DEMONSTRATION AND EVALUATION IN DESIGN: DEBATING THE USE OF THE MASTER-APPRENTICE MODEL IN VIRTUAL LEARNING ENVIRONMENTS

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ABSTRACT
Rooted in face-to-face teaching, the 'top-down' master-apprentice model is the dominant pedagogical approach in design education. Through reflecting on the results from two case studies, we discuss possible advantages and limitations of extending the master-apprentice model to asynchronous Virtual Learning Environments (VLEs) with regards two overarching principles of design education—*demonstration* of skills and *evaluation* of the aesthetics of students' designs. This debate is important as universities are predicted to increase their use of VLEs. Case study one describes an online system through which practical skills are demonstrated to students via a 'master-apprentice style' approach. Learners' qualitative feedback suggests this method is beneficial. This infers that the master-apprentice method may aid tutors to *demonstrate* practical skills in VLEs. Case study two describes an empirical investigation in which a homogeneous group of design educators (i.e. design experts) evaluate the aesthetic qualities of transport designs. In identifying a low level of agreement, these results query research which argues that experts are capable of delivering objective evaluations in terms of aesthetics. The results of case study two question how successfully the master-apprentice model can be applied to *evaluate* aesthetics in VLEs as such environments can lack an opportunity for nuances in communication between tutors and students to be propagated. We conclude by arguing the results presented in this paper may be related to inherent differences between *demonstration* and *evaluation* in design. We call for research on how best these constructs may be negotiated in the design of future VLEs.

Keywords: Design education, asynchronous communication, online tutorials, design evaluation

1 INTRODUCTION

The master-apprentice model is synonymous with teaching in disciplines which require 'making'. It is argued [1: p.449] to be "perhaps the oldest form of education […] designed to provide training in the crafts and trades." The master-apprentice method is situated within a patriarchal social and economic model [1]; as such it is a 'top-down' model. In terms of product design education, its use can be traced back at least as far as the Staatliches Bauhaus. Characterising this system, the founder of this seminal institution, Walter Gropius [2: p.1], argues that the educator "instruct[s]" the novice. Gropius [2: p.3] affirms the patriarchal, top-down ethos of this model by stating that "the instruction of the individual is left to the discretion of each master". Much has changed since Gropius' era, however the master-apprentice system remains dominant in contemporary design education [3].

Research suggests the master-apprentice system enables tutors to demonstrate practical skills to students [4]. Indeed, students expect its use in this regard [4]. However, literature suggests its use in evaluating students' aesthetic treatment of form can be problematic. Frascara [5: 64] states:

"I have seen instructors judge the quality of their students' work by saying: 'This one is too busy' or 'This is better, it is simpler.' […And…] *that 'busy' is bad and 'simpler' is better in every situation."*

Because of the prevalence of the master-apprentice model, the predicted growth in use of Virtual Learning Environments (VLEs) by universities [6] means increased possibilities for design tutors to practice it in on-line settings. By definition, VLE conditions differ greatly from the face-to-face scenarios in which this teaching model is rooted. VLEs often primarily function through the creation of asynchronous communication between tutors and students [7]. Learners can have negative experiences of such phenomena [8]. Issues include isolation from a community of practice and

technical problems [9] as well as the time taken for tutors to disseminate feedback [8]. Discussion on the potential benefits and disadvantages of the use of VLEs is particularly relevant to design education as research questions the value of extending the master-apprentice system to an online learning environment [4]. Through reflecting on the results from two case studies, this paper discusses possible advantages and limitations of extending the master-apprentice model to asynchronous VLE settings with regards two overarching principles of design education, *demonstration* of skills and *evaluation* of the aesthetics of students' designs [5].

