

Table of Contents

International Journal of Game-Based Learning

Volume 7 • Issue 3 • July-September-2017 • ISSN: 2155-6849 • eISSN: 2155-6857

An official publication of the Information Resources Management Association

EDITORIAL PREFACE

- v Playful Learning
Alex Moseley, University of Leicester, Leicester, United Kingdom

RESEARCH ARTICLES

- 1 What Really Happens When Adults Play? A Call for Examining the Intersection of Psychosocial Spaces, Group Energy, and Purposeful Play
Jo A. Tyler, Penn State University, Harrisburg PA, USA
- 11 Playing Digital Security: Youth Voices on their Digital Rights
Conceição Costa, Lusófona University, CIC.Digital (CICANT Pole), Lisbon, Portugal
Carla Sousa, Lusófona University, CIC.Digital (CICANT Pole), Lisbon, Portugal
José Rogado, Lusófona University, COPELABS - ECATI, Lisbon, Portugal
Sara Henriques, Lusófona University, CIC.Digital (CICANT Pole), Lisbon, Portugal
- 26 Perceptions of Play: Using Play-Doh to Enhance the Student Experience in Bioscience Higher Education
Gemma Lace-Costigan, CIC.Digital (CICANT Pole), University of Salford, Greater Manchester, United Kingdom
- 38 Can Games Help Creative Writing Students to Collaborate on Story-Writing Tasks?
David Jackson, Manchester Metropolitan University, Manchester School of Art, Manchester, England
- 51 We are the Game Changers: An Open Gaming Literacy Programme
Sylvester Arnab, Coventry University, Disruptive Media Learning Lab, Coventry, United Kingdom
Luca Morini, Coventry University, Disruptive Media Learning Lab, Coventry, United Kingdom
Kate Green, Coventry University, Disruptive Media Learning Lab, Coventry, United Kingdom
Alex Masters, Coventry University, Disruptive Media Learning Lab, Coventry, United Kingdom
Tyrone Bellamy-Woods, Coventry University, Disruptive Media Learning Lab, Coventry, United Kingdom
- 63 Using Formal Game Design Methods to Embed Learning Outcomes into Game Mechanics and Avoid Emergent Behaviour
Simon Grey, University of Hull, School of Engineering and Computer Science, Hull, United Kingdom
David Grey, York St. John University, York, United Kingdom
Neil Gordon, University of Hull, School of Engineering and Computer Science, Hull, United Kingdom
Jon Purdy, University of Hull, School of Engineering and Computer Science, Hull, United Kingdom
- 74 Playing Against the Game
Bernd Remmele, University of Education Freiburg, Institute for Vocational and Business Education, Freiburg, Germany
- 83 Case Study 1: Playful Team Reflection Using LEGO® Serious Play®
Tobias Seidl, Stuttgart Media University, Faculty Information and Communication, Stuttgart, Germany
- 87 Case Study 2: Using Games Based on Giant Dice and Time Restrictions to Enable Creativity When Teaching Artistic or Creative Subjects
Dan Barnard, London South Bank University, London, United Kingdom
- 93 Case Study 3: Students' Experiences of Interdisciplinary Learning while Building Scientific Video Games
Charlene Jennett, University College London, UCLIC, London, United Kingdom
Sofia Papadopoulou, University College London, Extreme Citizen Science, London, United Kingdom
Jesse Himmelstein, Centre for Research and Interdisciplinary, Game Lab, Paris, France
Alexandre Vaugoux, Centre for Research and Interdisciplinary, Game Lab, Paris, France
Vincent Roger, Centre for Research and Interdisciplinary, Game Lab, Paris, France
Anna L. Cox, University College London, UCLIC, London, United Kingdom
- 98 Case Study 4: Using Game-Based Learning for Induction
Osman Javaid, Manchester Metropolitan University, Manchester, United Kingdom

Copyright

The *International Journal of Game-Based Learning (IJGBL)* (ISSN 2155-6849; eISSN 2155-6857), Copyright © 2017 IGI Global. All rights, including translation into other languages reserved by the publisher. No part of this journal may be reproduced or used in any form or by any means without written permission from the publisher, except for noncommercial, educational use including classroom teaching purposes. Product or company names used in this journal are for identification purposes only. Inclusion of the names of the products or companies does not indicate a claim of ownership by IGI Global of the trademark or registered trademark. The views expressed in this journal are those of the authors but not necessarily of IGI Global.

The *International Journal of Game-Based Learning* is indexed or listed in the following: ACM Digital Library; Bacon's Media Directory; Cabell's Directories; DBLP; ERIC – Education Resources Information Center; Google Scholar; INSPEC; JournalTOCs; MediaFinder; ProQuest Advanced Technologies & Aerospace Journals; ProQuest Computer Science Journals; ProQuest Illustrata: Technology; ProQuest SciTech Journals; ProQuest Technology Journals; PsycINFO®; SCOPUS; The Standard Periodical Directory; Ulrich's Periodicals Directory; Web of Science (All Journals); Web of Science Emerging Sources Citation Index (ESCI)

Perceptions of Play: Using Play-Doh to Enhance the Student Experience in Bioscience Higher Education

Gemma Lace-Costigan, CIC.Digital (CICANT Pole), University of Salford, Greater Manchester, United Kingdom

ABSTRACT

Playful and kinaesthetic learning approaches are used in numerous early years (birth to 5 years old) learning environments, however studies in HE STEM disciplines are uncommon. This study aimed to explore the use of Play-Doh in an undergraduate anatomy module as a method of enhancing engagement. 63 students attended the ‘kinaesthetic play’ lecture, where students worked in teams to make a variety of epithelial cell types using Play-Doh. Before and after the activity, students were asked to ‘choose one word to describe how you feel’. Before the activity, 48.3% of responses were negative (E.g. confused, worried, childish). However, after the activity not a single negative response was recorded. 98% of students reported that they enjoyed the activity and 84% reported that the activity increased their understanding. This data suggests a utility for kinaesthetic playful practice in STEM teaching. Overcoming initial student perceptions towards alternative teaching practices is a challenge to be considered during session design.

