Ceramics studio to podiatry clinic: The impact of multi-media resources in the teaching of practical skills across diverse disciplines.

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This paper draws on the experiences of students from two vastly different disciplines to explore both the theoretical background supporting the use of multi-media resources to teach practical skills and provide a qualitative evaluation of student perceptions and experiences of using bespoke resources. Within ceramics and podiatry practical skills are traditionally taught via an apprenticeship model within small groups. We explore the practical and pedagogic benefits of developing bespoke multimedia resources to teach practical skills, identifying common themes from these disparate discipline areas. Student focus groups revealed that practically, the opportunity for repeated viewing at convenient times promoted less reliance on lecturers and better preparation prior to practical demonstrations. Pedagogically, time for reflection and sense making underpinned an increase in confidence which in turn led to increased creativity. The student voice was also used to identify recommendations and challenges driving future change.

Keywords: Multimedia instructional resources, skills, critical reasoning, autonomous learners.

Introduction

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Over the past five years, Cardiff Metropolitan University provided programme redesign sabbaticals to support the introduction of multi-media technologies to enhance learning and embed new practice within courses. Two of the selected projects, across vastly different disciplines (podiatry and ceramics) sought to explore the use of multimedia resources to enhance the development of clinical/creative skills. This paper seeks to explore the educational benefits, from the students' perspective, and provide recommendations for future practice.

Skills development is central to the curriculum within both the Wales Centre for Podiatric Studies and The Welsh Centre for Ceramics and is taught from the outset. Historically, such skills (both clinical and craft skills) have been taught through the use of a master-apprenticeship model, in which the expert demonstrates a psycho-motor skill with the novice observing. The novice then attempts to replicate this skill, modeling their behaviour on that of the master, under their help and guidance. Within the Arts the tradition of apprenticeship dates back to medieval times with long years spent practicing under a master (Griffiths & Wolfe, 2009; Pamuk, 2002) gradually learning to become the master themselves. Similarly within the field, Mackway-Jones and Walker (1998) highlight the widely held belief that the most effective means of teaching clinical skills, is through observation of experts. Students are initially very reliant on the master to demonstrate and correct mistakes in their practice and in time this dependency decreases as students develop progressively more complex skills which they learn to adapt to different situations. Although this method has been an accepted standard, producing generations of practitioners it is time and resource expensive and   less likely to promote personal responsibility for learning (Rennie, 2009).

The cognitive shift from novice to expert is often invisible to the student, with little illumination of the reasoning and strategies that experts employ (Collins, Brown & Holum, 1991). Griffiths and Woolfe (2009, p. 559) emphasised the need for educators to define a 'zone of proximal development', the gap between what a learner has already mastered and what they

can achieve when provided with educational support. This 'zone' can then be used to develop learning opportunities that bridge the gap and scaffold the learner, allowing the expert to withdraw and the learner to move from novice to expert. One aspect of this scaffolding is to provide opportunities that allow individual students to identify their own gaps and to provide access to learning opportunities that address these needs.

Historically, apprenticeships took place in the workplace and not the classroom. To translate this learning model into the classroom, Collins, Brown and Holum (1991, p. 10) developed the cognitive apprenticeship model, challenging the teacher to:

> identify the processes of the task and make them visible to the students, situate abstract tasks in authentic contexts, so that the students understand the relevance of the work; and vary the diversity of situations and articulate the common aspects so that students can transfer what they learn.

Studies investigating the use of visual media to scaffold student learning in the development of creative, clinical and critical thinking skills have suggested various benefits. Lee, Boyd and Stewart (2007), found that the use of well-structured clinical skills DVDs resulted in improved learning outcomes compared with traditional face to face didactic methods. Multimedia Instruction fosters a structured, student-centred, learning environment, affording the student support to develop at their own pace (Stegeman & Zydney, 2010). The ability to learn skills in a safe environment was further supported by Gormley et al. (2009) in which 90% of students felt more able to expand their skills on real patients having had the opportunity to develop those skills through e-learning.

Within both Ceramics and Podiatry students must adopt a complex range of processes and skills if they are to work confidently and safely. Students often wrestle with the multitude of new skills, leading to feelings of insecurity and a lack of confidence. Within podiatry this

may be related to the potential for patient harm, seemingly justifying close clinical supervision. However, students are often presented with discrepancies in practice and want a common base line on which to ground their practice, which provides positive reinforcement whilst reducing inconsistencies. For staff, clinical and workshop time is spent demonstrating skills and processes repeatedly to individual students who had not grasped techniques on first demonstration. Discussion with students also identified that a more flexible rather than linear approach may be more responsive to individual needs and learning pace.

