The Identification of Creative Abilities among Underprivileged Students

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Abstract

This article examined the impact of giftedness on the creative ability of young students. More specifically, it explored factors influencing the identification of gifted (those with superior IQs from 120 and above) from economically and culturally diverse backgrounds. The current research literature points to this pool of student as the most likely to carry the characteristics needed for creativity. Creative ability is an essential component to the resolution of problems related to everyday life and the workplace productivity in the 21st century global context. Resolution of problems is discussed as an effort to overcoming barriers by bridging gaps between status quo and desired state. This article explored alternative models for identifying disadvantaged students with the highest potential for creativity. Findings of the relevant literature indicated the need for revised educational policies to include culturally sensitive and comprehensive identification models less driven by standardized tests.

Keywords: creative ability, gifted, identification, factors, underprivileged

Introduction

This article discusses factors influencing the identification of students from economically and culturally diverse backgrounds with the highest potential for creative abilities. A particular focus was placed on the identification of gifted (those with superior IQs from 120 and above) as several researchers (Gardner, 1999; Gilford, 1950; Hall & Hord, 1987, 2001; Runco, 2008; Sternberg, 1985, 1986, 2006b, 2007; Torrance, 2008) indicated that this segment of the student population was the most likely to bear characteristics required for creativity. The relevant literature refers to such characteristics as: intelligence, knowledge, thinking style, personality and self-motivation. Intelligence is defined by the ability to apply creative problem solving skills and to think critically. Knowledge is required for creativity as it provides direction to the problem solving process while preventing the rediscovery of known solutions. The resolution of problems is addressed in this article as an effort of bridging gaps between status quo and desired state. In the process of closing this gap, problem solving involves removing obstacles (Runco, 2008; Treffinger, 2009; Torrance, 2008).

Moreover, creative thinking which the catalyst for creative ability is viewed as the process by which an individual or a group enables the production of novel and original solutions. Many researchers and scholars (Amabile, Conti, Coon, Lazenby, & Heron 1996; Baumol, 2005; Stewart, 2006) consider higher levels of creative thinking to be the most essential ingredient to enable innovation, which leads to problem resolutions, originality, productivity and maximization of project outcomes. Creative people have a common thinking style that is comprehensive and driven by the motivation to embrace challenges and discover original pathways to reach desired results. The willingness to persevere and the self confidence to leave the status quo behind are often characteristics found among creative people.

Review of Related Literature

A significant correlation between giftedness and creative skills is well established in the current research study literature. In fact, a research study conducted by Freeman (2008) using a quantitative research design examined the impact of giftedness on the creative skills of young students. Data for experimental and control groups were analyzed across six groups. The means of the experimental groups exceeded the means of the control group and the results of the tests were statistically significant at the $p<.05$ level. Statistical findings indicated that the main differences between the gifted learner and the traditional learner are: a) the ability to learn at a faster rate, b) the ability to find, act on and solve problems more easily, and c) the ability to manipulate abstract ideas and make connections. Another research study conducted by Jensen, (2007) using a confirmatory factor analysis (CFA) showed that giftedness explained 74% of the variance in creative ability. The psychometric literature indicates that creative thinking and creative performance have high construct validity when describing giftedness, which has lead many researchers (Sternberg, 2007; Tierney & Farmer, 2002; Tolan, 1999, to name a few) to conclude that giftedness, predicts creativity. Thus, identification of giftedness and creative abilities will be discussed interchangeably.

It is abundantly evident in the extant research study literature that gifted students learn more rapidly and in greater depth than their age peers; they comprehend complex ideas quickly, and draw generalizations about seemingly unconnected concepts, and ask provocative questions. The gifted are markedly different intellectually, more athletic, more musical, and often more artistic than others. Gifted students learn new material at a much faster pace with greater information retention than others, perceive ideas and concepts at more abstract levels than others do, are keenly interested in specific topics and want to stay focused on a topic until they feel satisfied that they have reached the saturation level, and are able to multitask. GTs learn two or more years' worth of math in one year, build science laboratories in the basements of their homes and use sophisticated words to express their thoughts (Amrein & Berliner, 2002; Runco, 2008; Treffinger, 2009). Thus, GTs from diverse backgrounds need access to develop creative skills as they yield faster and greater returns on investments.