KEYWORDS

Biology, Biomedical Science, Engagement, Higher Education, Kinaesthetic, Pedagogy, Play, Play-Doh, STEM

INTRODUCTION

The concept of playful learning is well researched and has formed the foundation of early years educational teaching methods (Piaget, 1999, Kangas, 2010, Broadhead et al, 2010). Engagement of adult learners through playful practice has been demonstrated in a few studies (Rice, 2009; Nerantzi et al, 2015), however there is relatively little research into the role and potential for playful learning methods in higher education (HE), particularly in STEM subject teaching including biological and biomedical science. Defining ‘play’ for an adult learner is difficult but in 1999, Henricks proposed that play could be considered an experience that has intrinsic (rather than extrinsic) motives, so that someone would choose to participate in that activity for the experience of participation alone and that learning is not the primary driver of participation. Henricks also postulated that the process of play was more important than the end result and play should involve some degree of active engagement. When students are completely captivated by a playful activity, Csikszentmihalyi (2013) proposed a state of mind called ‘flow’ where deeper learning can be achieved in both adults and children. Incorporating playful learning activities in adult learning environments therefore has the potential to increase learning whilst enhancing student experiences and satisfaction which has been reported to occur as a consequence of ‘flow’ (Csikszentmihalyi, 2013).

Learning models that incorporate kinaesthetic elements such as the VARK (visual, aural, read/write, kinaesthetic) model developed by Neil Fleming, have been well described across numerous

DOI: 10.4018/IJGBL.2017070103

Copyright © 2017, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

subject disciplines (Fleming & Mills, 1992). VARK learning style assessments are still used in HE in an attempt to enable learners with the information that will allow them to make informed choices about the way they select learning materials, study and prepare for exams. Within the biological and biomedical science disciplines, students are often encouraged to contextualise their learning through kinaesthetic means such as active participation in laboratory practical experiments or anatomy dissections. 'Learning through doing' or experiential learning (described by Kolb, 2014) is therefore a common practice within STEM teaching/learning. However, the kinaesthetic learning activities used often lack a creative dimension and often involve following step by step protocols to achieve a desired end result. There are limited opportunities for creative or explorative learning within some of the common kinaesthetic activities associated with science teaching and this may restrict the amount of deeper learning that can occur. There are countless texts describing the importance of providing opportunities for creativity within learning environments (Beghetto, 2015; Cropley, 2001; Mayer, 1989). However, it is unclear if these kinds of activities would be enjoyable or beneficial to HE STEM students, particularly those studying on biological or biomedical science programmes.

The field of cognitive psychology has generated a multitude of research describing how to increase engagement and promote learning. It is known that memories are enhanced during emotional arousal (Dolcos et al, 2004) and for a long time neurobiologists have researched the cellular basis of 'emotional learning' (LeDoux, 1992). Understanding that a student is more likely to remember a specific lecture (and associated content) if an emotional response is instigated during the lecture is something that can be exploited by academics when designing teaching sessions. Historically, individual students may have been targeted with questions during traditional lectures, or asked to stand in front of peers and take part in a demonstration which would most likely trigger a fear or an 'adrenaline' response in the participating student. The activation of a fear response may induce avoidance behaviours (LeDoux, 1992) which may lead to decreased lecture attendance. Whilst this method may have been successful in promoting increased attention in lectures (and memory of them afterward), this may not always have led to positive student experiences. With mental health issues such as anxiety on the increase in undergraduate student cohorts (Williams et al, 2015), it may be time to try and promote more positive emotional responses in lectures.

There are a number of challenges posed by teaching STEM subjects, for example, having to teach large cohort numbers. The need to teach large numbers of students at any one time may restrict the kind of learning environments available for use, for example, teaching may be restricted to the use of large lecture theatres with static furniture. Issues associated with 'crowd control' may deter academics from trying more adventurous and novel teaching styles. Teaching staff may also be required to cover a significant amount of complex course content in a relatively short period of time and the requirements of accrediting bodies may mean the curriculum lacks flexibility. Many STEM students may begin to feel overwhelmed by the volume and complexity of course material that is covered in a single teaching session. Additionally, research has reported that 59% of students find lectures boring half the time and 30% find lectures boring most of the time, with the use of PowerPoint slides being largely attributed to this effect (Mann & Robinson, 2009). In order to facilitate active learning and a deeper understanding of the more difficult (or tedious) course content it is vital that educators explore more novel methods of engaging students within the traditional lecture theatre environment whilst assessing the success of these more alternative approaches to teaching.

As described previously, there is evidence that both playful learning practice and kinaesthetic learning models have been successful in promoting engagement and learning in HE. Research has also demonstrated that learning is more likely to take place during a state of heightened emotional arousal (Dolcos et al, 2004) and so designing learning activities that stimulate a sense of happiness,

Figure 1. Play-Doh has a distinct and recognisable appearance, texture and smell



creativity and nostalgia may be used to enhance learning of some of the least interesting/stimulating areas of a STEM programme. Play-Doh is a type of popular modelling clay that has been on the market since the 1950's and is sold in approximately 75 different countries worldwide (Walsh, 2005). For decades, children have played with this product in their own homes and also have been exposed to it in schools and other learning environments. Play-Doh has a distinct appearance, smell and texture that would be recognisable by most individuals born after the 1950's and it could be predicted that the use of this medium could trigger feelings of happiness and nostalgia whilst adding a creative and tactile element to a learning activity (Figure 1).

