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Increasing creativity with unusual designs

Merve Hande Ergin[a*], Babak Daneshvar Rouyendegh (Babek Erdebilli)[a]

[a]*Department of Industrial Engineering, Atılım University, Ankara P.O .Box 06836, Turkey*

Abstract

Creativity is important in synthesizing new ideas. For the engineering students, there are different methods to increase the level of creativity. Also, the unusual designs stimulate the students' creativity helping them to think innovatively. The assessment tool CEDA (Creative Engineering Design Assessment) is applied with minor modifications (CEDA-modified) to measure creativity in IE 101 Introduction to Engineering course. The CEDA score is modified by using AHP method to decrease the subjectivity of the assessment criteria. The study is applied to 49 industrial engineering students as an exam question. The question asked requires developing five advantages to an unusual design given. Male students developed more ideas compared to female students when they face with unusual design. More designs may be required to discuss through out the term and a proper term project that requires more design may be submitted to increase the success level.

Keywords: Creativity; Engineering Design; Analytic Hierarchy Process (ANP)

1. Introduction

"…the process of sensing problems or gaps in information, forming ideas of hypotheses, testing and modifying these hypotheses and communicating the results." (Torrance, 1963)

"…the awareness, observation, imagination, conceptualization and rearrangement of existing elements to generate new ideas." (Farid et al, 1993)

"…the capacity to perform mental work that leads to an outcome both novel and applicable" (Pereira, 1999)

Other than these, many other definitions of creativity could be found and defined. Creativity is a necessary ability in today's world. In every item, people try to find something that makes them excited, surprised and happy and then want to have it. While solving any kind of problem, creativity and innovation are the primary points that should be considered to come up with a new product or service. Some of the time the artistic view point is added, a piece of architecture is included, also, psychology and sociology affects the result. Unusual designs, design of an object different from usual or combination of some functionality of another object, attracts customer; such as, an unusual design of a web site, water bottle designed as a dumbbell, architecturally designed shoes.

Creativity can be developed in a medium where the participants feel themselves free (Torrance, 1974) and have enough practice (Ishii&Miwa, 2005; Santamarina, 2002). The unusual designs discussed in the classroom may improve the viewpoint and thinking the way of students for creative and innovative designs. They are a way of to

* Merve Hande Ergin Tel.: +90-312-586-8309; fax: +90-312-586-8090.
E-mail address: mergin@atilim.edu.tr.

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break the barriers in mind (Hyman, 2002) and may come up with a totally different design that has never been thought before.

This study is a creativity research for first year first term students studying at the Department of Industrial Engineering at Atılım University registered to course IE 101 Introduction to Engineering. In the course engineering and engineering design steps are studied. During the semester, different designs are discussed and sometimes requested the students to sketch their own design for a certain problem. The students' creativity, beside these discussions are also tried to be developed with real-world style projects. To measure the success of the design, an unusual design was given in the midterm exam having a 20% of the whole exam. The aim was to evaluate the performance of students when they face with an unusual design. In this study, the performance of student will be measured by CEDA-modified tool which is a modified version of CEDA tool. Beside the overall performance, also the male and female students' performances registered to course are compared.

2. Engineering creativity evaluation

In someway, the development and improvement of the creativity in engineering should be determined. There are different methods studied to enhance the ability of student's engineering design. Some of them are Biographical Inventory of Creative Behaviors (Batey, 2007) to measure the everyday creativity of the participants, Purdue Creativity Test (Lawshe&Harris, 1960) where many possible uses of a designs are provided, Torrance Test for Creative Thinking[1] to assess mental characteristics, Structure of Intellect Model[2] developed to show that creativity is not a natural part of IQ. Also, Creative Engineering Design Assessment (CEDA) (Charyton et al, 2008) is developed to measure creativity in engineering where both divergent (alternative generation) and convergent thinking (problem solving) is measured. CEDA (Charyton et al, 2008) measures fluency and flexibility, originality in a design as criteria. During the assessment, individuals design several objects, indicate the potential users, generate alternative uses of the design and solve the problem for a specific functional goal. The tool asks five design problems having five parts. By this way the formulation and design idea expression is going to be assessed.

2.1. CEDA-modified for unusual design evaluation

ABET requires engineering design involvement in engineering curriculum and need the measurement of success. For IE 101 course, the design viewpoint was going to be measured by an exam question. Due to this, slight modifications with the definition of the criteria is held and named as CEDA-modified. The differences between the CEDA and CEDA-modified are shown in Table 1. For originality, the same definition and grading from 0 to 10 was applied as same as CEDA.

[1] http://www.indiana.edu/~bobweb/Handout/d3.ttct.htm

[2] http://www.cocreativity.com/handouts/guilford.pdf

Table 1. Differences between CEDA and CEDA-modified

Criteria	CEDA	CEDA-modified
Fluency	Amount of ideas	Number of advantages written
Flexibility	Differing types of ideas	Areas of the solution space
Originality	Novelty	Novelty

The weights of the CEDA assessment criteria are modified to decrease the subjectivity of the scoring. Analytic Hierarchy Process (AHP) method is used to determine the criteria weighting.

2.2. Analytic Hierarchy Process (AHP)

The AHP is a general theory of measurement. It is used to derive relative priorities on absolute scale from both discrete and continuous paired comparisons in multilevel hierarchic structures. These comparisons may be taken