Is Spatial Ability improved? Creative Sketch training for product design students

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ABSTRACT

Spatial ability has been considered as an essential of product sketch, which helps designer visualize their initial concept. 3D model, especially by virtual reality, has been used for students to observe the details of the every prospect that they can comprehend the visual appearance by all viewinProduct design students usually experience the difficulties creating product shapes that look uncommon. Spatial ability is considered as an essential of product sketch, which helps designer visualize their initial concept. This research applied model making and traditional sketch teaching method to two first year industrial design sketch classes. We assessed the changes of spatial ability and drawing creativity to investigate whether spatial ability is improved together with sketch creativity. The results show that the students generally improved their spatial ability and draw better in fluency and correctness. Drawing creativity is also improved but has no significant relation to spatial ability. Two classes have developed different approaches in drawing objects from imagination and may be applied in 3D engineering drawing software design in the future.g angle. On the other hand, imagination of spatial rotation is also a common way to encourage student to construct unseen prospects through reasoning the observable features. Through a practice of these two types of sketch training, this research is to clarify whether the improvement of sketch skill is by/with increased spatial ability and which type of training is better for improving sketch skill.

Two product sketch classes were invited to use different curriculum, real modelling experience and unseen viewing angle imagination. Spatial ability and creative sketch tests were conducted before and after the curriculum. As the results, spatial ability does not necessarily link to creative sketch Students of both classes improve their performance in creating shapes in which class B improves more than class A.

Conference Key Areas: Curriculum Development, I feel brilliant

Keywords: sketch, product design, spatial ability

INTRODUCTION

Product design students usually experience the difficulties creating product shapes that look uncommon. Spatial ability is considered as an essential of product sketch, which helps designer visualize their initial concept. 3D computer software, virtual reality, has been used for students to observe the details of the every prospect that they can comprehend the visual appearance by all viewing angle. On the other hand, imagination of spatial rotation is also a common way to encourage student to construct unseen prospects through reasoning the observable features. This research is to clarify whether the improvement of sketch skill depends on increased spatial ability and which type of training is better for improving sketch skill.

1 LITERATURE REVIEW

1.1 Creativity

In intelligent structure, divergent thinking has been considered as creativity procedure which consists fluency, variability, originality, elaboration and awareness [1]. Research has shown that designers tend to increase the density of ideas during process of sketch in which they could visualize their own potential concept and pass experience [2]. Creativity could be the process of seeing and thinking and there might be some rules for it.

1.2 Shape styling creativity

[3] classified creativity into divergent, different concept, and convergent, similar concept. Base on this, shapes can be created by transformation of original shape structure such as cube by bending, straightening, thickening, extending, flipping, angle changing, splitting, position changing, component substitution, element cutting, deleting and adding [4].

1.3 Sketch in creation procedure

Sketch is recognized as an important skill after observing designer's eye movement during a concept generation sketch section [5]. Creativity is based on a restructure and combination manoeuvre of what designers has already drawn [6]. Recently, computer tools are purposed to assist designers drawing what they have in mind [7,8]. However, freehand sketch is still the most efficient and intuitive way to progress their creativity. Designers analyse what they've drawn to clarify relationship between elements [9,10] that is believed as the designer's recognition process.
This creation process connects to Van Hiele Model [11] in which the thinking process starts with visualize the concept abstractly using basic geometric shape. Second, they analyse the principle between elements and finally they deduct the form with their idea. Furthering typical spatial visualisation process, styling objects is initiated by rough contour, getting matured through a see-move-see circle [12].

1.4 Creativity evaluation

Creativity can be evaluated in respects of novelty, variety, quality and quantity [13]. [14]'s research counted the number that participants drew rebus puzzles in limited time to represent the creativity value. In addition, the creation should provide with practicality. [15] adopt [1]'s definition of creativity using a 5-level scoring system to assess graphic design quality in respects of fluency, variability, originality, elaboration and awareness.

2 CURRICULUM DEVELOPMENT

In the product sketch classes, students begin with a basic line drawing. Following with learning prospective principle and sketchily sculpturing geometric shape in which students are taught to calculate the ratio and change view angles. A prospective grided cube (Fig 1) is given to student to practice shape styling (Fig 2) for them to experience the real shape creation and explore what they might still unsure in sketch it out.