Statement of the Problem

As the demographic landscape of America is rapidly shifting, the resurgence of multiculturalism is causing significant changes in the student populations. The demand for higher levels of multicultural competence among educators is greater than ever. In the next two decades, the White/Caucasian student population is expected to show a slight increase in size, while culturally and linguistically diverse students are expected to more than double in population size. Demographers project that 80% of the immigrant student populations will settle in highly populated urban centers. While this demographic shift among the student population continues to occur at a rapid rate, public schools continue to fail to adequately address the needs of economically and culturally diverse gifted students, which perpetuates the under-representation of less fortunate students in gifted programs (Huntington, 2004; Takaki, 2002).

The increased migratory incursion has resulted in a greater influx of socioeconomically disadvantaged and culturally diverse students from first to 12th grade. Unfortunately, indicators such as grades, student discipline, attendance, college acceptance, dropout rates, and standardized test scores have confirmed that the academic process has not worked well for many students from economically disadvantaged and culturally diverse background. Many gifted students lack access to programs comprised of 21st century instructional strategies and multicultural assessment tools essential to digital-age proficiencies with a particular focus on diverse population (Freeman, 2006).

The perpetuation of under-representation of economically disadvantaged and culturally diverse students in gifted programs contributes to deferred aspirations and missed opportunities, which could have been used to fulfill their infinite human potential (Freire (1968). Gifted identification process follows an oppressive model by continuing to use the same selection procedures that forfeit the academic empowerment of culturally diverse and/or economically disadvantaged individuals. The current educational enterprise is unintentionally perpetuating pedagogy of oppression by maintaining a static set of educational policies and practices. As a result, a disproportionate number of economically disadvantaged and/or culturally diverse students are never identified or drop out of gifted programs across the nation. By maintaining the standardized processes of identification and selection for gifted programs, the status quo of middle/upper-class white composition is reinforced, which can be interpreted as a form of oppression.

Often, the oppressed tend to blindly follow those who lead, with no resistance to the oppressor, stemming from a desensitization process fostered by generations of 'We have always done it this way'. Oppression, however, should not be the norm, and we must react with indignation and resistance, in the hope to find a better path to build a better educational system. Thus, this article examined factors related to traditional educational models as drivers of existing socioeconomic power structures and inequality while exploring alternative models that allow the economically and/or culturally "oppressed" gifted to rise above their oppression and reach their infinite human potential.

Historical framework

The dawn of contemporary research into motivation for creative expression was signaled by a speech delivered by Guilford's (1950) during his APA Presidential address. Guilford's speech was spotlighted by the denunciation that the field of creativity had been neglected, and that creativity was an area in which researchers feared to tread. Since Guilford's speech, a significant amount of empirical research into creativity has been added to the scientific body of knowledge, perhaps as a response to Guilford's criticism of the appalling neglect of this phenomenon by the scientific community. Guilford's speech is generally viewed as the foundation of much contemporary research on alternative curriculum models, particularly on gifted and talented students.

The enterprise of gifted and talented education dates back from the time of Plato (427–347 BCE) throughout the renaissance and colonial America. The design and implementation of this enterprise has been driven by the political and socioeconomic climate prevalent at different times. The first schools encouraging creativity, which included different educational models, special curricula and services for advanced or high-ability students, began with educational pioneers such as Benjamin Franklin, Lewis Terman and Leta Hollingworth. Benjamin Franklin was the first statesman to challenge the traditional school pattern. His effort toward the development of gifted and talented programs resulted in The Franklin Academy, which was the first American school to offer no traditional classes in mathematics, astronomy, athletics, navigation, dramatics and bookkeeping. Nevertheless, schools for the talented and gifted continued to follow the European traditional curriculum throughout the 18th and 19th centuries (Hayes, 2006).

At the middle of the 20th century, however, educators like Lewis and Terman Leta Hollingworth revolutionized the enterprise of non-traditional education. Lewis Terman was the publisher of the Stanford-Binet Intelligence Scale (a cognitive processing test) and author of the study, Genetic Studies of Genius. Leta Hollingworth was the founder of the Special Opportunity Class for gifted students in New York City. They spearheaded the movement of gifted education by introducing data driven innovative ideas to meet the needs of talented learners. Lewis Terman and Leta Hollingworth conducted some of the first widely published research studies on creative education. These educators introduced innovative ideas and advancements in the field of education by challenging traditional educational models while seeking better ways to prepare youngsters for the job market. They focused on the development of curricula encouraging creativity centered on action, experience and learning by doing.

