Assessment of Divergent Thinking Ability for Development of Creativity: An Integral Part of Holistic Development

Kaustuv Sen

Ph.D. Scholar, RIE (NCERT), Bhubaneswar

Prof . Bhujendra Nath Panda

Professor of Education & Dean of Research, RIE (NCERT), Bhubaneswar

ABSTRACT

In today's ever-changing and complicated environment, developing holistic skills and competences is essential for equipping individuals with the abilities and resources they need to thrive in both personal and professional domains. Divergent thinking, a cognitive ability that encourages creative problem-solving and original idealization, is crucial to this holistic development. Holistic development includes the harmonious development of cognitive, emotional, social, and physical components. Assessing and improving divergent thinking abilities can help to foster creativity and achieve a more holistic development of a person. This paper provides an overview of divergent thinking and its involvement on holistic development. The assessment of divergent thinking ability is an essential component in fostering creativity, which is one important aspect of holistic development. Divergent thinking abilities are becoming increasingly important as individuals and communities confront increasingly complex and dynamic situations. This paper emphasizes the need of incorporating divergent thinking assessments into school curriculum, professional development programs, and personal growth initiatives in order to foster creativity as an essential component of holistic development. This paper also presents an overview of divergent thinking assessment, including insights into the methodology, uses, significance and limitations of these assessments in a variety of disciplines. As the world continues to change at a rapid pace, understanding and embracing divergent thinking is imperative for stimulating creativity, problem-solving, and innovation.

Keywords: Divergent thinking, Holistic development, Creativity

Introduction:

Creativity is essential to human development. The International Bureau of Education of UNESCO speaks of it as an indispensable 'future competence' (Marope, Gryphon, & Gallagher, 2017) and a key competency for the twenty-first century (Parkhurst, 1999). It is defined as the ability to develop innovative and relevant ideas or solutions (Finke, Ward, & Smith, 1992; Mumford, Medeiros, & Partlow, 2012; Sternberg & Lubart, 1996). Two steps are involved in the process that leads to creative production: (a) coming up with a number of different ideas or solutions, and (b) choosing the most creative ones (Clapham, 1997; Smith, Ward, & Finke, 1995; Ward, Smith, & Vaid, 1997). The former could be referring to divergent thinking, while the latter could be referring to convergent thinking. Divergent and convergent thinking cannot be separate entities, but rather closely related. Furthermore, research has revealed that applying divergent thinking to generate ideas is more challenging than using convergent thinking to evaluate and choose ideas (Antink & Lederman, 2015; Basadur, Graen, & Green, 1982; Runco & Vega, 1990). Divergent thinking has been demonstrated to be a reliable predictor of creativity (Kim, 2011; Runco & Acar, 2012).

The holistic approach towards learning fosters a learner's interpersonal as well as cognitive maturity, allowing them to embrace life's obstacles, gain insight, and learn from their mistakes (Sarkar, 2022). An individual who receives a holistic education is better equipped for lifelong learning. The emphasis of

education shifts to the life skills, attitudes, and self-awareness that students will require in a society that is becoming more complicated (Sarkar, 2022).The holistic approach to education fosters social-emotional awareness while also providing opportunity to face problems. According to the NEP 2020, education should be focused on practical learning rather than academic learning. Society needs high-quality education, and it should be free from caste, gender prejudice, and other discriminatory practises. According to the NEP 2020, holistic education encompasses the whole development of a person's personality from all perspectives (cognitive, emotional, social, intellectual, and spiritual).

Assessment is essential in education. It is necessary for determining the extent of student learning (assessment of learning) and to assess student learning (assessment for learning). Assessment should be constructed in such a way that it facilitates student learning, whether at the topic level or at a higher level. Advance higher education thinks that paying attention to assessments and feedback methods, as well as the utilisation of self- and peer-assessment, is essential to student learning.

Transformation of Assessment: National Education Policy 2020:

A wide range of stakeholders will need to be included in the transformation of assessment process, which involves a cycle of evaluation, plan, and action. This has effects on the curriculum development and review process, the infrastructure, and the discussions that are required regarding assessments between teachers and students. In addition to fostering increased trust in academic standards, transforming assessment may positively affect student learning and satisfaction. The objectives of the National Education Policy-2020 (NEP-2020) are to evaluate higher-order abilities (such as analysis, critical thinking, and conceptual clarity) and to provide regular, formative, competency-based assessments that support the development and learning of students. NEP-2020 seeks to change the culture of assessment.

