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Conveyıng Creatıvıty in Educatıon and Self-Assessments of Creatıvıty

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Abstract
This study is based upon a self-assessment scale administered to 35 pre-service science teachers attending the faculty of education of a university in Turkey, and an open-ended question asked to 16 of them, who were randomly selected. Pre-service science teachers were administered the "Self-assessment of creativity" scale and asked an open-ended question on what they would do, as teachers, to improve their students' levels of creativity. The study aims to examine pre-service science teachers' self-assessments of creativity, and ability to transmit this skill to their pupils.
Keywords: creativity training, education, pre-service teachers

Introduction

Meador (2003) argues that thinking and debating like a scientist is necessary for scientific skills and for creativity, that creative thinking and scientific process skills are intertwined with one another, and that people who practice their scientific process skills have higher levels of scientific creativity. Developing creative thinking abilities is the starting point for developing creativity, because a creative person needs to use their creative thinking abilities to create an original product (Orçan, 2013). Guilford, in the mental model he created, he distinguished convergent thinking from divergent thinking, and underlined the role of divergent thinking in generating critical creative thinking (Lee and Therriault, 2013).

Park (2011) argues that scientific creativity is three-dimensional: creative thinking, scientific knowledge, and scientific research and investigation skills. There are several factors affecting the goals for long-term development of scientific creativity. Among these factors are the science teachers' skills and content-related knowledge, and the quality of the education and development opportunities offered to students at all levels of education (Schmidt, 2010). Educational institutions play an important role in developing the creative skills and abilities of the students, and science education plays the biggest role in improving the quality of creative thinking (Daud, Omar, Turiman, and Osman, 2012). Thus, the present study aims to examine pre-service science teachers' self-assessments of creativity, and their ability to convey this skill to education.

Methodology

This study was conducted by administering a self-assessment scale to 35 pre-service science teachers attending the second year of the faculty of education of a university in Turkey, and asking an open-ended question to 16 of them who were randomly selected. The participants were administered the "Self-assessment of creativity scale". The "How creative are you?" test, developed by Raudsepp, was adapted to Turkish by Sungur (1997). Later, Gülel (2006) had the test examined by linguists for fluency in terms of Turkish language and literature, and found the Cronbach's alpha reliability coefficient to be 0.761. In addition, pre-service science teachers were asked an open-ended question on what they would do, as teachers, to improve their students' levels of creativity.

Results

The findings of the study are reported in two separate tables. Table 1 reports the quantitative data from the scale, and Table 2 reports qualitative data from the open-ended question, in the form of the frequency of codes observed in the answers.

Table 1. Levels of self-assessed creativity

Items of the scale	Strongly disagree	Disagree	In between or don't know	Agree	Strongly agree
S1.It would be a waste of time for me to ask questions if I had no hope of obtaining answers.	54,3	25,7	5,7	8,6	5,7
S2. I occasionally voice opinions in groups that seem to turn some people off.	11,4	34,3	25,7	17,1	11,4
S3. I feel that I may have a special contribution to give to the world.	2,9	17,1	22,9	37,1	20,0
S4. People who seem unsure and uncertain about things lose my respect.	11,4	28,6	11,4	28,6	17,1
S5.On occasion I get overly enthusiastic about things.	8,6	11,4	5,7	42,9	31,4
S6. I rely on intuitive hunches and the feeling of 'rightness' or 'wrongness' when moving toward the solution of a problem.	8,6	11,4	17,1	42,9	20,0
S7. I like hobbies that involve collecting things.	2,9	17,1	11,4	45,7	22,9
S8. If I had to choose from two occupations other than the one that I now have, I would rather be a physician than an explorer.	42,9	17,1	17,1	11,4	11,4
S9. I have a high degree of aesthetic sensitivity.	8,6	11,4	37,1	28,6	11,4
S10. I am much more interested in coming up with new ideas than I am in trying to sell them to others.	8,6	11,4	22,9	42,9	14,3
S11. In evaluating information, the source of it is more important to me than the content.	8,6	14,3	40.0	28,6	8,6
S12. One's own self-respect is much more important than the respect of others.	5,7	11,4	2,9	14,3	65,7
S13. I like work in which I must influence others.	5,7	20,0	25,7	25,7	22,9
S14. People who are willing to entertain 'crackpot' ideas are impractical.	5,7	20,0	51,4	8,6	14,3
S15. When a certain approach to a problem doesn't work, I can quickly reorient my thinking.	2,9	20,0	20,0	42,9	14,3
S16. I am able to more easily change my interests to pursue a job or career than I can change a job to pursue my interests.	8,6	20,0	45,7	11,4	14,3
S17. I can frequently anticipate the solution to my problems.	2,9	17,1	11,4	48,6	20,0
S18. Only fuzzy thinkers resort to metaphors and analogies.	5,7	20,0	60,0	11,4	2,9
S19. I frequently begin work on a problem which I can only dimly sense and not yet express.	5,7	20,0	28,6	20,0	25,7
S20. I feel that hard work is the basic factor in success.	20,0	8,6	14,3	17,1	40,0
S21. I know how to keep my inner impulses in check.	11,4	11,4	8,6	37,1	28,6
S22. I resent things being uncertain and unpredictable.	8,6	31,4	20,0	31,4	8,6
S23. The trouble with many people is that they take things too seriously.	5,7	14,3	22,9	22,9	34,3
S24. I can easily give up immediate gain or comfort to reach the goals I have set.	14,3	8,6	45,7	17,1	14,3
S25. I'm attracted to the mystery of life.	11,4	11,4	8,6	42,9	25,7
S26. I always work with a great deal of certainty that I'm following the correct procedures for solving a particular problem.	8,6	8,6	14,3	40,0	28,6
S27. I believe that a logical step-by-step method is best for solving problems.	11,4	5,7	2,9	51,4	28,6
S28. I spend a great deal of time thinking about what others think of me.	17,1	40,0	22,9	8,6	11,4
S29. It is more important for me to do what I believe to be right than to try to win the approval of others.	2,9	20,0	14,3	31,4	31,4
S30. I am able to stick with difficult problems over extended periods of time.	2,9	17,1	25,7	37,1	17,1