2 CASE STUDIES

2.1 Case Study One: "Demonstration of skills via online Photoshop tutorials"

In transport design practice, Photoshop (PS) augments or sometimes replaces traditional manual visualisation processes. This case study describes a VLE developed by Author 3 in which PS skills are demonstrated to first year undergraduate transport design students via the master-apprentice system. In term one, tutors aim to develop students' manual sketching techniques. Tutors use the master-apprentice approach to demonstrate perspective drawing, effective utilisation of line weights and the principles of shading. In term two, PS demonstrations scaffold the teaching of practical skills. Author 3 uses a laptop connected to two large digital screens to demonstrate PS techniques and a graphics tablet to emphasise how PS can be used to create transport design sketches.

Two factors prompted these VLE innovations: growing student numbers and an increased body of international students whose mother tongue is not English. These issues limited Author 3's 'face-to-face' communication with the cohort. To support 'face-to-face' teaching of PS, Author 3 has created a series of web-enabled video tutorials in which PS skills are demonstrated to students. Screen capture programmes record both 'real time' screen activity during the demonstrations and associated spoken commentary. In this VLE, asynchronous discussions between Author 3 and students are constructed.

The first video in the series explains the PS interface layout, orientation and optimisation for sketching purposes (*Figure 1*). Subsequent videos convey basic PS sketching techniques tailored to allow students to transfer previously-gained manual sketching methods to a digital format (*Figure 2*). The videos build to form a library which students can access at any time.

Figure 1. PS interface layout

Figure 2. PS shading techniques

These recorded tutorials differ from other video tutorials available on Youtube.com or through other web 2.0 enabled channels, because they offer a structured and incremental approach to learning. The video library also includes examples of more advanced techniques, enabling more advanced students to find appropriate material, which, due to time constraints, cannot be covered in the 'face-to-face' demonstrations. The videos also maximise the value of 'face-to-face' demonstrations: the latter are recorded and edited for inclusion in the video library to capture both students' questions and Author 3's spoken guidance.

Videos are typically 15 minutes long and encourage students to practice the procedures shown whilst away from teaching sessions—for example when they are at home. Typically, each demonstration takes about 8 hours to prepare. The 'face-to-face' demonstrations usually last about 20 minutes, but can overrun if students wish to ask many questions. The larger the group the less questions are posed, which means that the videos gain in importance.

In terms of specific teaching and learning philosophy, prior to this trial, students applied a form of action learning, which is defined as follows: "a continuous process of learning and reflection, supported by colleagues, with an intention of getting things done" [10: p.11]. Via this method,

students learn "with and from each other by working on real problems and reflecting on their own experiences" [10: p.11]. In terms of teaching PS, the action learning model proved not to be optimally effective, because in their eagerness to learn PS (or because of a lack of patience with the software), many students attempted to 'learn what they wanted to' rather than taking incremental steps. The latter is the best means to aid students develop their skills in preparation for professional practice. The PS teaching method is now in the form of blended learning, a combination of both traditional and e-learning activities [11]. This blended method of delivering PS tuition ensures sequential delivery to enable students to build skills and knowledge in an appropriate and cumulative way. The video library functions as a "digital learning object that can be reused to help facilitate and support learning activities" [12]. Returning to the study's aims, first year students were asked to provide qualitative feedback on the video library. A total of learners kindly provided feedback. These individuals were aged between 19 and 24 years; 5 were female, the remainder male. Their nationalities were: British, Chinese, Columbian, Korean, and Nigerian. Students noted negative issues linked to massification, for example:

"getting everyone to be quiet during the tutorials"

"I personally could not pay attention because of the dark and the heat from the crowded classroom made me sleepy".

Learners' feedback suggests the videos had helped students negotiate massification-related issues. For example:

"the screen is a little small, maybe sometimes some mates can not see clear. Fortunately we have replay videos can be watch. It is very good."

Also, feedback from separate students whose mother tongue is not English suggests the videos aided their understanding:

"*Replay is very important for me because I need to focus on both hearing and watching and I sometimes miss either of them"*

"sometimes in class it is hard to understand what they are saying so the videos help me to go back if I don't understand something"

"The processes are clear, but some commentary I cannot understand. Most time I just analyze how do you do by Photoshop in the video".

In summary, case study one suggests that the asynchronous communication intrinsic to the aforementioned PS VLEs can enable students to engage in effective distance learning.