Particular interest in vicarious learning and the potential for providing a resource that would meet the needs of a diverse student population and offset their apprehension in tackling complex psychomotor tasks led to funding to explore how the Virtual Learning Environment (VLE) could supplement the hands-on teaching and provide increased flexibility for both students and staff.

Intervention

Within ceramics an on-line resource within the institution's VLE was created to house a library of streamed videos, hyperlinked to websites providing technical information. The videos featured both staff and students demonstrating and articulating techniques, together with students and artists showing examples of their work and talking through the thought processes from conception of idea to final product. The emphasis was on critical deconstruction of techniques rather than simple process description. Hyperlinks to artists using similar techniques provided insight to the potential outcome of their labours, allowing students to make cognitive

connections between the processes, enhancing meaningfulness and motivation. This resource would be provided alongside the normal demonstration model.

Within podiatry on-line instructional videos and still photos were presented to supplement the clinical experience and familiarise students with the requisite skills and an understanding of the practical context. Resources were introduced, with appropriate instruction and support provided through classroom sessions. Clinical reasoning and reflection in action was emphasized to provide insight to the thought process. Importantly both resources were available in practical / clinical areas, providing instant access to learning objects during practicals as well as outside the learning areas.

Methodology

An interpretive, qualitative research design was employed as the research aimed to explore subjective accounts of the benefits of the resources to podiatry and ceramics students. This was based on a constructivist paradigm (Lincoln & Guba, 2000) which assumes that we construct meaning from shared understanding, procedures and language. Questionnaires and interviews were considered but in light of the desire to promote open discussion and achieve consensus regarding students' perceptions and commonality of experience (Madriz, 2000) focus groups were selected. Questions encompassed resource content, quality and accessibility, usage and areas for future development. Questions prompted open discussion and more in-depth analysis of these themes. Academics from both disciplines and the Learning and Teaching Development Unit conducted and analysed the focus groups.

Participants

Convenience sampling, on the basis of willingness to participate, was used to recruit volunteers from each year group, for each discipline, to take part in focus groups. Institutional ethical protocols were adhered to, with the research categorized as an evaluation of learning and teaching. Written consent was obtained. Each focus group included 5-7 participants, lasted approximately 40 minutes, and ended when information saturation was deemed by the researcher to have been achieved.

Six focus groups were conducted, with students from each of the three undergraduate year groups within podiatry and ceramics. The focus groups were held for each discipline year group separately.

Data analysis

Focus groups were audiotaped and transcribed verbatim. A grounded theory approach was taken to data analysis with patterns emerging from the data rather than being predefined (Strauss & Corbin, 1994). Initial coding was carried out with codes ascribed to similar concepts. These codes were refined and modified by revisiting the data to explore similarities and differences. Inconsistencies and contradictions between groups and disciplines were identified (Cohen, Manion & Morrison, 2007). Constant comparison enabled codes to be grouped together to form categories. The categories were determined as recurrent events and key issues were highlighted by the participants and led to the identification of emergent, overlapping themes. The themes were linked to existing literature to enable further discussion:

- Confidence building;

- Sense making and reinforcing existing knowledge;

- Time and space for reflection;

- Decreased reliance on lecturers leading to increased autonomy;

- Personal and creative adaptation of skills;

- Accessibility of the learning objects.

These findings will be discussed under these themes with discussion around changes that resulted from consideration of the student voice and the engagement of students as partners within these projects. Representative quotes from a variety of students will be used to illustrate the conclusions drawn. Recommendations for future practice indicated by the findings will also be highlighted.

Results and discussion

Confidence building

Whilst the use of multimedia resources is well discussed, it is the application in a complex psychomotor activity which requires highly developed tactile awareness that is new. The potential for harm associated with scalpel skills creates additional anxieties and explains adherence to traditional apprenticeship approaches. Students identified that they used the developed multi-media resources to examine the intricacies of the skill, deconstructing it in minute detail, to build confidence in translating these into the clinical environment with real

patients. The use of the resources here would seem to be in relation to planning an approach to these psychomotor skills to increase confidence. In 1943 Maslow (Maslow & Lowery, 1998) set out his hierarchy of needs in which he describes safety needs as providing freedom from harm and reducing fear and highlights the need for these to be addressed to allow the individual to develop. A podiatry student commented:-

> I had a meltdown before Christmas, a crisis of confidence (I've had a few actually). Something like this would help eliminate that crisis because you can be sure you are safe and can eliminate mistakes …..