Assessment and Learning Outcomes Alignment:

Assessment-as-learning requires that assessments be aligned with learning goals.

• Learning outcomes specify how students are supposed to demonstrate their understanding of what they have learned.

• The strategy for assessment outlines how students will demonstrate what they have learned.

To ensure the validity of the assessment, these two components need to function together.

Why is transforming assessment important?

It is possible to greatly improve teaching and learning in schools by changing assessment practises and policies. This can result in:

• Increased capacity for learning among students;

• An improvement in student satisfaction;

• More equitable presentation of student success;

• Increased assurance regarding academic standards;

• Improved applicability of assessment techniques;

• Better value for the money in comparison to 21st century HE results.

Conceptual Framework of Holistic Development:

People require different abilities and the capacity to think creatively to flourish in today's fast-paced world of technology. In today's digital era, life will be incredibly rapid and will rely entirely on a technology-based schooling system. Multiple abilities are required to conduct multiple tasks in school (curriculum and co-curricular activities). The premise behind holistic education is that children may be educated in a more natural and engaging manner. The holistic approach aims to enable students to utilise their academic learning as a stepping stone for their emotional and social empowerment rather than compartmentalising school courses. (ScholarBase, 2014)

Why is holistic development necessary?

From the outset of schooling, we have always prioritised the overall development of the child. From the ancient to the modern eras, child development is essential to enabling them to learn new things through a variety of activities. In order for students to fully participate in every aspect of the curriculum, it is important to ensure that their mental and physical capacities are improved. It is essential to provide children with the opportunity to identify and maximise their strengths while also strengthening their areas of weaknesses (Mcilroy, 2022). Learning is the act of acquiring knowledge concurrently, and it is linked to other learning processes such as seeing, hearing, and observing. Teachers can enhance their audio-visual perception, linguistic awareness and competence, fine

motor skills, listening and reacting abilities, focus and attention to work, and listening skills via the teaching and learning process. Academic proficiency can only be developed by social, physical, mental, and intellectual means. Learning to protect and control one's own emotions requires a strong foundation in social and emotional competencies. It is essential to provide children with opportunity to identify, maximise, and develop their skills while strengthening their areas of weakness.

Intellectual Ability Development:

It is sometimes referred to as cognitive ability. Intellectual abilities are those in which we get information and knowledge for overall development. Learning skill enrichment is fundamental to intellectual development. This method describes how children utilise their minds to generate ideas, concepts, and perspectives for life in this environment. Language has a critical function in intellectual development. It is the capacity to grow and develop a child's ability to learn, think, imagine, and reflect thoughts in the world. Children with this skill can solve problems in the necessary area or field. It is significant to arrange one's thinking and ideas into distinct zones as needed.

Curriculum reduction to focus on essential learning and creative thinking:

A greater focus should be placed on innovative thinking and.

- Holistic education
- Inquiry-based education
- Discovery-based education
- Discussion-based education
- Analytical learning
- Content will be focused on essential concepts, ideas, applications, and problem solving;
- Teaching and learning will be more participatory;
- Questioning will be encouraged;
- And classroom sessions will include more enjoyable and exploratory activities on a regular basis.

Creative Thinking: What Is It?

According to the Oxford Dictionary of English (2010), creativity is the act of creating something new, requiring both intelligence and imagination. It is the ability to produce through thinking creatively and imaginatively. It places more emphasis on the procedure than the outcome. One can classify a method that is unique from previous ones as the outcome of their creativity.

The capacity to invent something new, come up with fresh concepts for addressing problems, or recognise a novel connection between or among already-existing pieces are all examples of creativity. One's actions or attitude reveal something about their level of creative thinking. It is said that the results of creativity, which are novel for themselves and don't always have to be novel for other people or the world at large, are more significant in the birth of creativity than something that has never been known before. The researcher has concluded that creativity is the potential of an individual's creative power as a way of thinking in order to find new ways to solve problems or new relationships between existing elements that manifest as self-motivation and a strong desire to be creative, based on the definition given above.