2.2 Case Study Two: "Evaluation of aesthetics—inter-individual variability between experts"

Here, Author 2 asked a homogenous group of design experts (all transport design educators) to rate a range of compact urban vehicle concepts with regard to their aesthetic appeal and the extent to which each incorporated a range of aesthetic design principles. The participants were considered automotive design experts because they all worked as professional car designers for a minimum of 3 years previous to their current roles as automotive design educators and academics. The group consisted of males with a mean age of 46 years. Using a dedicated usability lab, the designs were shown on a 23" wide screen TFT monitor with the images subtending a horizontal and vertical angle of 13 and 7.5 degrees of visual arc, respectively. The vehicles consisted of compact urban concept vehicles and were chosen to control for difference in vehicle type and size and focus on the aesthetic differences within this specific category. Each vehicle design was shown in a three-quarter perspective and in greyscale to control for any possible effect of colour on participants' appreciation of aesthetics.

Using 7-point Likert scales, the participants evaluated the concept vehicles according to their aesthetic appeal and 8 design principles thought to be associated with automotive beauty. These principles were: 'simple', 'elegant', 'well-proportioned', 'flowing', 'sculptural', 'minimalistic', 'fluid', and 'understated' [13].

The level of agreement was operationalised as the Intraclass Correlation Coefficient (ICC) which is a statistical measure of the consistency with which the participants rate a given trait. The ICC takes on a value between 0 and 1 where the former indicates the absence of any consistency, and a value of 1 when there is perfect agreement. In the field of art, ICC values for criteria such as simplicity, coherence, and craftsmanship, tend to hover between 0.1 and 0.3 suggesting very low levels of agreement [14]. Given the homogeneity of the expert group, as well as the use of everyday objects (i.e. cars) which show only limited artistic variation when compared to artworks, the authors hypothesised

considerably higher levels of agreement within this expert group [14]. As shown in *Figure 3*, however, large inter-individual differences were observed as indicated by low ICC values.

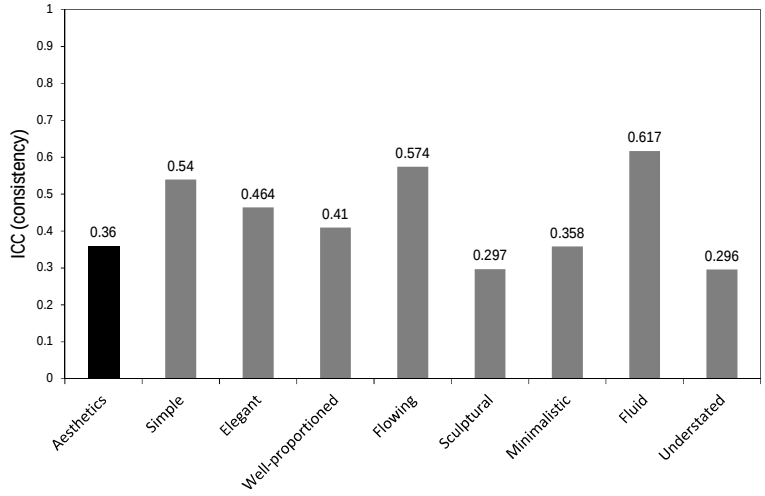

Figure 3. Intraclass Correlation Coefficients (ICC) for aesthetic ratings and aesthetic design principles

As the participants shared both a common education and experience as transport designers prior to beginning their careers as educators, they can be said to be *appropriate judges* [15] of aesthetics in their field. Such judges are considered to be capable of achieving high levels of agreement [see, 14]. Consequently, they are argued to be able to make objective decisions about aesthetics and associated design principles [15]. The large inter-individual differences identified here appear to be at odds with the above notions. This lack of agreement is particularly striking given that the principles were derived from a large body of domain knowledge existing of published automotive literature, surveys, focus groups and interviews with automotive design experts [13].

