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## Effects of Training on Student Creativity: A Comparison of Different Assessments

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Creativity is essential for the long-term success of individuals and nations (Ford & Gioia, 2000). Kim (2011) reported that for the first time in decades creativity has been declining in the USA. Potential consequences of this trend are far-reaching because creativity is essential for every aspect of our lives. It is important to understand whether training might be effective in improving people's creativity. Many researchers have reported creativity increased after training, using only a single assessment (Karpova, Marcketti, & Barker, 2011). No empirical study has investigated creativity changes as a result of training using multiple assessments. In addition, even when creativity for the entire sample increases after training, some individuals might demonstrate a decrease in creativity (Karpova et al., 2011). The purpose of this study was: 1) to evaluate the effectiveness of a training program in increasing participant creativity using several assessments of creativity; 2) to examine changes in creativity after the training for individual participants; and 3) to investigate possible reasons of a decrease in creativity for some participants after the training. Two theories were used to develop a framework for this study: growth mindset theory (Dweck, 2006) and Vygotsky's cultural-historical theory (Moran & John-Steiner, 2003).

Three assessments of creativity were used. The Torrance Test of Creative Thinking (TTCT) is the most widely used assessment of creativity (Torrance, 2008). Self-assessment of creative ability (SACA) is a common and simple way to assess one's creativity (Kaufman, Plucker, & Baer, 2008). Attitude toward risk-taking is one of the most important traits in determining one's creativity (Russ, 1993). To test effectiveness of training, three hypotheses proposed that creativity measured by TTCT and SACA as well as attitude toward risk-taking are higher after training than before the training as measured by the three assessments.

Regression to the mean (RTM) might be used to explain why some participants might report a decreased creativity after training (Barnett, Van der Pols, & Dobson, 2005). RTM occurs when a repeated measurement is taken on the same subjects to collect data and refers to a statistical phenomenon that relatively high (relatively low) values at the first time of measuring tend to decrease (increase) to the true mean in subsequent measures. With RTM effect, participants who received relatively high creativity scores before training are likely to report a decreased creativity after the training at the second time of measurement. Three hypotheses were proposed to test the RTM effect for each of the three creativity assessments.

Data was collected at the beginning and the end of a Creative Thinking and Problem Solving course in a large land-grant Midwest university. The paired data sample size used for the analyses was 40 students. A general linear model of repeated measures was used to compare student creativity at the beginning and at the end of the course, as measured by the three

assessments. Linear regression was used to test hypotheses proposed regression to the mean for each of the three assessments.

The results indicate that after the course students had significantly higher (1) creativity as measured by TTCT ( $F_{(1, 39)} = 7.4, p = .01$ ) and SACA ( $F_{(1, 39)} = 25.22, p < .0001$ ) as well as (2) attitude toward risk-taking ( $F_{(1, 39)} = 14.58, p = .0001$ ). These findings supported the first three hypotheses: student creativity increased after the training as measured by three different assessments. Even though for the whole sample participants' creativity and risk-taking had significantly increased after the training, some students demonstrated a decrease in scores after the training. The results supported all three hypotheses that proposed RTM effect for each of the three assessments: TTCT, SACA, and attitude toward risk-taking. The findings indicate that participants with relatively high (low) creativity scores before the training tend to decrease (increase) creativity after the training, which proved RTM effect.

This research addressed a gap in the literature by employing three different creativity assessments to evaluate effectiveness of a creativity training program: external experts' assessment of creative thinking (TTCT), participant self-assessment of creative ability (SACA), and attitude toward risk-taking. Prior studies employed only one assessment when evaluating effectiveness of a creativity training program. Employing regression the mean, this research, for the first time, offered an explanation why some participants might decrease creativity after completing training when the whole sample demonstrated an increase in creativity. Implications for educators are presented. Research limitations are discussed.

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