



## Incorporation of Pen-Based Digital Drawing Tools in Apparel and Interior Design Instruction for Effective Design Communication

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Keywords: Digital, technology, design, instruction

*Instructional Merit and Purpose.* Effective design communication skills lie at the heart of apparel and interior design professions. One of the challenges of apparel and interior design education is keeping pace with the evolving needs of the professions with respect to design communication technologies. These technologies have changed significantly over the last ten years (Clark & Clark, 2010) and emerging technologies of today are likely to be commonplace in higher education within the next five years (Johnson, et al, 2011). According to a study (Koch & Domina, 2003), computer-aided design literacy for students in entry-level positions within creative industries will have increased from 5% a decade ago, to 85% in the next decade. The purpose of this instructional enhancement project was two-fold: 1) to incorporate the use of pen-based digital drawing tools (pressure-sensitive stylus pens and tablets) into studio instruction in one apparel design and one interior design course; and 2) to assess the effectiveness of employing digital drawing tools on critical student learning outcomes relating to technical and aesthetic quality of digital drawings.

*Implementation.* This project assessed the effectiveness of employing digital drawing tools on critical learning objectives in two introductory Interior and Apparel courses with respect to the technical quality of line (line weight, consistency, and smoothness), aesthetic quality of line (line depth, expression, character, flow and movement), technical quality of form (proportion and level of detail) and aesthetic quality of style (creativity, originality, and harmony) of the outcomes. The assessment of student work was limited in scope to a non-graded practice exercise that was an existing part of the course curricula during the introduction of the Adobe Illustrator program for technical drawings. Apparel and Interior Design students completed technical drawings of an apparel or interior product using a mouse and a digital-drawing pen. Half the students were assigned to begin the exercise with the mouse and the other half were assigned to begin the exercise with the digital pen. All students were given twenty minutes to complete the exercise with the two tools. Following the exercise, students were asked to evaluate their experience in using the two tools (mouse and digital pen) with respect to the above dimensions of technical and aesthetic quality on a 5-point scale anchored by 'very difficult' (1) and 'very easy' (5) through a paper-based survey.

*Assessment.* A total of 13 Interior Design and 15 Apparel Design students participated in the instructional assessment. Repeated measures analysis of variance was used to test the effects of the tools on perception of technical and aesthetic quality of the outcomes. All the scales for technical and aesthetic quality had adequate reliability and hence composite means were used for each scale in the analysis. Results revealed that the *tool used* (mouse, pen) had a main effect on the perceived aesthetic quality of the line and the technical quality of the line. The mouse

produced higher perceptions of aesthetic quality of the line than the digital pen ( $M_{\text{mouse}} = 3.69$ ,  $M_{\text{pen}} = 3.29$ ;  $F_{1,23} = 4.52$ ,  $p < .05$ ), as well as higher perceptions of technical quality of the line than the digital pen ( $M_{\text{mouse}} = 3.86$ ,  $M_{\text{pen}} = 3.47$ ;  $F_{1,26} = 5.38$ ,  $p < .05$ ). Hence, the mouse was perceived to be more effective than the digital pen with respect to the technical quality of line (line weight, consistency, and smoothness) and the aesthetic quality of line (line depth, expression, character, flow and movement). The *tool used* also interacted with the *program* (Interior vs. Apparel) to significantly affect the technical quality of form ( $F_{1,26} = 6.19$ ,  $p < .05$ ). Perceptions of the technical quality of form was higher among Interior Design students who used the digital pen ( $M = 3.42$ ) and Apparel Design students who used the mouse ( $M_{\text{mouse}} = 3.43$ ) than among Interior Design students who used the mouse ( $M_{\text{mouse}} = 2.96$ ) and Apparel Design students who used the digital pen ( $M_{\text{mouse}} = 2.9$ ). Hence, the digital pen was perceived to be more effective among Interior Design students than Apparel Design students with respect to technical quality of form (proportion and level of detail). The effect of the *tool used* on the aesthetic quality of style was non-significant ( $p > .5$ ).

*Discussion and Follow-up.* Two reasons could have influenced the perceived effectiveness of the mouse over the pen for aesthetic and technical quality of the line. Students in both programs had no experience with using the digital pen prior to the practice exercise, however, most student have used a mouse for general computer usage. Hence, the lack familiarity in using the digital pen tool could have been an important factor in these results. To address this in the follow-up study, we will be ensuring that students have adequate time in using both tools with the software programs before the assessment. Another reason for the effectiveness of the mouse over the digital pen may have emerged due to the nature of the technical drawings. Both technical drawings consisted of fairly geometric lines, where a mouse can be just as effective as a digital pen in capturing the lines. Existence of more organic lines in the drawings may have produced a different result for the effectiveness of the digital pen. The follow-up study will use a more organic drawing to test this proposal. An additional reason could have influenced the differential effectiveness of the digital pen among Interior and Apparel Design students relative to the technical quality of form (proportion and level of detail). The Apparel Design students employed a body template to create the technical drawing of the apparel product, which provides guidelines for proportions. The Interior Designs students did not employ a template in creating a technical drawing of the interior product, which may have allowed them to perceive the benefit of the digital pen in sketching the part to whole proportions. The follow-up assessment in the subsequent implementation will control for the above reasons.

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