More attention was given to the enterprise of gifted education in the early 1980s when a published national report entitled *A Nation at Risk* revealed that schools are consistently failing to provide opportunities for top students to realize their potential. The Nation at Risk report spotlighted the fact that scores of America's brightest students failed to compete with their international counterparts. Tomorrow's scientists, engineers, artists, writers, business leaders, politicians and etc. are being lost due to undeveloped potential of high achievers and gifted students. Through the enterprise of education, creative abilities must be nurtured and increased to create individuals able to function intellectually and productively in society. The ability to compete in a global economy, however, requires not only excellence in intellect and productivity, but also the ability to recognize talent and giftedness in human capital particularly among nations that strive to lead in the globe market. Some of the procedures currently used to recognize giftedness will be discussed next.

Measurement Procedures Influencing Identification of Gifted Students

A plethora of opinions exist on how creative ability should be measured to determine the selection of students with the highest potential for creativity. Intelligence tests have been the common method used to identify and enroll these gifted students into special programs. Since intelligence assessment tools have been the best predictors of academic achievement, it is just plausible to believe that the top 3 to 5 percent best performing students should be selected as gifted. It has been argued throughout the literature, however, that this method alone is insufficient to capture the known dimensions of creativity leading to the exclusion of too many gifted students from purpose driven programs (Abbott, 2010a).

In 1982, a National Report on Identification: Assessment and Recommendations for Comprehensive Identification of Gifted and Talented Youth was conducted leading to the development of a more comprehensive, multi means identification process. Multiple means involve multiple types of information, multiple sources of information, and multiple time periods. The multiple types of information include a student's cognitive abilities, academic achievement, performance in a variety of interests, creativity, motivation, learning characteristics and behaviors (Whiting, 2006). The multiple sources of information include test scores, grades, creativity tests, recommendations from teachers, educators, community members and self report. The multiple time periods ensure that students are not overlooked and are observed year after year for possible eligibility. Traditionally, identification methods are comprised of three phases, which include ongoing assessment for students to be identified as their needs are recognized. The three phases in this process are selecting students, screening students for eligibility and enrolling students who are eligible for gifted services (Cloud, 2007; Treffinger, 2009).

In spite of the existing multi mean and detailed methods of gifted student identification, the process needs more improvement in order to effectively and equitably select and enroll creative students into gifted programs. The current methods of selection, screening and enrolment of students into gifted programs are to a great deal based upon the results of standardized intelligence tests, which reflect an inadequate process. This has been the argument of many researchers who point out that the IQ test is multifaceted and the standardized test is not a valid measurement of intelligence or academic potential. This has compounded inequalities in the educational systems for the reason that it systematically narrows the accessibility to learning resources for gifted students, particularly those from low income and culturally diverse background (Tomlinson, Brimijoin & Navarez; 2008).

Understanding the complexities of creative potentials while developing culturally sensitive identification models for gifted learners has become one of the greatest challenges in special education. Although some of the federal mandates speak to the boundaries and expectations concerning curriculum design and implementation of general and special education, the faulty arrangements of gifted programs are not addressed. As a result, identification services provided under the gifted umbrella continue to reflect an underrepresentation of low income and culturally disadvantaged students being served. In the mean time, a whole generation of students with strong creative potential are been left behind doomed to boringness, drop out and functional illiteracy (Tomlinson, 2008). In fact, the discussions about appropriate identification models and adequate curriculum to address the needs of creative students are exacerbated by the awareness that many economically and culturally diverse gifted students are being misidentified and excluded from special programs (Cloud, 2007; Naglieri & Ford, 2005).

The National Center for Education Statistics (2009) reports the use of IQ based assessments for entrance into special programs has negatively impacted the enrollment of low income and culturally underrepresented students. When testing is used as an exclusive measure of creative ability, low income and culturally diverse students are often misidentified as they tend to score lower than their peers. It is noteworthy, however, that the low enrollment rate of economically and culturally diverse students in gifted programs is the result of a faulty referral process, limitations of culturally competent identification tools, lower levels of multi culturally competence among educators, institutional practices and biases. Creative ability is manifested differently among groups that are culturally different from dominant groups and these differences are not always recognized within mainstream schools. The high reliance on IQ testing as the gateway to gifted programs will perpetuate the misidentification of creative students, particularly among the low income and culturally diverse segment of the gifted student population.