This study aimed to explore and evaluate the use of Play-Doh in a 'kinaesthetic play' lecture in an attempt to increase engagement and student enjoyment during a two hour histology lecture focusing on epithelial tissue.

METHODS

Study Sample

This study was performed at the University of Salford with L4 students enrolled on the BSc (Hons) Biomedical Science (IBMS) programme which is offered by the School of Environment and Life Sciences. This programme is accredited by the Institute of Biomedical Science (IBMS) and so much of the curriculum content is inflexible to ensure that graduates have covered the key learning material for graduate biomedical science practice. The most recent National Student Survey reported 90% overall student satisfaction with this programme and that 91% of students were employed or in further

study within six months of graduating (Which? University, 2016). Common careers for biomedical science graduates have included employment as NHS biomedical scientists, research scientists, industry scientists and employment as medical writers. Other graduates have gone on to study for MRes, MSc, PhD, Medicine, Dentistry and Teaching qualifications.

121 students were enrolled on the L4 Human Anatomy module which is a lecture based module delivered over two semesters. 2.3% of these students were international students, 60.3% were female and 18% were classed as mature students. The group was ethnically diverse and included 29% Asian/Asian British Pakistani students, 23.3% White British students, 12.2% Black/Black British African student and 7% being of Asian/Asian British Indian origin.

Kinaesthetic Play Lecture Design

In the first semester of the L4 Human Anatomy module the teaching and learning focus was on gross anatomy and was delivered by a single member of staff via traditional lecture methods in a large lecture theatre. In the second semester, the focus shifted to tissue histology and was again delivered by a single (different) member of staff, Dr Gemma Lace-Costigan (GLC) in the same lecture theatre. The lecture theatre capacity was sufficient to seat 130 students and was divided into two equal seating blocks (separated by stairs with additional stairs at the end of each block), with each block being organised into rows of 8-10 seats. Entry points were located at both the front and the back of the room.

In the first lecture delivered by GLC, students were advised that different teaching methods would be used in an attempt to enhance learning and promote engagement. As per the University of Salford academic regulations (University of Salford, 2016), lecture notes were made available at least twenty-four hours before the lecture, however students were informed that details regarding some of the planned learning activities would be removed to ensure an element of surprise and originality to the sessions.

The kinaesthetic play lecture was the fourth lecture to take place in the series of 8 lectures delivered. Out of the 121 students enrolled on the module, 63 students attended the kinaesthetic play lecture. Before the start of the lecture, each seating space had a single sticky note placed on the desk which was to be used to collect the study feedback. At the start of the session students were informed that the content delivered in the first half of the session would be used to allow all students to participate in a competition later on in the lecture. Students were then given a traditional lecture (via PowerPoint) describing the role, types and features of different types of epithelial tissue. Once the subject material had been delivered, students were informed that the competition was about to start. The students were presented with the following information on a PowerPoint slide: 'Working with the students in your row, you have 10 mins to create each of the following cell types; simple squamous epithelia, simple ciliated columnar epithelia, simple cuboidal epithelia, stratified cuboidal epithelia. Label in detail. Don't forget the 'general' features of an epithelial cell'. Students were given the opportunity to ask any questions about the activity and then before the activity started a new slide was displayed which directed the students to use their sticky notes to anonymously complete the following task; Choose ONE word to describe how you feel about taking part in this activity. Once this was completed the competition instructions slide was projected once again and students were asked a second time about any activity queries and a small pot of Play-Doh was given to each student. Once all queries were answered a timer was started and the activity began. During the activity, the academic in charge (GLC) walked around the room, encouraging participation and asking/answering student questions. All students present took part in the activity. After 10 minutes, all students brought their entries down to the front of the room for formative assessment. The work was primarily assessed by GLC but students were also invited to leave feedback for their peers with respect to the accuracy of the models and labelling. It was reinforced that models would not be assessed based on their artistic merit but instead on evidence of understanding the structure of the various epithelial cells. The entries were discussed as a group and a small prize (a choice of chocolate or stationary) was awarded to the team that produced the best models. The students were then asked to complete the following task;

choose ONE word to describe how you feel AFTER taking part in the activity. Students were also asked to rate (1-strongly agree, 2-agree, 3- undecided, 4- disagree or 5- strongly disagree) the following statements; 1) I enjoyed that activity and 2) That activity increased my understanding of epithelia. The feedback was collected and the lecture then continued using traditional PowerPoint delivery.

Data Analysis

Of the 63 participants, 58 fully and correctly completed feedback sticky notes. 5 sets of feedback were not utilised in the study due to missing ratings or use of full sentence responses rather than a single word response.

A basic language analysis was performed by inputting the responses into WordClouds.com to assess the frequency of responses for each question and to generate a visual summary of responses. This site generates word clouds allowing the visualisation of text inputs so that the most frequently occurring words appear in larger font, whereas the less frequently occurring words appear in a smaller font. Each response was categorised as being optimistic/positive, neutral/ambiguous in meaning or pessimistic/negative.

A register was taken at the end of the session and this was used to explore the relationship between kinaesthetic play lecture attendance and overall module exam performance via an unpaired T-test.