In summary, higher-order thinking encompasses creative thinking. It refers to creating something fresh, coming up with an idea from scratch, and assembling components in a novel way. Learners that use this way of thinking are better able to solve issues and make choices.

Creativity-influencing factors:

There is evidence in the literature that both domain-specific and domain-general elements can affect an individual's creativity (Amabile, 1983). First of all, creativity depends on a person's subject knowledge and competence, which provides the inspiration for creative thought (Amabile, 1983; Hass & Burke, 2016). Experts can be distinguished from novices based on their domain knowledge and competence. Experts have superior retrieval skills and can discern connections between seemingly unrelated ideas, which provides a strong foundation for creativity.

Second, domain-general elements that affect creativity include cognitive capacity, personality characteristics, creative potential, motivation, and attitude towards creativity (Feist, 1998; Shalley, Zhou, & Oldham, 2004; Sternberg & Lubart, 1992). According to Runco, Plucker, and Lim (2001), "creative potential" is the ability to generate original ideas and act in ways that demonstrate one's appreciation for, ability to apply, and proficiency with ideas in natural settings. Divergent and convergent

thinking skills are the two key components of the cognitive ability for creativity, with the former being a strong predictor of the latter (Kim, 2011; Runco & Acar, 2012).

Development of scientific creativity in school education:

Due to the obvious structural and functional changes in people's brains at this time, research indicates that adolescence is a crucial period for the development of cognitive capacities (Casey, Jones, & Hare, 2008; Sternberg, 2006). Higher-order cognitive skills and abilities for investigation, reasoning, and problem-solving have been actively emphasised in school education, particularly in the area of science. Science is a vital discipline that needs creativity in order to find new challenges and produce new ideas or answers to problems. While creativity is frequently encouraged in engineering and design disciplines in higher education and in the business, it has gotten insufficient attention in school science teaching (De Vries & Lubart, 2017; Kind & Kind, 2007; McWilliam, Poronnik, & Taylor, 2008; Ng & Smith, 2004; Simonton, 2003).

Several researches have investigated techniques to encouraging students' creativity in scientific areas in order to meet the difficulty. Yang, Lee, Hong, and Lin (2016), for example, created an educational framework to encourage creative thinking in primary school children in an inquiry learning setting. The framework included inquiring, planning, executing, concluding, and reporting, as well as tactics (for example, applauding students' unique ideas and promoting openness) for creating a social atmosphere in which students felt free and secure to explore innovative ideas. This method was discovered to assist students in improving their performance on science inquiry and convergent thinking, but not divergent thinking. This might be explained by the instructional framework's lack of divergent thinking tools. Sun et al. (2019) found that computer-based cognitive mapping improved divergent thinking by making the complicated cognitive process explicit to learners.

Divergent thinking training for the development of creativity:

Given the relevance of divergent thinking in creative performance, training in divergent thinking abilities has gained significant attention in creativity development (Ritter & Mostert, 2016; Scott, Leritz, & Mumford, 2004). Divergent thinking may be defined as the act of recovering existing information and linking and integrating unrelated knowledge in a fresh and relevant way (Marron & Faust, 2018). Overcoming established thinking patterns or biases and discovering various alternatives are crucial for the development of scientific creativity (Ness, 2012). Previous training programmes offer relevant divergent thinking skills (e.g., analogies, associations, and metaphors). Furthermore, research indicates that the cognitive process underpinning divergent thinking is complicated and difficult to capture; as a result, it is critical to support divergent thinking by making its main aspects obvious to learners (Sun, Wang, & Wegerif, 2019). Several fundamental factors comprise the cognitive process enabling divergent thought, including association, deconstruction, and combination with adjustment (Michalko, 2014; Ross, 2006; Smith, 1998; Sun et al., 2019).

Assessment of Divergent thinking ability:
Divergent Thinking Tests:

Divergent thinking tests are likely the most often utilised method for testing daily creativity. In these assessments, individuals are asked to generate various thoughts in response to certain stimuli. Stimuli and reactions are usually visual or verbal in nature. Drawing images with an unfinished figure, writing inquiries prompted by hypothetical events, or outlining various applications for an object are all examples of item answer forms. The goal is to assess the divergent thinking skills demonstrated by test taker responses. Divergent thinking testing often examine numerous skills, with fluency, flexibility, creativity, and elaboration being the most commonly assessed.