Another factor that exacerbates the problem of misidentification and admission of creative students into gifted programs is the lack of standardized policy defining how creative ability should be measured to determine giftedness. Educational policies, however, must be culturally sensitive, comprehensive and less driven by standardized tests or the notion that one size fits all. For instance, the No Child Left Behind Act of 2000 (NCLB) prescribed a significant increase of standardized tests while correlating giftedness with proficiency in English language, arts and mathematics. This increase in standardized testing has undermined the process of fairly and inclusively selecting students with the highest potential for creative thinking. The design of standardized tests underlining memorization of facts and less critical thinking skills results in this detriment (Cloud, 2007; Hayes, 2006). Currently, each state has the authority to define acceptable identification methods of how students are selected and develop their own assessment tools to determine how students are served within special education programs.

The lack of federal policy has left the specifics of each gifted program to be defined by individual states, which causes statistical problems in making strict comparisons between what has been taught and what is being measured. A reconfiguration of the current educational enterprise with a special focus on standardization of selection, admission and services will open the gates of programs designed to exercise creative skills to students of economically and culturally diverse backgrounds (Naglieri & Ford, 2005; Tomlinson, Brimijoin & Navarez, 2008).

Socioeconomic Factors Influencing Identification of Gifted Students

Children from all walks of life begin school eager to engage on a lifelong academic journey. Many of these children have never used a computer, eaten at a restaurant, been inside of an elevator, a mall, a bus or a zoo. These children come to school excited to learn, but they lack the social and / or technological experiences of their peers who have been raised with greater access to main stream resources. Subsequently, it is difficult to identify gifted children from these backgrounds due to their poor performance on standardized norm-reference tests. The cry for improvement on the identification process of gifted and creative students is deafening.

On the other hand, it is very difficult to distinguish between truly gifted children and children whose background has been so enriched that they score extremely well on norm-referenced tests. This faulty arrangement in the identification of giftedness exacerbates the need for data driven policy formulation targeting a more comprehensive and effective selection process of students with great possibilities for creativity. Friedrich Frobel, the inventor of kindergarten, stated that, "The young, growing human being should be trained early for outer work, for creative and productive activities" (Dewey & Dewey, 1915; p. 106). The emerging concern about effective identification process seems to be triggered by the underrepresentation of low income and culturally disadvantaged students in programs designed to be a cross section of all races, income levels, ethnic groups and cultures. Some progress has been made in recognizing the problem regarding the development of policies and practice targeting the increase of effectiveness of the identification process for creative abilities. Nevertheless, the problem of underrepresentation across all subgroups enrolled in gifted programs still continues while triggering questions of fairness and discrimination, pleading to be addressed. In fact, Rycraft (1991) classifies these groups of individuals as having the "greatest wasted talent" (p. 141).

Descriptive data from the National Research Council (2007) indicates that affluent Anglo Americans students are more likely to be enrolled in gifted and talented programs in the United States public schools than culturally diverse students (African American or Hispanic) and/or students of economically disadvantaged backgrounds (which includes African American, Hispanic, and White children living in poverty). Unfortunately, only 8% of Hispanic and African American students are enrolled in gifted programs across the country. That percentage drops to approximately 3% for low-income students of Hispanic and African American backgrounds. Although the number of Hispanic, African American and economically disadvantaged students continue to grow in the general population their enrolment in gifted programs lags behind.

Although 50% of the student population fit the criteria of low income, only 28% of students enrolled in gifted programs come from low income families. It is obvious that not all children from culturally diverse backgrounds come from low income families. Hispanics and African Americans, however, have disproportionately large numbers among the economically disadvantaged segment of the population. Thus, it is plausible to think that the higher incidence of poverty among culturally diverse families has a significant correlation to the gross under-representation of economically disadvantaged students in gifted programs (Treffinger, 2009; Whiting, 2006; Bailey, 2006).