Results

All attending students participated in the learning activity (100% engagement) with each individual student producing one of the four epithelial cell types required. In order to submit a competition 'entry,' each team had to submit all four epithelial cell types. When there were more than four members in each team, additional cells were made to ensure all individuals could create something as demonstrated in Figure 2.

After being presented with the learning activity students were asked to 'Choose ONE word to describe how you feel about taking part in this activity' (Figure 3A). After participating in the learning activity students were then asked to 'choose ONE word to describe how you feel AFTER taking part in the activity' (Figure 3B). Figure 3A highlights that before the activity, the most common responses were 'excited,' 'confused' and 'shocked'. However, after the activity, the most common responses were 'happy,' 'excited' and 'great'. The full range of student responses can be visualised in Figure 3, where the most commonly reported words appear in a larger font size within the word cloud and the least commonly reported words being reported appearing in a smaller font size.

When asked to 'choose ONE word to describe how you feel about taking part in this activity' before the activity took place, 48% of responses used language that was negative/pessimistic, 35% that

Figure 2. The kinaesthetic play lecture activity



Figure 3. Perceptions of play A) before the activity B) after the activity (Word cloud created at wordclouds.com)

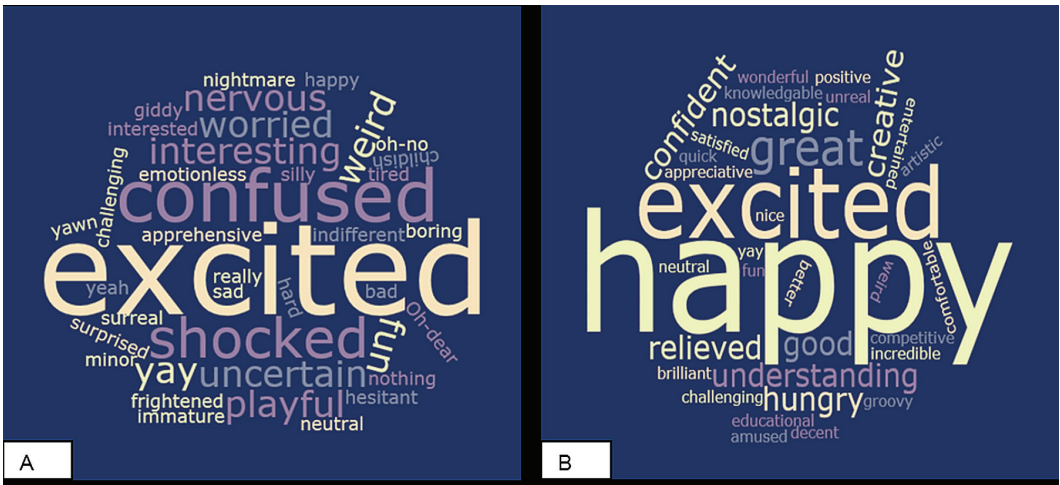
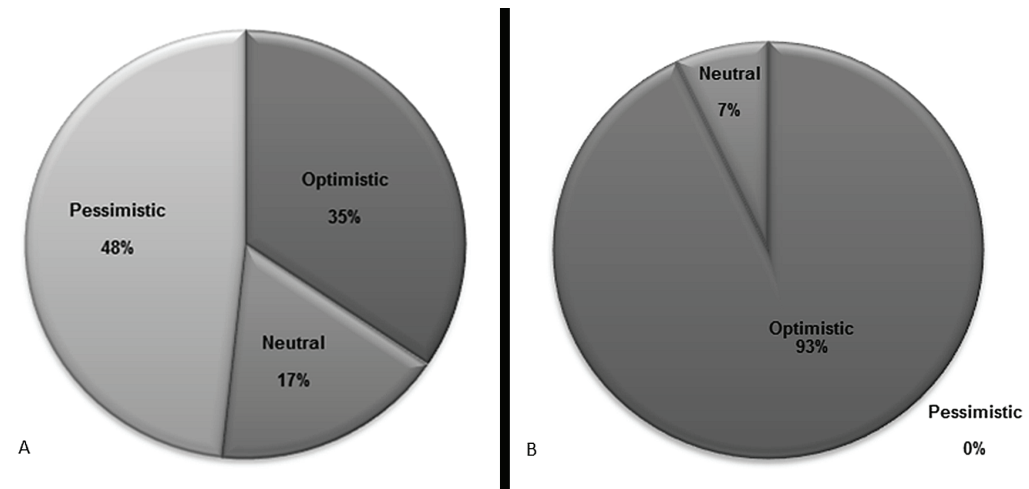


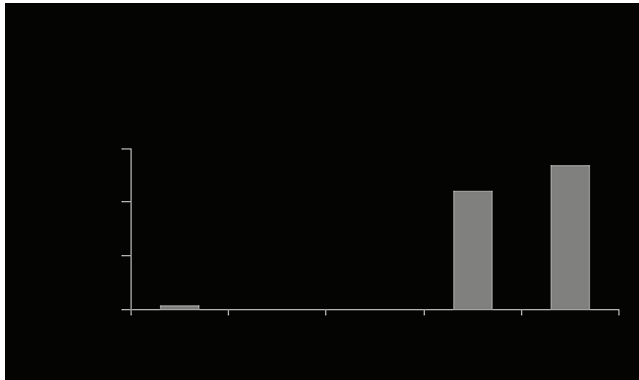
Figure 4. Language analysis of responses A) before the activity and B) after the activity



was positive/optimistic and 1% of responses were neutral or ambiguous in meaning (Figure 4A). The most popular three negative/pessimistic words were ‘confused,’ ‘shocked’ and ‘worried’ and a number of students also reported feeling ‘nervous,’ ‘apprehensive,’ ‘frightened’ and also selected words such as ‘nightmare,’ ‘immature,’ ‘childish’ and ‘boring’. The most common three optimistic words were ‘excited,’ ‘interesting’ and ‘playful’ and other responses included ‘fun,’ ‘yay,’ ‘giddy’ and ‘happy’. The most frequently selected neutral/ambiguous words were ‘weird,’ ‘indifferent’ and ‘emotionless’. Overall, the top three responses were ‘excited’ which was interpreted as being a positive/optimistic response, and ‘confused’ and ‘shocked’ which were deemed negative/pessimistic responses.