There are several divergent thinking tests available. Some of these are considered generic tests that may be given to a wide range of people. The Torrance Tests of Creative Thinking (TTCT), Alternative Uses or Consequences tests, and multinational instruments such as the Spanish CREA test are examples of these. Other divergent thinking tests, such as the Purdue Creativity Test for engineers and the Creative Engineering Design Assessment (CEDA), have been constructed using stimuli that pertain to specialised fields of expertise. Some assessments look at both divergent and convergent thinking. The Structure of Intellect Learning Abilities Test (SOI-LA) is an example of a broad population tool. Currently, both domestically and internationally,

the Torrance Tests of Creative Thinking are the most widely used divergent thinking tests accessible. They are regarded as the gold standard in divergent thinking assessments. Torrance tests can be verbal (Thinking Creatively with Words), figural (Thinking Creatively with Pictures), or abridged (abridged Torrance Test for Adults, ATTA). Each consists of a number of activities that are graded across many parameters. Following that, sub-scores and total scores are generated.

Numerous research investigations have discovered weak correlations between scores on verbal, figural, and mathematical divergent thinking tasks, indicating that domain-specific skills impact test performance. The explanation for this finding might be that divergent thinking tasks need extra abilities beyond divergent thinking these are tied to domain expertise, rather than the idea that the process of divergent thinking is domain specific. Whatever the cause, divergent thinking tests with diverse types of stimuli and answer formats do not appear to be totally interchangeable. Despite these limitations, research on divergent thinking tests suggests that they might be beneficial in evaluating divergent thinking, an essential component of creativity.

Criticism:

Divergent thinking tests have long been popular in creativity research, but they have also been the subject of heated controversy concerning their limitations. A recurring concern is that while divergent thinking ability is a good predictor of creative potential, it may not generalise to a more general conceptualization of creativity that encompasses, for example, real-life creative success (Runco & Acar, 2012). A second prevalent difficulty is that divergent thinking scores have poor psychometric qualities (i.e., objectivity, reliability, and validity). To ensure the validity of divergent thinking tasks in evaluating creative potential and investigating the cognitive and neurocognitive processes behind creative ideation, these psychometric problems must be addressed (e.g., Benedek, Könen & Neubauer, 2012; Fink & Benedek, in press; Gilhooly et al., 2007; Nusbaum & Silvia, 2011). In recent years, significant efforts have been made to further examine divergent thinking tests in light of various factors related to methodology and to propose new approaches for addressing common issues (e.g., Plucker, Qian, & Wang, 2011; Runco,

Okuda, & Thurston, 1987; Silvia, Martin, & Nusbaum, 2009; Silvia et al., 2008).

Conclusion:

We must understand what children demand from school, which includes not only academic progress but also growth outside of the curriculum, such as extracurricular activities. Every parent's motivation for sending their children to school and college is the necessity to study certain specialised subjects for the advancement of their future, as well as exposure for holistic development (Physical, Intellectual, Emotional, Mental, and Social). The teaching-learning process is the only way to create a strong and healthy environment where students can understand the relationship between positive and negative environments. Education is an internal component of the educational system because only it has the power to alter students' behaviours and help them understand the psychological pressures they are under. In order to foster self-reliance, team spirit, and honest communication in education, educators, policymakers, and stakeholders must guarantee that the curriculum is not only theory-based but also includes a wide range of activities (social and mental) and practice.

Although researchers in the field of creativity have mostly reached an understanding about the definition of creativity, there is less consistency regarding the best ways to operationalize and quantify creativity. Since Guilford's model on the structure of intellect (Guilford, 1967), this subject has been at the heart of creativity study. The assessment of creativity is a complex issue (Plucker & Renzulli, 1999). Reviews and prior studies raise doubts about the external validity of creativity studies by indicating that variables or predictors linked to creativity may vary depending on the measure employed (Hornberg & ReiterPalmon, 2017; Plucker & Renzulli, 1999; Reiter-Palmon, Young Illies, Kobe Cross, Buboltz, & Nimps, 2009). Guilford (1950) focused on the study of creativity in daily life and the significance of divergent thinking for the generation of creative work. Since then, creativity research has likely employed divergent thinking activities more frequently than any other type of measurement (Plucker, Qian, & Wang, 2011; Reiter-Palmon & Tinio, 2018).