Scaffolding learning by means of on-line multimedia, allowed students to order their learning in an incremental way, according to their current skill level. Maslow outlines this early need for order and structure, providing learners with some sense of stability. Ryan and Deci (2000) however warn against the dangers of excessive control, non-optimal challenges and lack of connectedness, as these serve to decrease actualization and therefore there is a need to ensure when designing multimedia resources that activities that promote autonomy, competence and relatedness are provided. These, according to Ryan and Deci (2000), engender commitment, effort and high quality performance.

Having the familiarity of their workshop/clinic, their learning environment, their fellow students and lecturers, was perceived as crucial to this sense of security.

> there is a confidence in the source and reliability of information, people you know in a place you know (ceramic student)

The importance of situated learning is cited by Wooley and Jarvis (2007) as being crucial for effective learning. Multi-media instructional resources showing the familiar clinic / workshop allow students to familiarize themselves with the environment, equipment and workplace as well as observe practice in an authentic environment thereby increasing confidence.

One stark difference between the discipline groups was the preference for staff or student led resources. Ceramic students commented on the usefulness of having students articulate processes as they highlighted similar areas for consideration to those in which the watching students experienced difficulties. Within Podiatry the students' preference was for staff demos to be sure that the information given was correct, even when assured that all videos were screened. This could reflect the difference in the nature of the apprenticeship model adopted by the two disciplines with greater acceptance of personal expression / promotion of individuality within ceramics contrasting with the evidence-based approach within podiatry and the need to meet Professional Standards.

Sense making and reinforcing existing knowledge

The ability to view the resources repeatedly and at will was of paramount importance. The ability to pause and examine the procedure closely helps ensure that students are able to witness the same procedure as their fellow students. This is often difficult to achieve in the workshop setting where it can be difficult for all to obtain a clear view.

By scaffolding the learning, students can often perform tasks that would normally be beyond their ability without assistance and guidance from the teacher. What came as a surprise was the students' use of the resource prior to teaching, providing a comfort in knowing what they were about to experience. Stegeman and Zydney (2010) argue that cognitive knowledge, analysis and application are enhanced through the opportunity to visualize an activity prior to its first execution. This preference for accessing e-learning material prior to a teaching session is echoed in the findings of Gormley, et al. (2009). One 2nd year ceramics studentexplains:-

looking at the video prior to the teaching demonstration familiarized me with the basic information so I could concentrate on the more complicated aspects of the process (during the demonstration)

Seeing the entire process promoted understanding in that students were able to see where their part of the process fitted into the whole and gave insight to potential outcomes. The students' focus shifts to knowledge construction rather than knowledge reproduction, identifying the gaps in their own abilities and the possibility of addressing this and therefore providing greater learner control. This promotes self-regulation and emphasizes meta-cognition as students seek to identify and rectify errors and misconceptions (Ernest, 1995). In providing such opportunities there is sensitivity towards, and attentiveness to, learners' previous constructs.

This shift in focus represents transition from a traditional to a cognitive apprenticeship model where task process, visability, context and relevance are clearly articulated (Collins, Brown & Holum, 1991).

Students commented on the need for future multimedia to be designed to deliberately bring thinking to the surface, making it visible, to illuminate the tacit processes and knowledge of the expert, enabling re-enactment and practice of these processes for themselves.

Time and space for reflection

Giving students multiple representations of process skills and time for reflection enabled them to be more creative in the potentials of the end product, generating their own perspective.

> It gives you an opportunity to take time to go back, having made a mistake and review the material and work out what you should have done. Clinic can be very stressful when you are trying to make adaptations on the spot (Podiatry student).

Podiatry students constantly have to adapt their practices to meet the needs of patients, for example, when making padding for irregular shaped feet where the 'text book' shape would be inappropriate. This requires creativity and can only be achieved if the student grasps key principles and skills. Time for practice and reflection, outside of the pressure of the clinic, provided students with the opportunity to perfect basic skills and utilize them across multiple situations. Whilst podiatry practice seemingly lacks the creativity of the ceramic studio this is an oversimplification.