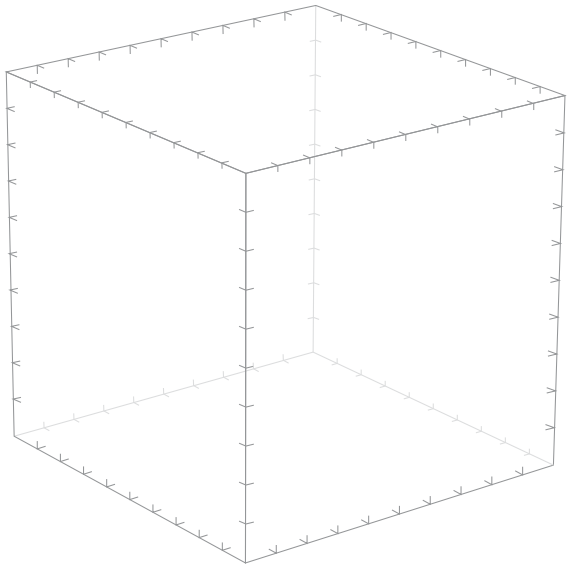

Fig 1 10-scale grided prospective cubical frame

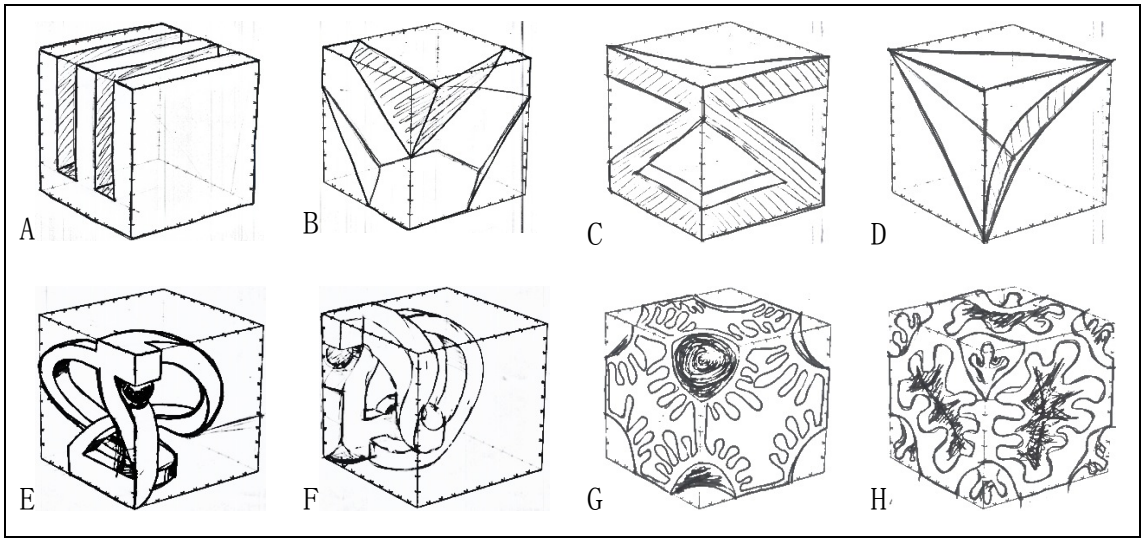

Fig 2 Initial shape styling practice

After the basic skill is taught, this research purpose two different curriculum to stimulate student's creativity in shape styling: real model making and imagination of unseen view angles.

2.1 Real modelling experience (Class A)

The purpose of this section is to emphasis the observation of shape details and appearance in different viewing angle and establishes a real cubical frame in their mind. Class A was taught to style a cube-based model and after that they were asked to realize the model by sculpturing a PU form (Fig. 3) . Students were

encouraged to observe the presentation of features in different prospects during sculpturing the models.