When asked to ‘choose ONE word to describe how you feel AFTER taking part in this activity,’ 0% of responses were negative/pessimistic, 93% were positive/optimistic and the remaining 7% responses were neutral or ambiguous in meaning (Figure 4B). The most commonly selected positive/optimistic responses were ‘happy,’ ‘excited’ and ‘great’ and other responses included ‘understanding,’

Figure 5. Student ratings of the statement 'I enjoyed that activity'



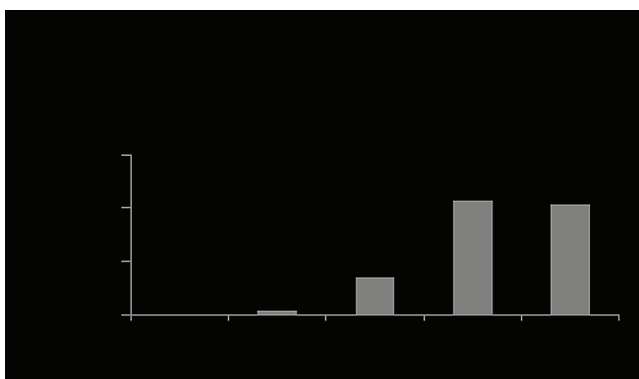
'nostalgic,' 'confident' and 'creative'. The most frequent neutral/ambiguous responses were 'hungry,' 'neutral' and 'weird'.

When participants were asked to consider the statement 'I enjoyed that activity,' 54% of participants reported to 'strongly agree,' 44.4% reported to 'agree,' 1.6% reported to 'strongly disagree' and no students selected to 'disagree' or were 'undecided' (Figure 5). Overall, 98.4% students therefore reported enjoying the activity.

When participants were asked to consider the statement 'The activity increased my understanding of epithelia,' 41.3% students reported that they could 'strongly agree,' 42.9% reported to 'agree,' 14.3% were 'undecided,' 1.6% reported to disagree and no students chose to 'strongly disagree' with the statement. Therefore 84.2% of students felt the activity increased their understanding of epithelia (Figure 6).

Out of the 121 students enrolled on the module, 63 students attended the playful lecture. The group of students that attended the session achieved a mean exam result of 70.1% whereas the student group which did not attend the lecture attained a significantly lower exam mark of 60.1% ($p < 0.05$). Access to the full lecture series attendance records were not available and so marks could not be adjusted to compensate for regular lecture non-attendance.

Figure 6. Student ratings of the statement 'The activity increased my understanding of epithelia'



CONCLUSION

Designing engaging and interactive lecture sessions that enhance deep learning is a challenge taken on by academics across different discipline areas worldwide. Kinaesthetic learning activities and playful learning practice has been shown to be successful in a number of disciplines, yet these methods are poorly explored in HE STEM subjects. Teaching to large numbers of students within the constraints of a traditional and static lecture theatre can be intimidating at times, and educators may be cautious with respect to introducing kinaesthetic and playful learning activities due to issues associated with 'crowd control'. Modern day Universities strive to increase student satisfaction as well as exam performance and some academics may feel there is a risk associated with deviating from the normal modes of educational practice. More research is needed to explore the potential use of alternative teaching methods with larger student groups within traditional lecture hall environments in HE STEM disciplines.

Academics whom are keen to appease their students may be concerned that the incorporation of kinaesthetic and playful learning activities may be considered patronising or childish by adult learners. In this study, Play-Doh was used as a learning material and this particular medium is a popular toy that is also used in early years' education. After being briefed about the learning activity, the initial responses from students regarding taking part in the kinaesthetic play activity were mostly negative/pessimistic (48.3% of responses), with only 34.5% of students giving a positive/optimistic response. Many of the responses given were anxious responses (for example 'confused,' 'shocked,' 'uncertain,' 'worried,' 'nervous,' 'apprehensive,' 'frightened') indicating students were being pushed out of their learning comfort zones. The Learning Zone Model of learning (Senninger, 2000) describes how students can be encouraged to learn by venturing out of their comfort zone but without being pushed into their 'panic' zone. It would be interesting to note the impact on the responses if the students were given advanced warning of the class activity in future sessions, thus removing the element of surprise and not pushing students into their 'panic' zone. However, by doing this you would introduce the risk of students harbouring any negative preconceptions simply not turning up to the session. Though the majority of teaching on the BSc (Hons) Biomedical Science Programme at the University of Salford is centred around traditional lectures, lab classes and tutorials, less traditional approaches such as flipped-learning, workshops, poster/oral presentation sessions, problem based learning, seminars etc are also increasing being incorporated within the programme. However, the majority of these alternative teaching practices are utilised at L5 and L6 where the class sizes are smaller and the subject material is more specialised. Increasing the variety of teaching styles and learning activities right from the start of L4 may be useful to modify student expectations so that alternative learning activities are not perceived as threatening, intimidating and without pedagogical benefit. Encouraging and inviting students to step out of their learning comfort zones whilst being mindful that certain activities may hinder learning due to negative emotional reactions is likely to enhance both learning and student learning experiences (Senninger, 2000).

