

An Evaluative Study of Teacher Creativity, the Heuristic Diagnostic Teaching Process and Student Mathematics Performance

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Studies show that teachers may not identify creative children (Dawson, 1997, Reisman & Bach, 2000). This may be due to a lack of teacher knowledge about the creative characteristics. Many times, the creative child is not the one that has been identified as creative, but rather the one that has been identified as defiant, and has fallen out of favor with the teacher due to some behavioral issues (Dawson, 1997). Research shows that teachers often predict only verbal creativity marked by a certain set of characteristics, such as hearing a child speaking descriptively or expressing many ideas verbally, while overlooking another set of characteristics that predict figural creativity such as seeing a child invent elaborate and original ideas through illustration. Figural creativity has been found to be a hidden strength among academic underachievers who are typically minorities from low socioeconomic backgrounds (Reisman & Bach, 2000). This study will investigate the relationship between teachers' figural creativity, as measured by the Torrance Tests of Creative Thinking, and their ability to identify student creative characteristics.

Torrance's (2000) findings suggest that adult creativity can be predicted in childhood, but if teachers are not identifying creative strengths in students, then those strengths may never be realized. According to Reisman (2000), when looking at student mathematics performance using the Heuristic Diagnostic Teaching process (HDT), one should obtain a diverse "triangulation of evidence" and creativity measures help to explain mathematics performance. The Heuristic Diagnostic Teaching Process is unique in its approach to identify strengths and weaknesses in a student's mathematics ability through assessment, as well as to hypothesize about identified gaps. This model is unique because during the hypothesis stage the teacher engages in a process that, like brainstorming, considers all possibilities for mathematics weaknesses, including family background, socioeconomic, etc.

This study will investigate the role of the teacher's figural creativity in the identification process of creative characteristics, and look at the relationship between teacher use of the HDT process and student mathematics performance and how that relates to teacher identification of student generic influences on learning and creative characteristics.

Research Questions

1. Is there a relationship between teacher figural creativity and identification of student creative characteristics?
2. Is there a relationship between teachers who report to use HDT strategies and their students' mathematics content knowledge?

3. Is there a relationship between teachers who report to use HDT strategies and those who identify student Generic Influences on Learning?
4. Is there a relationship between teachers who report to use HDT strategies and those who identify Creative Characteristics?

Significance of the Study-HDT Identification of Creative Abilities

According to Feist (1999), creativity is often determined by a set of characteristics. Traditional characteristics, such as artistic personality, daydreamer, and withdrawn, may lead to misconceptions, especially in the classroom setting. There is an emerging view that there is one specific profile that can be applied to a creative artist, and another profile that fits the creative scientist who is much more conscientious and orderly (Feist, 2000). The creative scientist would be less likely to exhibit qualities associated with the creative artist such as lack of focus, disorganization, and not paying attention to time (Feist, 2000). Although themes emerge, characteristics and intricate profiles that can even refer to "dual roles," "withdrawn yet outgoing personalities" (McMullan, 1975) can lead to confusion as to who is creative. The characteristics of whom and what is creative continue to evolve.

Oddly, teachers' perceptions of creative children and their characteristics do not tend to match what research has found to be the actual characteristics of creative children. Teachers often consider characteristics such as sincere and responsible as those indicating creativity in students (Dawson, 1997). On the other hand, parents tend to identify their children as creative based on the characteristics such as disorganized, artistic, orderly, not concerned with rules, and daydreamer; characteristics that are more in line with the current research (Dawson, 1997; Runco, 1989). Many times, the creative child is not the one that has been identified as creative, but rather the one that has been identified as defiant, and has fallen out of favor with the teacher due to some behavioral issues (Dawson, 1997.) Teachers do have success at predicting verbal creativity but not figural (Dawson, V.L., D'Andrea, T., Affinito, R., & Westby, E.L, 1995). Verbal creativity is an ability to think metaphorically, conceptually, and to make associations whereas figural creativity is represented by picture construction (Torrance, 2000). Both types of creativity strive to be original and represent flexible thinking (Torrance, 2000). Figural creativity has been found to be a hidden strength among academic underachievers who are typically minorities from low socioeconomic backgrounds (Reisman & Bach, 2000). This has created a need for a closer look at the teacher's identification of the creative abilities in children in order to maximize all students' future creative contributions.

This study will evaluate whether there is a relationship between teachers figural creativity and how they identify student creative characteristics. This study is relevant because creative students are not being identified in classrooms (Dawson, 1997, Reisman and Bach, 2000). This may have an affect on one's adult creative productivity, because Torrance (2000) shows a significant correlation in creativity identified in high school and continued creative production during adulthood. This study will look at the relationship between teacher use of the HDT process and the identification of other observable

characteristics, namely the generic influences on learning, creative characteristics, as well as student mathematics achievement. The analysis of the HDT process is relevant to creativity because the process may have practical applications for the identification of creative characteristics by investigating the relationship between teacher use of the HDT process and the identification of other observable characteristics, namely the Generic Influences on Learning. Personal characteristics can be related to one's creative abilities similar to the generic influences role in mathematics ability (Reisman & Payne, 1987). The study will investigate the figural creativity of teachers, use of the HDT process, which involves divergent thinking at the hypothesis stage of the process, (Reisman, 1982) and how this affects student mathematics outcomes.

Significance of the Study-HDT Mathematics Outcomes

Teachers who use the HDT process gather data from assessment scores in mathematics performance and creative thinking (Reisman, 2000). It involves the identification of mathematics strengths and weaknesses, where the teacher thinks divergently to hypothesize about all of the reasons for the mathematics performance of the child. It is more the norm for teachers to think convergently. In a school setting, the Heuristic Diagnostic Teaching process seeks to treat the students in a class as individuals with individual needs, not as a group with non-varying needs (Solomon, 1999). The HDT process also focuses on observable characteristics, that is generic influences and creative characteristics, and not on inferences or traditional labels given to children. The observable characteristics, called the Generic Influences on Learning, have four major categories: cognitive influences, psychomotor influences, physical and sensory factors, and social factors and emotional factors (Reisman & Payne, 1987). If a relationship is found among the HDT process and student mathematics performance, then this study is relevant because the process may be used to improve mathematics instruction and performance.

Methods

In this study, teacher figural creativity assessments (TTCT) will provide research on the possible relationship between figural creative strengths in teachers and the creative characteristics that they identify in students. By analyzing teacher self-reports through factor analysis, the use of the Heuristic Diagnostic Teaching (HDT) process in teacher classrooms as related to student mathematics scores and identification of creative characteristics and student Generic Influences on Learning will be investigated.

The observing supervisors at the school will be interviewed in regard to school climate and values to see if HDT strategies and creativity are encouraged at this school. This will provide information on current educational practices that are being used in the school or reinforced in professional development activities. Content knowledge is an important factor in the HDT process. Teachers will indicate the level of mathematics coursework

that they have attained which directly affects student mathematics performance (Reisman, 1993).

The participants in this study are consenting teachers in an urban West Philadelphia School. Teachers will be given the Torrance Tests of Creative Thinking (Figural) and the HDT Self-Report during their professional development. The student assessment to be analyzed during two 6-week intervals is the Philadelphia Benchmark Assessment Test (PBAT).

Results

Data for this research project will be collected in April 2004 and analyzed during the Spring 2004.