References:

1. Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualization. Journal of Personality and Social Psychology, 45(2), 357–376.

2. Antink, M. A., & Lederman, N. G. (2015). Creative cognition in secondary science: An exploration of divergent thinking in science among adolescents. International Journal of Science Education, 37(10), 1547–1563.

3. Basadur, M., Graen, G. B., & Green, S. G. (1982). Training in creative problem solving: Effects on ideation and problem finding and solving in an industrial research organization. Organizational Behavior and Human Performance, 30(1), 41–70.

4. Benedek, M., Könen, T., & Neubauer, A. C. (2012). Associative abilities underlying creativity. Psychology of Aesthetics, Creativity, and the Arts, 6, 273–281.

5. Casey, B. J., Jones, R. M., & Hare, T. A. (2008). The adolescent brain. Annals of the New York Academy of Sciences, 1124(1), 111–126.

6. Channawar, Sonali. (2023). Conceptual framework for Holistic Development :NEP 2020. 82. 22-27.

7. Clapham, M. M. (1997). Ideational Skills Training : Ideational skills training : A key element in creativity training programs. Creativity Research Journal ISSN:, 10(1), 33–44.

8. Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. Personality and Social Psychology Review, 2(4), 290–309.

9. Gilhooly, K. J., Fioratou, E., Anthony, S. H., & Wynn, V. (2007). Divergent thinking: Strategies and executive involvement in generating novel uses for familiar objects. British Journal of Psychology, 98, 611–625.

10. Hass, R. W., & Burke, S. (2016). Implicit theories of creativity are differentially categorized by perspective and exemplar domain. Thinking skills and creativity, 19, 219-231.

11. Kim, K. H. (2011). The APA 2009 division 10 debate: Are the torrance tests of creative thinking still relevant in the 21st century. Psychology of Aesthetics, Creativity, and the Arts, 5(4), 302–308.

12. Marron, T. R., & Faust, M. (2018). Free association, divergent thinking, and creativity: Cognitive and neural perspectives. The Cambridge Handbook of the Neuroscience of Creativity, (May), 261–280.

13. Michalko, M. (2014). Cracking Creativity - The Secrets of Creative Genius. Work Study (Vol. 48). Ten Speed Press.

14. Mumford, M. D., Medeiros, K. E., & Partlow, P. J. (2012). Creative thinking: Processes, strategies, and knowledge. Journal of Creative Behavior, 46(1), 30–47.

15. Nusbaum, E. C., & Silvia, P. J. (2011). Are intelligence and creativity really so different? Fluid intelligence, executive processes, and strategy use in divergent thinking. Intelligence, 39, 36–45.

16. Plucker, J. A., & Renzulli, J. S. (1999). Psychometric approaches to the study of human creativity. In R. J. Sternberg (Ed.), Handbook of creativity (pp. 35– 61). New York, NY: Cambridge University Press.

17. Reiter-Palmon, R., Illies, M. Y., Cross, L. K., Buboltz, C., & Nimps, T.(2009). Creativity and domain specificity: The effect of task type on multiple indexes of creative problem-solving. Psychology of Aesthetics, Creativity, and the Arts, 3, 73–80.

18. Runco, M. A., & Acar, S. (2012). Divergent thinking as an indicator of creative potential. Creativity Research Journal, 24(1), 66–75.

19. Runco, M. A., & Vega, L. (1990). Evaluating the creativity of children's ideas. Journal of Social Behavior & Personality, 5(5), 439–452.

20. Scott, G., Leritz, L. E., & Mumford, M. D. (2004). The effectiveness of creativity training: A quantitative review. Creativity Research Journal, 16(4), 361–388.

21. Silvia, P. J., Martin, C., & Nusbaum, E. C. (2009). A snapshot of creativity: Evaluating a quick and simple method for assessing divergent thinking. Thinking Skills and Creativity, 4, 79–85.

22. Sun, M., Wang, M., & Wegerif, R. (2019). Using computer-based cognitive mapping to improve students' divergent thinking for creativity development. British Journal of Educational Technology, 50(5), 2217-2233.

❖ ❖ ❖