A number of the responses collected before the learning activity indicated that students perceived the activity to be childish or unsuitable at the HE level. Responses such as 'immature,' 'childish' and 'silly' reinforce the importance of explaining the significance of the activity with respect to its potential to enhance learning. If a student does not consider a learning activity meaningful and worthy of their time and effort, they are less likely to fully engage and commit to the interaction (Fredricks et al, 2004). Making students aware of the success of other adult associated playful learning initiatives such as 'Lego Serious Play' (James, 2015; Nerantzi et al, 2015), games-based learning approaches (Whitton & Moseley, 2012) and the use of augmented reality to enhance scientific laboratory skills (Akçayır et al, 2016) may be effective in demonstrating the significance of such playful approaches. By carefully explaining the underlying pedagogical principles associated with playful/kinaesthetic learning activities and how this relates to achieving intended learning outcomes, one might expect to reduce some of the initial negative/pessimistic perceptions evoked.

It is extremely interesting to note that while 48.3% of the responses were negative/pessimistic before the activity, this value dropped to 0% after the activity with 93% of students giving positive/optimistic responses. Many of the responses indicated a level of enjoyment (for example, responses included feeling 'happy,' 'excited,' 'great,' 'incredible,' 'positive,' 'brilliant,' or the word 'fun') and a number of students reported the feeling of nostalgia. Creativity was also a theme amongst responses (for example students reported feeling 'creative' and 'artistic') and a significant number of responses indicated that the students felt they had learned from the activity (responses included the words 'understanding,' 'knowledgeable' and 'educational'). The lack of negative/pessimistic responses after the learning event demonstrates that once the learners had experienced the learning activity first hand, those negative feelings were extinguished. The source of those original negative feelings may have been due to the association between Play-Doh, childhood memories and early years' educational experiences and a misalignment with their expectations of adult learning methods in University. The kinaesthetic play lecture would have been the first and only exposure to a creative and tactile learning activity whilst in a large group teaching session in HE and some level of scepticism is not unexpected. Students come into HE with certain preconceptions of how, when and where learning will take place. It would have been interesting to compare enjoyment levels before the introduction of the playful learning activity to how students perceived the lecture with an incorporated kinaesthetic playful element. It would also be interesting to follow up with those students in the future to see how their perceptions change with time. It is only natural for a student to relate back to their own personal experiences of education or media portrayals of University life and in a culturally and ethnically diverse population such as cohort being described in this study, these preconceptions may vary significantly. These findings again reinforce the significance of increasing student awareness of the success of other adult learner associated playful learning practices (such as 'Lego Serious Play') and the scholarship associated with these methods. By seeing these learning activities as part of a research informed approach, students in HE may have less negative preconceptions about participation. It is an extremely significant finding that despite almost half of the cohort originally having negative thoughts and feelings associated with the kinaesthetic play activity, after the activity the majority of the group gave positive feedback. It could therefore be postulated that increased exposure to alternative teaching styles (and understanding of the underlying pedagogies) may be more likely broaden the minds of learners in HE so that similar activities are not viewed so negatively when presented in the future. It would have been useful to conduct a series of pre-activity and post-activity interviews to allow a more detailed exploration of student perceptions of kinaesthetic playful practice in bioscience HE. However, given the large cohort size, this would have proved logistically difficult and so a follow up study targeting smaller group sessions in bioscience HE might be useful in dissecting out what underlies some of the negative preconceptions of playful practice.

This study aimed to explore whether HE STEM students would appreciate and enjoy a more artistic and tactile learning activity, despite the subject area conventionally not being associated with creative learning approaches. 98.4% of the students that participated in the kinaesthetic play lecture reported that they enjoyed the activity which demonstrates more creative learning activities should not be overlooked simply because they do not traditionally sit within STEM teaching methods. The increasingly collaborative nature of academia means that science and art fusion projects are on the increase therefore enabling students to think about science creatively is likely to increase employability. Encouraging students to express scientific understanding through artistic means may help consolidate their learning, since many biological/biomedical students may in fact learn through kinaesthetic learning methods (Kolb, 1994). There exists a catalogue of historical research describing different learning styles and preferences (Honey & Mumford; 1982, Kolb, 1981; Myers-Briggs, 1980; Schmeck, 1998) however more modern approaches celebrate the complex and individual nature of learning and how learning preferences may be dynamic rather than static. It is therefore important for educators to provide a variety of learning activities that so that students can explore which learning

methodologies work best for them and their individual learning requirements at any given stage of their learning journey.