3 DISCUSSION

Case study one has described a method in which VLE-enabled master-apprentice style teaching of PS supports 'face-to-face' teaching of this software. This VLE functions via constructing asynchronous communications. This study has demonstrated that VLE (and accordingly distance-enabled) teaching of PS can successfully extend the reach of the master-apprentice model beyond 'face-to-face' scenarios. The results of this study appear to query aforementioned research [4] which questions the value of the master-apprentice system in VLE-enabled distance learning environments.

Case study two has described an investigation into experts' evaluation of the aesthetics of design concepts. It identified considerable disagreement amongst experts and thus called into question the notion that relevant tutors can achieve high levels of agreement with regards to aesthetics and associated design principles [see, 14] and can therefore make objective decisions about aesthetics [15]. The results of case study two raise the possibility that the evaluation of a design may not be fully captured through the use of commonly utilised terms within a particular design community. It can be argued that the 8 aesthetic principles used in this study may only refer to the most apparent and, cognitively, most readily available design principles. If this were the case, it may be at the cost of other, less prominent and less accessible design principles argued to be associated with aesthetic appraisal, for example the principle of 'prototypicality' [see, 16]. Whereas design tutors may not be consciously aware or be able to explicitly express the above, 'face-to-face' dialogue with students may allow for a more refined and richer design evaluation. 'Face-to-face' dialogue allows humans to pick up on nuances in communication and facilitates it [17]. Virtual communication channels can create communication problems between humans. Issues with communication via VLEs are exacerbated through participants' reliance on text to construct dialogue [18]. The potential to create poor communication increases when tutors construct asynchronous discussion via VLEs [7]. With the above in mind, it is possible that a tutor's 'top-down' master-apprentice style evaluation of design aesthetics [5] presented as a virtual asynchronous written dialogue may increase the chances of precipitating miscommunication with students. The results of case study two suggest that this situation

may become exacerbated when evaluation of the aesthetics of students' designs is provided by more than one tutor via a VLE. A comprehensive search has not yielded literature discussing the effect on students of being presented with tutors' differing evaluations on the aesthetics of their designs. Perhaps this may be because the idea that experts are capable of making objective decisions [15] is widely accepted in design teaching environments? A lack of agreement with regards to individual tutors' evaluations may result in frustration for students and may prompt learners to request further clarification from their instructors. As noted, the time taken for students to receive responses from a tutor is one reason argued to exacerbate frustrations with VLEs [8]. Waiting for virtual responses from more than one tutor could further amplify these feelings.

4 CONLCUSION

As the prevalence of university teaching via VLEs is predicted to grow, it is important to debate how this may affect design education. This paper has aimed to stimulate such discussion.

We have argued that, with regards the teaching of PS, asynchronous communications constructed through a VLE have benefitted students' learning experiences with respect to issues related to massification and problems faced by overseas students whose mother tongue is not English. Accordingly, these findings suggest it is possible to extend master-apprentice demonstrations to a VLE format. The PS VLE was constructed to augment 'face-to-face' teaching. Further research will have to be conducted to evaluate whether VLE teaching of PS can effectively replace 'face-to-face' methods. This raises ethical questions on how such a study may be attempted: it is, for example ethically unviable for a group of students within a cohort to be excluded from 'face-to-face' demonstrations for research purposes. The results of case study two question research which argues that experts are capable of making objective evaluations of aesthetic values. Taken together with issues limiting communication via VLEs, these results suggest evaluating aesthetics via asynchronous dialogue may cause frustration for students.

The discussion in this paper appears to revolve around inherent differences between *demonstration* and *evaluation* in design. Arguably, the 'top-down' demonstration of PS skills is a 'more objective' practice as it involves explaining tools and illustrating the rational practice of shading form utilizing a light source (see, *Figures* 1 & 2). PS skills may therefore be more suited to being taught through asynchronous communication methods. Evaluation of students' aesthetic treatment of form, though performed in a 'top-down' fashion, may be a 'less objective' practice. We call for research on how the 'more objective' notion of demonstration and the 'less objective' idea of evaluation may be negotiated in the design of future VLEs. We argue this research may be important in benefitting students' learning experience in the digital age.

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