

Mindscapes of Learning: Gender, the Creative Imagery Ability, and the Embodied Nature of Academic Success

Osman Yılmaz KARTAL¹, Akan Deniz YAZGAN², Dinçer TEMELLİ³, Meral YAVUZ KARTAL⁴, Beyza BULUT⁵, Çavuş ŞAHİN⁶

Abstract

This particular study sets out to investigate thoroughly the intricate and fascinating relationship that exists between the abilities of creative imagery and the academic performance of the eighth graders; especially for the male and female learners and how they perform in relation to their imaginative abilities and academic achievement. The research was done among a total of 105 eighth-grade middle school learners which included 52 boys and 53 girls drawn from a public middle school situated in the moderate socio-cultural as well as the socio-economic context of Çanakkale, Turkey. The results of this particular study have revealed that overall, girls do much better than boys on Vividness and Transformation with significantly higher means in these two dimensions while for Originality, the findings indicate that there are no significant gender factors. As regards academic achievement, significant gender-based differences were also observed, as girls eclipsed boys in Turkish, Mathematics, and Science with overall better performance percentages. The study further showed that there is a positive relationship between the creativity capacities of male participants which implies that the high-performance levels of such students can be directly linked to their creative imagination abilities whereas this correlation was not observed in female participants.

Keywords: *Creative Imagery Abilities, Creativity, Academic Achievement, 8th-Grade Students, Gender.*

Introduction

The need for a highly creative person who can develop solutions to various problems in an innovative and effective way arises from the rapid socio-economic transformations that the modern world is experiencing (Navikova, 2019). Considering the fact that creativity is the defining quality of humans, a wide variety of research activity has been concentrated in several disciplines, including psychology, philosophy, neurobiology, art history and anthropology, and has provided insights into the veracity and mechanisms as far as creativity is concerned (Palmiero, Nori, Aloisi, Ferrara and Piccardi, 2015; Perrone, 2014; Shevlin, 2021). As observed by Fedyk and Xu (2021), the adverse factors for psychological theories of creativity concern the essential principles of sound scientific theories that originate from philosophy. It is notable that, despite the numerous attempts by scientists in the fields of psychology and neuroscience, the enigma of this complex phenomenon remains largely unresolved. In order to gain a full understanding of this complex entity, it is vital that further intellectual and experimental work is carried out without delay (Abraham et al., 2012). Furthermore, the investigation of methods to enhance creativity has the potential to yield significant benefits for the wider community (Cockbain, Vertolli and Davies, 2014). The proposition put forth by Blackmon (2018) that imagination and creativity are the foundation of innovation is substantiated by the observation that the individuals who spearhead significant movements, developments,

¹ Department of Education Sciences, Çanakkale Onsekiz Mart University, Çanakkale 17000, Turkey; Email: osmanykartal@comu.edu.tr, 0000-0003-2922-0069.

² Department of Education Sciences, Çanakkale Onsekiz Mart University, Çanakkale 17000, Turkey; Email: akandeniz@comu.edu.tr, 0000-0002-4607-6700

³ Ministry of National Education, Gelibolu 100. Yıl Başı Secondary School, Çanakkale 17500, Turkey; Email: dincer0182@gmail.com, 0000-0001-6258-5049

⁴ Ministry of National Education, Çanakkale Governorship—European Union and Foreign Relations Office, Çanakkale 17000, Turkey; Email: meral.kartal@icisleri.gov.tr, 0000-0003-3441-9494.

⁵ Ministry of National Education, Çanakkale 17000, Turkey; Email: beyzakincal@gmail.com, 0000-0003-4430-7007

⁶ Department of Primary Education, Çanakkale Onsekiz Mart University, Çanakkale 17000, Turkey; Email: cavussahin@comu.edu.tr, 0000-0002-4250-9898

and revolutions are those who possess both imagination and creativity. Creativity is an evolutionary and dynamic concept that adapts to the emergence of new challenges (Makarevicz & Ilisko, 2018).