Furthermore, the label of being gifted does not always generate positive responses particularly among socioeconomically disadvantaged youth where gifted students are often seen as members of an elitist class. As a result, many low income and culturally underrepresented members choose not to participate in gifted programs in an effort to avoid negative feedback from their peers. Students from low income and culturally underrepresented background who choose to be enrolled in special education programs often find themselves alienated as they do not fit the profile of the dominant class. Subsequently, economically disadvantaged students enrolled in special programs often are forced to make a choice between social acceptance and academic achievement. When students are faced with this type of decision, social acceptance is often the chosen path. Unfortunately, these economically disadvantaged students have generational experiences of being robbed from services and goods in society due to stigmas based on environmental deficits upon which they have no control (Freeman, 2006; Pannells & Claxton, 2008).

Cultural Factors Influencing Identification of Gifted Students

Giftedness is manifested in different forms and may be masked due to cultural influences. The frame of reference of culturally diverse students may differ markedly from the norm and their cultural experiences may temper the emergence of traditional "gifted" characteristics. The concern with misidentification of creative potential among students from culturally diverse background is spotlighted by an inadequate identification and provision of services in areas of giftedness that society recognizes and rewards. Different societies encourage the development of certain talents that fall in alignment with their pattern of values and believe, otherwise known as culture. Gifted students from linguistically and culturally diverse backgrounds come from cultures that also value special talents. Unfortunately, however, these special talents are not always recognized by the dominant culture. It is noteworthy, no one cultural group has specific areas of talent reserved or allotted to them. More importantly, there is strength in diversity as evidenced in the natural environment (Milner & Ford, 2007; Naglieri & Ford, 2005).

Gifted students from culturally diverse backgrounds can help to enrich the educational experience of particular contexts due to their unique cultural experiences. The characteristics used to identify creative students among members of the dominant culture often are not manifested in the same manner among culturally diverse populations. As a result, students from culturally diverse backgrounds with great potential for creativity and innovation are frequently misidentified and robbed from the opportunity to be stretched cognitively. If the mind of these hidden treasures could benefit from the opportunity to be stretched they would never regain their original dimensions, instead, they would be empowered to fulfill their creative potential, dreams and aspirations (Naglieri, & Ford, 2005).

Furthermore, consideration of the cultural context in which a child develops can provide important insights regarding specific external and internal assets correlated to creative potential. The cultural context gives students a "cultural lens" through which they see the world. The lens informs their successes, challenges, goals, and needs. What a contribution we could make to society if we could increase the empowerment of creative expression while stretching gifted minds to embrace truly great and innovative ideas targeting the resolution of problems and the betterment of mankind!

Implications for Educational Policy and Practice

A review of the research literature revealed the prevailing themes that provided contextual information about factors associated with creativity discussed in this article. Providing equitable identification to students with strong capacity for creativity, originality and innovation is an increasing concern of the educational enterprise here in the United States. Even those of us not directly involved in the identification and services of gifted students must produce new ideas in order to move the field of creative education forward. We must shake up our thinking patterns regarding the inclusion of underrepresented gifted students into special programs by searching for creative potential among students who may not exhibit their gifts in the same manner as students from middle or upper class backgrounds (Runco, 2008; Milner & Ford, 2007).

As the educational enterprise strive to provide a continuum of learning opportunities, the following core strategies need to be at the forefront of policies addressing the identification gap of economically and culturally diverse creative learners:

- Inclusion of parents and community in determining the strongest indicator variables to explain the variance of creativity in all socioeconomic contexts.
- Careful validity / reliability analysis of assessment tools designed to measure creative potential in a pluralistic socioeconomic context.
- The use of multiple methodological approach and criteria for assessing creative potential among diverse populations including portfolios of experiences and achievements.
- Teachers / staff development targeting the identification of culturally diverse and/or economically disadvantaged students for special programs designed to exercise creative skills.

Additionally, these strategies must target the reduction of test bias by including culturally sensitive observation of suspected gifted student. This type of systematic observation can be done by teachers trained on the selection of students from underrepresented populations through staff development workshops (Treffinger, 2009). Multicultural competent teachers are able to observe pools of students who are identified as potentially creative individuals who may not score exceptionally high on standardized tests.