Entwistle and Peterson (2004) talk about the importance of helping students move over the threshold of seeing knowledge as absolute to seeing things from multiple perspectives, which allow students to generate their own reasoned argument for their actions. This is crucial if students are to develop their own style and individual creativity or practice.

> We have a tutorial, which is great and we see skills being performed but unless we have the opportunity to go away and practise that immediately in clinic and get that visual connection, it is not reinforced and you lose the connection (Podiatry student).

Sustained connection with the material beyond the immediate teaching environment encourages on-going reflection as a learning tool. Within the clinical/workshop environment students are required to reflect in action to make rapid decisions, often to rectify mistakes. The on-line learning resources allow students to take a step back and reflect 'on-action' (Schon, 1983) where students reflect on their performance, comparing and contrasting critical features to highlight differences (Wooley & Jarvis, 2007). Exposure to the articulation of the practice of others (novices and experts), students can move away from the premise of knowledge as

absolute and appreciate the variability inherent in the real-life situation. This further highlights the need for resources that encourage exploration, reflection and articulate thinking.

Decreased reliance of lecturers leading to increased autonomy

Lack of confidence and feelings of inadequacy were highlighted frequently within the focus groups. These drive students to constantly seek reassurance leading to inefficiency of staff time, as staff demonstrate the same skill repeatedly. Reassuringly, whilst all students agreed that it wouldn't replace the lecturer they did recognise that it would reduce their reliance.

When asked what the resource added to what they were already getting a podiatry student commented:-

A lot! We get to see it once or twice and you swim or sink if you don't get it. It does highlight what you don't know (Podiatry student).

Students also expressed embarrassment at having to ask staff to repeat an action or skills over and over. One ceramic student sums it up:-

I was too embarrassed to admit I had forgotten how to do it

Ceramic and clinical skills are often taught and revised using text based media. The main teaching materials are presented in two dimensional (2D) forms including books, white or blackboards. To interpret such representations students need to make the mental conversion of these 2D pictures into a 3-D reality requiring spatial reasoning skills (Phillips, 2011). The difficulty this presents causes students to seek additional guidance from tutors. The benefit of film over drawings as an instructional method was praised.

When you look at a handout it is hard to work out at what angle to hold the scalpel, at least when

you have a film of how it is properly done you don't have that need (Podiatry student).

The importance of moving images compared to static representations seems central in helping

students develop complex, refined skills. Seeing the hand positions, grip changes and dexterity

needed as the scalpel is manipulated was seen as crucial in the development from novice to

expert. Likewise in Ceramics the moving image captured subtle changes missed   by 2D

images.

The importance a verbal commentary to support the visual material, providing the

students with the critical reasoning from both the expert and novice served to increase the

students' understanding of the processes and reasoning for action undertaken. Mayes, Dineen,

McKendree and Lee (2002, p. 224) stress the importance of educational dialogues in making

"explicit inferences which would normally remain unspoken".

The on-line materials promoted increased autonomy, paced learning and the setting of

individual outcome and process goals. Brydges, Carnahan, Safir and Dubrowski (2009) found

that students self-regulating access to instruction performed better on retention than those

whose instruction was controlled externally. Within both disciplines students chose the video

segments they viewed to meet their own learning needs.

Seeing fellow students in a familiar context promoted a sense of belonging, exploiting

what Maslow and Lowery (1998) describes as a 'hunger for a place in the group or family'.

Throughout the focus groups this need to belong to a community of practice was clearly voiced.

The process of gaining feedback from students also revealed to staff how far they had

developed since their own student experience, and that often students had not grasped what

staff saw as simple processes. Having long since grasped key threshold concepts staff often

have difficulty looking back and recognising the points at which students are struggling (Meyer

& Land, 2005). This makes deconstructing the learning process more difficult. The focus groups together with the students' films assisted in the process of illuminating these areas and have since influenced curriculum design to reconcile the issue – through, for example, time allocation and increasing transparency of thinking.

Accessibility of the learning objects

Students stressed the importance of being able to access resources both from home and in the workshop / clinical setting. For ceramics in particular the ability to access the material within a dusty workshop was revolutionary as access to books necessitated leaving the workshop, and changing clothes before being allowed access to library facilities.

All students accessed the resources from home, with most accessing them prior to their classroom introduction. Access after the event was used for reflection and development of skills.

