Applying Cognitive Operations in Collaborative Apparel Design Process

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Keywords: Cognitive operations, CPDAM model, collaborative project

One of the most important issues in design process is the cognitive process designers undertake (Stempfle & Badke-Schaub, 2002). Design students often lack in communicating their cognitive process and do not effectively work in a group setting (Muhammad & Ha-Brookshire, 2011; Romeo & Lee, 2013). Analyzing the thinking and reasoning process of designers, particularly in collaboration, is a difficult task since there are not direct measures to inspect a designers' thinking process. Teams can provide more complex, innovative, and comprehensive solutions to problems, but the cause of teams' failures may be great due to poor planning or breakdown in internal team processes (Sundstrom, DeMeuse, & Futrell, 1990).

Therefore, the purpose of this study is to apply the content-and process-directed activity model (CPDAM) proposed by Stemplfle and Badke-Schaub (2002) to a collaborative apparel design project. Based on this, a modified CPDAM is proposed to be implemented in design courses. Specifically, this study modifies the model to fit the content of the design project grounded in sustainability and examines the effective team performances between two designers and maps onto different stages of the content and the process as shown in Figure 1.

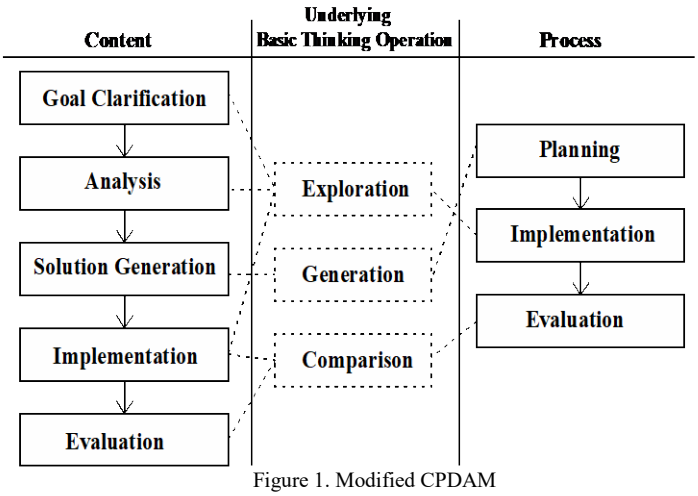

Figure 1. Modified CPDAM

The *goal clarification* stage of the specific design project was to explore sustainable design process and create an innovative upcycled dress. This topic was chosen since the fashion industry has embraced "upcycling," the conversion of waste materials into new products of better quality and better environmental value (Aus, 2011). Unlike recycling, upcycling "up-values" products innovatively, instead of just reusing them (Goldsmith, 2009). For *analysis* stage, we conducted literature reviews and adopted a framework for upcycling from Aus (2011). The *solution generation* stage included ideas of integrating computer-aided design systems (Adobe Illustrator for laser cutting and Optitex for garment patternmaking) and sustainable design methods (ensuring minimum waste and adopting upcycling processes) to create an upcycled dress inspired by a Gothic architecture. To accomplish this solution, we purchased used women's leather jackets and men's neckties to upcycle. Garment patterns were draped, and then strategically placed on the jackets where they were digitized into Optitex subsequently cut using a Trotex laser cutter to ensure minimum waste. Based on the inspiration, repeat motifs (pointed arcs and flowers) were developed in Adobe Illustrator, and parts of leather were cut using the laser cutter. In the *implementation* stage, four different prototypes for laser cutting swatches were generated along with a garment prototype using draping techniques. Lastly, four-step framework for visual analysis from Delong's (1989) was adopted to evaluate the content in the *evaluation* stage.

In the *planning* stage from the process section of CPDAM, two designers planned how to proceed and how to distribute tasks. To strategically communicate between designers, a shared drive folder, an electronic calendar and a blog were created to communicate and document the cooperative design process. For *implementation* stage, two designers divided the planned tasks and reported the individual process after completing each. In the *evaluation* stage, reflection questionnaires of individual and group were conducted using Blum and McHugh (1984)'s self-reflection technique. After evaluations were done for both content and process of the project, the underlying basic thinking operation of *exploration*, *generation*, *comparison*, and *selection process* (Stempfle & Badke-Schaub, 2002) were examined by reviewing recorded documentations from each stage.

By adopting CPDAM to the collaborative design project grounded in sustainability, it enabled us to segment a complex design team activity into small parts that can be analyzed by a variety of methods and provide a precise picture of what design teams really do, leading to successful outcomes. The presentation will include: (a) explanation of CPDAM framework and the design process to be implemented in design courses, (b) photographs of the collaborative design process and the completed ensemble, and (c) outcomes of the evaluation and overview of the effectiveness of the collaborative design process and its contribution to the future design projects.

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