Teachers must be able to recognize what Glaser and Ross (1970) called "creative behavior." Look for the child who has a strong sense of self, pride, and worth; the child with an independent mind; the child who resists peer pressure and other typical negative social conditioning; the child who, on occasion, resists the teacher. Look for the child who, at critical points in his or her development, is prone to asking questions such as "Who am I?" or "Where am I going?" Look for children who believe that their self-determination, creativity, and hard work will pay off in the future. Look for children who can channel their anger at being disadvantaged into strategic action to change the situation for themselves and others around them. Clearly, such characteristics, attributes, and behaviors are not absolute in the sense that every gifted child always exhibits every one of them in the same manner. Rather, they are attributes ascribed to children identified as creative. An apparent implication is that the search for better identification procedures for culturally diverse and economically disadvantaged gifted children focuses on ways of recognizing the specific behaviors or manifestations of these attributes in various cultural, contextual, and environmental settings (Runco, 2008; Hayes, 2006).

The utilization of alternate methods to identify creative potential in students of diverse backgrounds has been in consideration since Gardner's theory of multiple intelligences. Nevertheless, these alternate assessment methods are still driven by language skills significantly impacting problem solving performance and demonstration of creative thinking. These types of monocultural measurement method to identify creative potential in students of socioeconomic diverse backgrounds can be improved with the inclusion of resources of a specific educational domain to test creativity expression through non-language stimuli (Rex, 2006; Pannells & Claxton, 2008).

Furthermore, these strategies ought to involve assessment of creative potential including language and non-language activities featuring closed- and open-ended problem solving. Although the implementation of these core creative identification strategies and related activities require additional staff development, it is a step forward in decreasing the underrepresentation of students with creative potential from economic and culturally diverse groups. Quantitative and qualitative assessments should be an ongoing process in the identification and selection procedures of gifted students.

In working with low income and culturally diverse students, the Wechsler Intelligence Scale for Children, Cartoon Conservation Scale, Torrance Tests of Creative Thinking and the System of Multicultural Pluralistic Assessment could be suitable instruments to effectively identify giftedness and assess academic achievement. Although there are other effective alternatives developed for assessing creative potential, what matters the most is to continuously update and satisfactorily validate measurement tools as the paradigm to qualify creative students continues to shift (Naglieri, & Ford, 2005).

At any rate, it is paramount to continue investing heavily in education while raising academic standards; researching predictors of high academic performance, supporting a multi-faceted view of giftedness and providing appropriate curriculum with a particular focus on gifted students. Alternative curriculum models must encourage teachers to develop and incorporate strategies targeting the development of critical thinking, creative thinking, and problem-solving skills using multicultural assessment tools with a particular emphasis on diverse population. The world cannot, by any means, afford to retreat from providing access to educational excellence to creative learners in difficult economic times. All the efforts made to revise and develop gifted identification policies to narrow the underrepresentation gap of economically and culturally diverse student in special programs should be done in light of the fact that 21st century jobs now require 21st century skills. An educated workforce including highly equipped creative learners is so intimately connected to economic prosperity, social development and the reduction of oppression (Prabhu, Sutton & Sauser, 2008; Tomlinson, Brimijoin & Navarez, 2008).

Since oppression is explained by Freire (1994) as the lack of resources to meet the individual's basic needs, the access to resources through awareness of creative potential and access to a purpose driven education transforms pedagogy of indignation into pedagogy of hope. As individuals become aware of their creative and innovative potential, they seek resources to exhibit those gifts, allowing them to experience upward mobility, rise above oppression and reach their full potential. When gifted students from low income and culturally diverse backgrounds are cognitively empowered and liberated from the oppression perpetuated by constrains of traditional education, pedagogy ceases to belong to the oppressors and becomes pedagogy for all people.

Conclusion and Final Thoughts

With apologies to Guilford (1950) who saw the future with a high degree of lucidity, the following is a summary of a portion of his APA presidential speech as an attempt to finish this chapter with the final thought:

Much is being said these days about the new technologies and their impact on education. Considering the rapid technological advances driving the current digital revolution, it is plausible to think that much of the creative thinking currently infused in education and instruction could soon be replaced by automated performances of sophisticated new technological devises. At the heart of the current struggle between the educational industry and its presumable consumers is the infinite technological advantages new computer related products offer as result of the revolution. The transformative effect of these technological devises, however, could result in a steep decline in the creative power of the human brain. Eventually, about the only educational or instructional value of brains left would be the latent abilities of creative thinking and creative performance (Guilford, 1950). Subsequently, the following line of inquiry should be articulated: How can revised curriculum design adapt to the new technology paradigm while increasing the creative thinking and creative performance abilities of the human brain.

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