Further developments

Self-determination theory (Ryan & Deci, 2000) outlines three factors that form the basis for internal motivation and goal pursuit; Competence, Relatedness and Autonomy. The initial resources sought to address these issues; however evaluation of the resources by students and exploration of the focus group findings revealed a need for further development.

Students expressed the need for increased interactivity and student partnerships. They valued opportunities for vicarious learning (Mayes & Fowler, 1999), the use of students themselves as teachers and identified   a need to develop communities of practice (Wenger, McDermott & Snyder, 2002) to support students and post graduates. One criticism of the initial project centered on the use of the institutional VLE and its lack of versatility, with ceramics students commenting that the resource was 'like looking at a wonderful website through a letterbox.' Students also identified the need for the development of an on-line community of practice. Wenger (2006) identifies three characteristics that make up the Community: The domain (a shared interest); the community (joint activities and discussion) and the practice (Practitioners developing a shared repertoire of resource, experiences, stories, tools, ways of addressing recurring problems; in short, a shared practice). Two different approaches have been taken to address these needs.

Within Ceramics, a website embeds the original process skills but provides opportunities for students to share practice through e-portfolios, and contribute to a ceramics blog to share (debate) current thinking, exposing students to multiple perspectives. Student and expert vodcasts enable articulation of tacit knowledge and provide opportunities for vicarious learning, illuminating where thresholds have been crossed and enabling dialogue, highlighted by Shreeve, Sims and Trowler (2010) as being crucial to student-centred learning. The e-portfolios include private space for students to develop and reflect on their work before placing it in the public domain. They are learning to judge where they and their work 'fits and belongs within a practice' (Shreeve et al., 2010, p. 132). Links to Facebook and a ceramics blog encourages discussion amongst students, staff and the wider ceramic community creating a clear relationship that supports learner autonomy. This open educational resource promises a community of practice for those wishing to join the domain, the apprentices of that domain (the students) and for experts in the field. This has already won international acclaim (Jorum Prize

For Open Access Resources, http://dspace.jorum.ac.uk/xmlui/handle/10949/2027) and continues to develop with the student voice driving future developments. Central to the website is the focus on students who identify their own learning, demonstrate skills and verbalise their thinking to promote vicarious learning and social learning.

Within podiatry, a blog aims to promote interaction between staff and students and to help identify the gaps in understanding between the expert and the novice. Additionally the potential use of visual media (in particular instructional videos) produced by students, providing educational dialogue, has been recognised by both students and staff as enabling students to establish a common understanding and reasoning from multiple perspectives. These learning objects also help the development of deep learning through the preparation required to teach others. Mayes and Fowler (1999) describe this as tertiary courseware where instructional material is produced by previous learners in the course of discussing or assessing their learning tasks. These learning experiences are then re-used to promote learning in others.

Conclusion

The use of accessible multimedia resources has increased the opportunities for students to develop skills but more importantly has provided them with a platform to promote their development as autonomous learners and practitioners. Both disciplines identified the value of multi-media resources as providing opportunities to increase confidence and enhance the ability to construct new skills and knowledge, but also to reinforce existing knowledge. They appreciated the time and space it afforded them for reflection. Differences identified by the disciplines (in particular the preference for expert driven materials, an increased reliance on

academic and clinical staff for feedback), may in part be due to the competency, evidence-based practice driven outcomes required by professional bodies within health professions. This presents an important challenge when developing multi-media resources. The ongoing development of the ceramics website and podiatry blog seeks to provide a supportive environment, offering reassurance, and the opportunity to share practice, view finished work and develop their practice. Increased opportunities for students to engage in developing their own learning materials has increased partnership working between student and academic staff and promoted the idea of students within a community of practice. The ceramics website and podiatry blog also provides students with the opportunity to develop competence at their own pace by providing opportunities to revisit materials and situating learning in familiar contexts. By making the creative process / clinical thinking visible students are given the opportunity to vicariously make their own connections and develop an understanding of previously hidden thought patterns that determine steps to a finished process. Seeing the change of thinking from novice to expert is central to this. Convenience sampling may have captured the views of motivated students, however due to focus groups numbers and small cohort sizes the findings highlight the potential on multi- media resources.

The longer term impact has been on curriculum design where such activities have been moved from being peripheral to central, with students directly influencing the resources being developed. The ongoing challenge is to listen to the student voice to ensure that student needs are met and that future development marries sound pedagogy with opportunities for social learning and increased student partnership working which promotes autonomy.

Notes on contributors

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