S31. I often get my best ideas when doing nothing in particular.	11,4	20,0	22,9	22,9	22,9
S32. When problem solving, I work faster analyzing the problem and slower when synthesizing the information I've gathered.	11,4	14,3	28,6	31,4	14,3
S33. Daydreaming has provided the impetus for many of my more important projects.	11,4	2,9	17,1	37,1	31,4
S34. I can get along more easily with people if they belong to about the same social and business class as myself.	2,9	25,7	8,6	34,3	28,6
S35. Intuitive hunches are unreliable guides in problem solving.	22,9	28,6	25,7	11,4	11,4
S36. I tend to avoid situations in which I might feel inferior.	17,1	14,3	31,4	28,6	8,6
S37. I like people who follow the rule "business before pleasure".	8,6	17,1	25,7	34,3	14,3
S38. I feel people who strive for perfection are unwise.	14,3	22,9	20,0	28,6	14,3
S39. It is important for me to have a place for everything and everything in its place.	11,4	5,7	8,6	54,3	20,0
S40. I don't like to ask questions that show ignorance.	17,1	25,7	20,0	20,0	17,1
S41. I rather enjoy fooling around with new ideas even if there is no practical payoff.	14,3	14,3	11,4	34,3	25,7
S42.Inability to solve a problem is frequently due to asking the wrong questions.	20,0	5,7	17,1	37,1	20,0
S43. It is a waste of time to analyze one's failures.	60,0	14,3	8,6	11,4	5,7
S44. At times I have so enjoyed the ingenuity of a crook that I hoped he or she would go scot-free.	22,9	11,4	20,0	28,6	17,1
S45. I frequently tend to forget things such as names of people, streets, highways, small towns, etc..	22,9	31,4	14,3	22,9	8,6
S46. To be regarded as a good team member is important to me.	14,3	8,6	8,6	40,0	28,6
S47. I am a thoroughly dependable and responsible person.	14,3	5,7	2,9	45,7	31,4
S48. I prefer to work with others in a team effort rather than solo.	8,6	17,1	31,4	20,0	22,9
S49. I am frequently haunted by my problems and cannot let go of them.	2,9	14,3	8,6	57,1	17,1
S50. If I were a college professor, I would rather teach practical courses than those involving theory.	17,1	2,9	2,9	8,6	68,6

As Table 1 shows, pre-service science teaches typically gave positive answers to the questions, but answers given to some of the items showed inconsistency. Pre-service teachers gave inconsistent answers to the following items, among others: "*I am able to more easily change my interests to pursue a job or career than I can change a job to pursue my interests; I frequently begin work on a problem which I can only dimly sense and not yet express; I know how to keep my inner impulses in check; I resent things being uncertain and unpredictable; I tend to avoid situations in which I might feel inferior; I don't like to ask questions that show ignorance;* and *I prefer to work with others in a team effort rather than solo*".

Table 2. Conveying creativity in education

Codes	**N**
Laboratory/Conducting experiments	6
Connecting with daily life	4
Teaching by doing and by living	3
I would have them prepare projects	2
I would avoid rote learning	2
I would help them understand nature	2
I would have them conduct research	2
I would use visuals	2
Other (total)	12

As Table 2 shows, the methods most preferred by pre-service science teachers to teach creativity to their students are "laboratory/conducting experiments", "connecting with daily life", and "teaching by doing and by living".

Conclusion and Discussion

Experts agree that thinking skills can be taught to students at all levels of education, in line with their abilities and levels of intelligence (Özden, 2011). According to Meyer and Lederman (2013), creativity forms the basis of scientific knowledge. Scientific creativity can be described as the scientific point of view employed to solve

problems and meet needs that are required for survival (Demir, 2014).

Studies on creativity and science education show that activities and techniques developed to improve creative thinking skills are effective in improving creativity (Orçan, 2013). The conclusion that the use of proper educational environments, materials and methods can improve creativity is one shared by many studies conducted in different parts of the world (Orhon, 2011). Science/technology/society activities conducted with research and investigation methods lead to higher levels of creativity (Barrow, 2010). Similarly, hands-on experiments, problem solving, class discussions, and cooperative work offer great opportunities for improving creative thinking and acting skills (Kar, 2015). The present study found that pre-service science teachers could think of only a few methods to improve creativity in their students, and were undecided about many items in the self-assessed creativity scale. It has been argued that science classes help develop creativity, and including scientific creativity in the lesson plans for science, would help prepare students for the future (Kind and Kind, 2007). Another relevant finding in the literature is that teaching practices based on creative thinking have a big impact on the scientific creativity and scientific process skills of students (Kurtuluş, 2012). For all these reasons, it can be argued that more emphasis needs to be placed on creativity training.

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