areas of interest while still receiving guidance and advice”; “I liked the field choices this year, they were really wide and really gave me a chance to explore other options”. This freedom also linked to the opportunities to explore, experiment, gain feedback on their ideas and build their confidence and skills: “I have enjoyed having the freedom to explore different materials and techniques in my subject area”; “I really enjoy the freedom of the course, I feel like I can explore anything within my project and the tutors are so supportive”. However there were a small number of comments from students with regards to lacking confidence. For example, one student commented that “I don’t feel confident enough to come in on my independent working days to work in [the school] studio”, and therefore chose to work at home on their own.

**New Insight and Connections:** Students gave many positive comments in relation to how the transdisciplinary nature of the course and the modules provided opportunities to gain new insights, to make new connections, and to collaborate with students from different disciplines: “Field has been brilliant to work with other disciplines and create things I would never have considered beforehand”; “the opportunity to go on so many trips ... has really helped generate ideas and furthered my interest in certain topics”; “chances to collaborate, like Field, have been stunning this year.” However, not all students found that the collaborative projects worked well for them. For example, a common concern related to collaboration with other students who are not as motivated, “I found the Field module difficult, trying to complete a project with people who you can’t necessarily gel with and who may not be motivated.”

One other common theme that came out of the student comments related to workload and the timing of assignments, and the consequential implication on student engagement and creativity: “Sometimes you can’t get into a flow in your work practice because there are so many assessments running all at the same time”; “too many projects at once .... unable to focus and create a well constructed piece”; “having three projects to juggle at the same time and a certain standard expected is asking a little too much of students”.

## Discussion

Our curriculum has been designed first and foremost to help students develop their creativity, i.e. to develop the student's ability to create novel ideas or artefacts that are valuable and substantive. These skills are crucial for the new creative economy (Robinson and Aronica, 2015; World Economic Forum, 2016). Our findings suggest that placing a focus on enhancing student creativity can also enhance student engagement, as there is a very strong overlap between the factors affecting creativity and the factors affecting student engagement. However, our research also highlighted that there are areas where we still need to make improvements. For example, a significant minority of students still struggle to see the relevance of their work in the constellation module to their core subject work (i.e. linking theory and practice). This seemed to be particularly true for first year students. One of the challenges about encouraging student creativity, is getting students to engage with new ideas that they might not initially see as relevant to their core area of practice. Often, only after a period of reflection, do students realise the benefits of such explorations. As stated in one of the student comments above, we probably need to "explain better at the beginning of the year" the benefits of this approach. One way of doing this is perhaps to explain more directly to first year students the factors and processes affecting creativity and getting them to reflect on the implications for their own area of focus and their own way of working.

The challenge raised about collaborating with students who are less motivated is a difficult one. One way around this is not to have collaborative projects, but this takes away very important learning about the role of collaboration in enhancing creativity. Therefore, this needs further investigation. The same holds true for the results related to students feeling part of a community of staff and students. We run many activities in the school to try and create a sense of community among staff and students, so this needs further investigation. Another area that needs further study is the relation between a student's level of engagement (and their creativity) with their learning style preference to help gain further insights into how we can improve the learning experience for all students.

Based on our research findings, we have already put in place some changes for the 2017-2018 academic year, but have not yet evaluated the impact of these changes. One of the major changes relates to the size of the modules for the first year. Previously the subject, field and constellation modules were of equal weighting (40 credits each). We have decided to change this for the first-year students, so that there are now two subject modules worth 30 credits each, the field module is reduced to 20 credits and the constellation module stays at 40 credits. One of the reasons for the change was to give more time for the first-year students to gain skills and confidence in their own subject area before moving into areas related to collaboration and transdisciplinary work. We hope it will also help students strengthen their sense of belonging to their main subject area, and help the sense of being part of a community. Students are not able to explore and play unless they feel safe (Gordon, 2009, Loudon, 2019), and hopefully this change will help them feel more safe and secure.

The first subject module is taught at the beginning of the year. This is then followed by the field module, with the second subject module starting after the field module is complete. First-year students have a summative assignment at the end of the first subject module, another at the end of the field module, and a final summative assessment at the end of the second subject module. There are two motivations for this modified structure. The first relates to student engagement and intrinsic motivation. In the old structure, we found that modules were too long in length. Even though there were formative assignments throughout the module this did not seem to be enough of an incentive for some students to fully engage. Students often spent too long procrastinating and losing motivation. This relates to Peifer et al.'s (2014) research on flow performance. With the shorter modules and the assessments at the end of the module, we hope that student engagement and student creativity will be enhanced. The other hopeful benefit of the change relates to one of the student comments above, that they have "many assessments running all at the same time" and that they "can't get into a flow".

Another change made for the 2017-2018 academic year relates to the second-year field module. In this case, the summative assessment has been split into two stages. The first part of the summative assessment is conducted on completion of the module. This relates to the same point above, of getting students to engage more and keeping their motivation and level of effort high throughout the module. The second part of the summative assessment is at the end of the year, where students have to reflect on how the knowledge and ideas learnt from the field module has benefitted their core subject work. The motivation for this is to help them reflect on the purpose and benefits of collaboration and transdisciplinary work to their own practice and their own creativity.

It is important to note that the student's final degree mark is based on the work they undertake in their final year alone. The motivation for this is to encourage students to take more risks in experimenting and exploring new ideas in their first two years of study. Therefore, even though we have introduced summative assessments earlier in the first two years of the course, this is balanced against the fact that students just need to pass the year to progress. Fear of failure can be a major barrier to creativity (Amabile, 1996; Gordon, 2014), particularly when students have yet to build self-efficacy in their creative abilities (Loudon, 2019).

## **Conclusion**

We believe our curriculum design offers a practical and effective way of aligning creative practice with student engagement and results in graduates who have the necessary skills to thrive in the new creative economy. However, there are still areas where we need to improve student engagement and student creativity. We plan to continue refining our curriculum with the help of our students and by using insights gained from the research community (including our own research). We believe our approach is not just relevant to the art and design disciplines and can be applied in many different disciplines including STEM subjects. Several other research groups have been looking at how ideas from art and design can be applied to teaching STEM subjects (Connor, Karmokar and Whittington, 2015; Keane and Keane, 2016; and Watson and Watson, 2013). We are currently exploring how our model can be applied in other schools at the university.

### **Related future work**

Another area of work we are exploring is how to help students develop and maintain a 'coherent' state of being throughout their studies. This relates to issues of mental health and clearly has a major impact on student engagement and student creativity. We hope to present findings from this research in the near future.

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