Using Play-Doh as a learning tool served to inject some creativity within a traditional lecture based learning environment, allowing students to individually participate in the learning activity whilst also working as part of a team. A wide variety of literature is available to support that many students 'learn through doing' (Kolb, 2014) and since each student would be individually producing a Play-Doh model, each student would therefore be actively involved in the session. By immersing themselves in the tactile and sensory task of making different epithelial cells, the student was creating their own, personal experience and memory of the kinaesthetic play lecture which would facilitate their learning through active participation. Additionally, each individual formed part of a team so even though parts of the activity were being performed in solitude, there was a collaborative slant on the activity. When students work well with others and experience a sense of connection whilst undertaking a learning task, engagement has been reported to increase (Wentzel, 2009; Deci & Ryan, 2000). Introducing a competitive element to the activity (via offering a small reward for the most accurate Play-Doh creation) increased the motivation of the student to participate through the desire to win and/or receive an award. The use of competitive activities to enhance motivation and learning has been described in numerous publications (Brophy, 2013; Weiner, 1990). Other studies have reported how cooperative learning techniques (which involve the use of activities where students work together on tasks to receive rewards or recognition) have been used successfully in primary and secondary school education (Slevin, 1980). Games participation is a classic example of how reward and 'winning' can be used to motivate engagement and newer pedagogical research approaches provide evidence to support the use of games to enhance teaching and learning (Whitton, 2011; Moseley & Whitton, 2012). It would be interesting to note if the results would have been different if the competitive element of the activity was removed. The kinaesthetic play activity used in this session combined using active participation, collaborative learning with a competitive element, which ultimately resulted in enhanced positive/optimistic feedback after the activity. Though team activities can be logistically difficult to manage in a traditional lecture hall environment, this study demonstrates that they are a worthwhile effort and useful in enhancing engagement, promoting student satisfaction and enhancing learner experiences.

A large number of responses after the activity were highly emotive (for example, students reported feeling 'happy,' 'excited,' 'nostalgic,' 'satisfied' or responded with the word 'fun') and previous research has demonstrated that in situations of heightened emotional arousal, learning and memory formation becomes more effective (Dolcos, 2004; LeDoux, 1992). The students who attended the lecture attained significantly higher marks in their exams compared to those who did not attend the lecture however these results should be interpreted with caution. It must be considered that only ~10% of the exam questions were associated with the kinaesthetic play lecture content and the non-attending students may have generally had poor attendance to the full lecture series. In future sessions, a before and after activity test could be delivered using a platform such as Kahoot. This would enable an exploration of how these kinds of tactile and playful activities may enhance understanding of the course content in a traditional lecture environment. It should be recollected that the main aim of this study was to assess the utility of using Play-Doh based kinaesthetic playful activities to enhance student engagement and enjoyment rather than to increase student exam performance, though it is known that a relationship between engagement and performance exists. Enhancing student learning should be the primary objective of a teaching activity and 84.2% of students felt the activity enhanced their understanding of the subject area and the other study findings support the notion that they had fun whilst learning.

Since 100% of the students present in the session actively participated in the learning activity, with 98.6% of students reporting that they enjoyed the activity and 84.2% reporting they felt the activity increased their understanding of the subject, it can be concluded that kinaesthetic playful learning activities using Play-Doh can be used in increased student engagement, enjoyment and understanding.

Engaging large numbers of HE students in creative, playful and kinaesthetic learning activities can be logistically challenging but ultimately beneficial to the learner. This research demonstrates that despite having some initial negative perceptions about kinaesthetic learning practice, students ultimately enjoy these alternatives to traditional lecture based delivery styles and report that they feel their understanding of the subject area has been enhanced. Kinaesthetic playful practice therefore has the potential to be used at different levels of education across a variety of different discipline areas, including within HE STEM teaching.

REFERENCES

- Akçayır, M., Akçayır, G., Pektaş, H. M., & Ocak, M. A. (2016). Augmented reality in science laboratories: The effects of augmented reality on university students laboratory skills and attitudes toward science laboratories. *Computers in Human Behavior, 57*, 334–342. doi:10.1016/j.chb.2015.12.054
- Barbe, W. B., Milone, M. N., & Swassing, R. H. (1988). *Teaching through modality strengths: Concepts and practices*. Zaner-Bloser.
- Beghetto, R. A. (2016). Creative learning: A fresh look. *Journal of Cognitive Education and Psychology, 15*(1), 6–23. doi:10.1891/1945-8959.15.1.6
- Broadhead, P., Howard, J., & Wood, E. (Eds.). (2010). *Play and learning in the early years: From research to practice*. Sage.
- Brophy, J. E. (2013). *Motivating students to learn*. Routledge.
- Cropley, A. J. (2001). *Creativity in education & learning: A guide for teachers and educators*. Psychology Press.
- Csikszentmihalyi, M. (2013). *Flow: The psychology of happiness*. Random House.
- Deci, E. L., & Ryan, R. M. (2000, October). Deci, E. L., & Ryan, R. M. (2000). The what and why of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. doi:10.1207/S15327965PLI1104_01
- Dolcos, F., LaBar, K. S., & Cabeza, R. (2004). Interaction between the amygdala and the medial temporal lobe memory system predicts better memory for emotional events. *Neuron, 42*(5), 855–863. doi:10.1016/S0896-6273(04)00289-2 PMID:15182723
- Fleming, N. D., & Mills, C. (1992) VARK. Retrieved from www.vark-learn.com
- Fleming, N. D., & Mills, C. (1992). Not another inventory, rather a catalyst for reflection.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. doi:10.3102/00346543074001059
- Henricks, T. S. (1999). *Play as ascending meaning: Implications of a general model of play*. In *Play contexts revisited* (pp. 257–277). Stamford: Ablex Publishing Group.
- Honey, P., & Mumford, A. (1982). *Manual of Learning Styles*. London: P. Honey.
- Kangas, M. (2010). Creative and playful learning: Learning through game co-creation and games in a playful learning environment. *Thinking Skills and Creativity, 5*(1), 1–15. doi:10.1016/j.tsc.2009.11.001
- Kolb, D. A. (1981). Learning styles and disciplinary differences. *The modern American college, 1*, 232-255.
- Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development*. FT press.
- LeDoux, J. E. (1992). Brain mechanisms of emotion and emotional learning. *Current Opinion in Neurobiology, 2*(2), 191–197. doi:10.1016/0959-4388(92)90011-9 PMID:1638153
- Mann, S., & Robinson, A. (2009). Boredom in the lecture theatre: An investigation into the contributors, moderators and outcomes of boredom amongst university students. *British Educational Research Journal, 35*(2), 243–258. doi:10.1080/01411920802042911