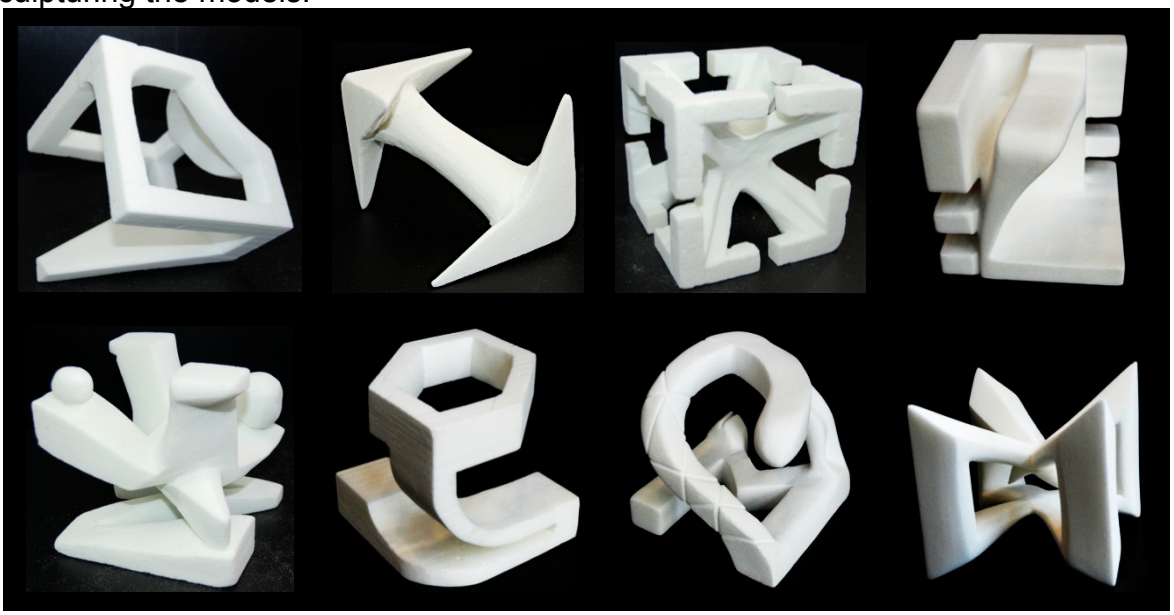

Fig 3 PU form models

2.2 Unseen viewing angle imagination (class B)

Another class (class B) was taught to observe objects and encouraged to sketch out the objects in unseen viewing angles. For example, in Fig 4, students were encouraged to draw from the top after an observation of surrounding of the building.

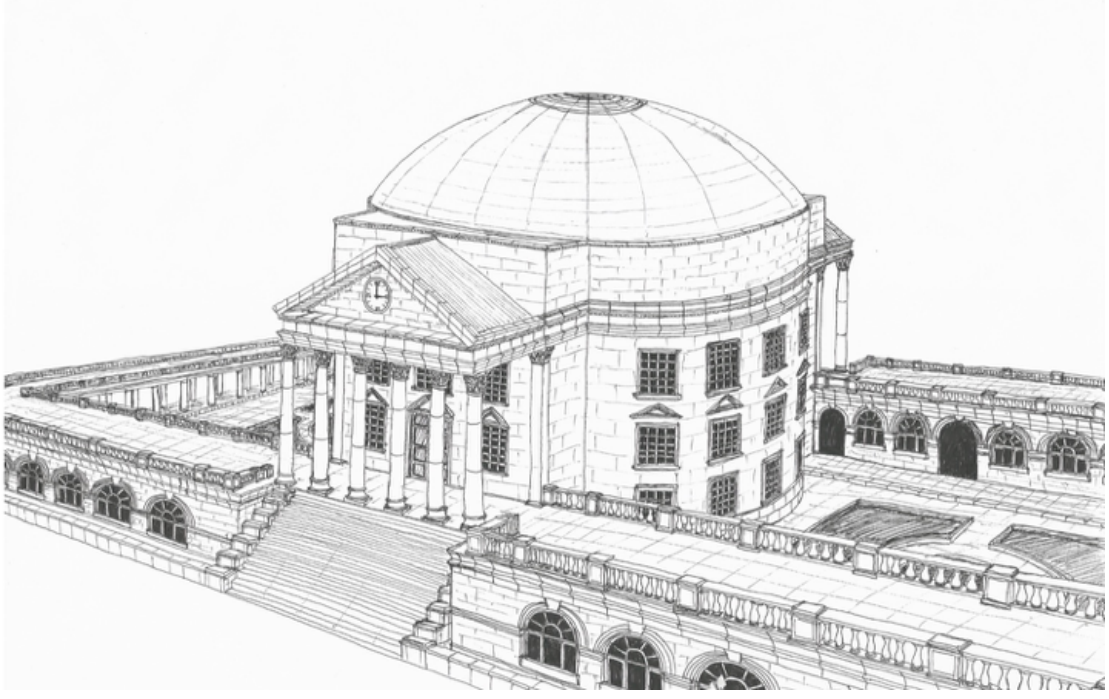

Fig 4 students drawing building from unseen view angle

3 METHOD

Spatial ability tests and cube-based styling tests were conduct before and after the diverted 10 weeks two-hours sketch curriculum (class A and B). The spatial visualization tests consist of 40 questions in aspects such as object rotation and 2d views of 3d shapes. In the cube-based styling test, students were asked to sketch

models they create in their mind on the cube frame (Fig 1). The number of models they drew and the complexity of maneuverer in styling they made were evaluated.

3.1 Subjects

Two product sketch classes of Tatung University for first year product design students were employed to this experiment. 11 female and 12 male, average 18.49 years old, students were in class A whereas 13 female and 11 male, average 18.30 years old students were in class B.

4 RESULTS

The results show that the students generally draw better in fluency and correctness. Students from class B show better spatial ability after different viewing prospect imagination section whereas students from class A shows no better spatial ability after the model making section. Class B students also generate more model variations and slightly more complexity in using outline transformation skills. In conclusion, unseen viewing angle training section improves student's spatial visualization so as performance in creating shapes. Model making section does not seem to help student's spatial ability but sketch creativity. Although spatial ability does not significantly connect to styling creativity, it still makes contribution averagely. In the future, student's creativity performance in their following design class will be evaluated that the impact of this two curriculum maybe clarified.