- Miller, M. D. (2011). What college teachers should know about memory: A perspective from cognitive psychology. *College Teaching*, 59(3), 117–122. doi:10.1080/87567555.2011.580636
- Myers-Briggs, I. (1980). *Gifts Differing*. Palo Alto, CA: Consulting Psychologists Press.
- Nerantzi, C., Moravej, H., & Johnson, F. (2015). Play Brings Openness or Using a Creative Approach to Evaluate an Undergraduate Unit and Move Forward Together. *Journal of Perspectives in Applied Academic Practice*, 3(2). doi:10.14297/jpaap.v3i2.141
- Piaget, J. P. (1999). De la pedagogía.
- Rice, L. (2009). Playful learning. *Journal for Education in the Built Environment*, 4(2), 94–108. doi:10.11120/jebe.2009.04020094
- Schmeck, R. R. (1998). *Learning Strategies and Learning Styles*. New York: Plenum Press.
- Senninger, T. (2000). *Abenteuer leiten-in Abenteuern lernen: Methodenset zur Planung und Leitung kooperativer Lerngemeinschaften für Training und Teamentwicklung in Schule, Jugendarbeit und Betrieb*. Ökotopia Verlag.
- Slavin, R. E. (1980). Cooperative learning. *Review of Educational Research*, 50(2), 315–342. doi:10.3102/00346543050002315 PMID:6698102
- University of Salford. (2016). Academic Handbook. Retrieved from http://www.governance.salford.ac.uk/page/academic_handbook
- Walsh, T. (2005). Play-doh. In *Timeless toys: Classic toys and the playmakers who created them*.
- Weiner, B. (1990). History of motivational research in education. *Journal of Educational Psychology*, 82(4), 616–622. doi:10.1037/0022-0663.82.4.616
- Wentzel, K. R. (2009). Peers and academic functioning at school. In K. Rubin, W. Bukowski, & B. Laursen (Eds.), *Handbook of peer interactions, relationships, and groups. Social, emotional, and personality development in context* (pp. 531–547). New York, NY: Guilford Press.
- Which? University (2016). Retrieved from <http://university.which.co.uk/university-of-salford-s03/biomedical-science-3-years-8500-b900>
- Whitton, N. (2011). Encouraging engagement in game-based learning. *International Journal of Game-Based Learning*, 1(1), 75–84. doi:10.4018/ijgbl.2011010106
- Whitton, N., & Moseley, A. (2012). *Using games to enhance learning and teaching: a beginner's guide*. Routledge.
- Williams, M., Coare, P., Marvell, R., Pollard, E., Houghton, A., & Anderson, J. (2015). *Understanding provision for students with mental health problems and intensive support needs*. Brighton: Institute for Employment Studies.

Call for Articles

International Journal of Game-Based Learning

Volume 7 • Issue 3 • July-September 2017 • ISSN: 2155-6849 • eISSN: 2155-6857

An official publication of the Information Resources Management Association

MISSION

The mission of the **International Journal of Game-Based Learning (IJGBL)** is to promote knowledge pertinent to the design of Game-Based Learning environments, and to provide relevant theoretical frameworks and the latest empirical research findings in the field of Game-Based Learning. The main goals of IJGBL are to identify, explain, and improve the interaction between learning outcomes and motivation in video games, and to promote best practices for the integration of video games in instructional settings. The journal is multidisciplinary and addresses cognitive, psychological and emotional aspects of Game-Based Learning. It discusses innovative and cost-effective Game-Based Learning solutions. It also provides students, researchers, instructors, and policymakers with valuable information in Game-Based Learning, and increases their understanding of the process of designing, developing and deploying successful educational games. IJGBL also identifies future directions in this new educational medium.

COVERAGE AND MAJOR TOPICS

The topics of interest in this journal include, but are not limited to:

Adaptive games design for Game-Based Learning • Design of educational games for people with disabilities • Educational video games and learning management systems • Game design models and design patterns for Game-Based Learning • Instructional design for Game-Based Learning • Integration and deployment of video games in the classroom • Intelligent tutoring systems and Game-Based Learning • Learning by designing and developing video games • Learning styles, behaviors and personalities in educational video games • Mobile development and augmented reality for Game-Based Learning • Motivation, audio and emotions in educational video games • Role of instructors • Virtual worlds and Game-Based Learning

ALL INQUIRIES REGARDING IJGBL SHOULD BE DIRECTED TO THE ATTENTION OF:

Patrick Felicia, Editor-in-Chief • IJGBL@igi-global.com

ALL MANUSCRIPT SUBMISSIONS TO IJGBL SHOULD BE SENT THROUGH THE ONLINE SUBMISSION SYSTEM:

<http://www.igi-global.com/authorseditors/titlesubmission/newproject.aspx>

IDEAS FOR SPECIAL THEME ISSUES MAY BE SUBMITTED TO THE EDITOR(S)-IN-CHIEF

PLEASE RECOMMEND THIS PUBLICATION TO YOUR LIBRARIAN

For a convenient easy-to-use library recommendation form, please visit:

<http://www.igi-global.com/IJGBL>