Given the profound impact of creativity on individual and societal progress, a deeper understanding of its defining characteristics is essential. Therefore, some of the various definitions and conceptualizations of creativity that have emerged across different fields of study should be examined more closely. Creativity has been defined as the innate human capacity to elicit, articulate and implement profoundly original and valuable ideas or diagnoses through the systematised comprehension of the world (Sternberg & Kaufman, 2010). A novel idea is defined as one that combines elements of existing concepts in a new way, or that draws upon existing knowledge to create something original. Conversely, appropriate or valuable ideas are those that align with the needs of the individual or organisation and can be utilised to achieve a defined objective (Hui, Chiu, Pang, Coombes and Tse, 2021). The term "creativity" can be defined as the capacity to identify issues and propose solutions. Such instances of creativity occur when an individual attempt to address a specific challenge, potentially resulting in novel insights (Lindwall & Nillson, 2021). In their 2019 study, Nurcahyono, Suryadi, and Prabawanto propose that creativity can be understood as a function of the right brain. This part of the brain is typically regarded as the primary source of human innovation. There is a significant overlap between the cognitive and neuronal underpinnings of intelligence and creativity (Chiu, 2012; Frith et al., 2021). In addition to their role in creative thought, evidence increasingly indicates that executive functions (EFs) are essential for creative thinking (Beaty et al., 2016; Zabelina et al., 2019).

To genuinely comprehend the operational ramifications of those theoretical bases, it is necessary to analyze in what way creativity is both expressed and nurtured within the pedagogical environment. The increasing prevalence of technology in educational settings has led to a growing recognition among researchers of the importance of creativity as a key factor in education (Tsai, 2012). As posited by Chang, Kao, Wang and Huang (2021), the capacity of a nation to become an innovative industrialised country is contingent upon the creativity of its citizens. In light of these developments, it became evident that a focus on creativity was a crucial aspect of educational policy in numerous countries. In order to facilitate the implementation of creative and innovative solutions to the challenges of the 21st century, it is necessary to effect a transformation in education and learning practice, thereby fostering individuals with the capacity for innovation (Bourgeois-Bougrine, Latorre and Mourey, 2018). Creativity is the most highly valued human quality in society (Abu-Akel, Webb, Montpellier, Bontivegni, Luechinger, Ishii and Mohr, 2020). The acquisition of creativity represents one of the 21st-century skills (Çakır, Korkmaz, İdil and Erdoğan, 2021). The most effective means of fostering innovation and creativity in students is through the school environment itself (Ahyani, Supriatno and Surakusumah, 2021; Yazgan, 2021). This environment should possess the following qualities: originality, acknowledgement of inspiration, novelty, and personal growth (Plucker and Makel, 2010). Those who engage in creative thought are distinguished by their capacity for divergent and imaginative thinking (Dziedziejewicz, Oledzka and Karwowski, 2013). As outlined by James and Asmus (2001), a number of traits are associated with creativity, including divergent thinking, introversion, self-esteem, ambiguity tolerance, risk-taking ability, behavioural adaptability, emotional instability and the complexity of absorbing imagery. In a recent meta-analysis, the researchers found that, on average, there is a small-to-medium effect size for the relationship between creative potential and academic achievement. The most pronounced effect was observed during the middle school period (Anderson & Graham, 2021). A further meta-analysis of 120 studies corroborated the existence of a positive correlation between creative abilities and academic performance, albeit a weak one (Gajda, Karwowski, & Beghetto, 2017). Furthermore, there is a correlation between multicultural experiences and creative thinking (Groyecka, Gajda, Jankowska, Sorokowski and Karwowski, 2020).

Although the educational environment serves as an integral part of the mechanism of immersing oneself in creativity, a careful examination of the particular cognitive processes that are the basis of creative thinking, especially the part of imagination, is equally important. Imagination is an important part of the creative process. The channel of creativity can be imagined as a stream of mental abilities, of which imagination is the strongest (Liang, Hsu, Chang and Lin, 2013). Vygotsky's conceptualisation of imagination as a function of the mind, higher than thought and consciously controlled by cognition (Ness and Dysthe, 2020). The important role that creative thinking plays in the effective use of human creative potential makes it one of

the most critical abilities we have (Ren, Li, Zhang and Wang, 2012). Moreover, this ability begins to emerge in early childhood when it becomes a key component in the process of learning and problem solving (Garcia and Mukhopadhyay, 2019). The first step in teaching students to think creatively is to develop their 'imagination' (Ganiev and Tashev, 2021). The research by Campos and Gonzalez (1995) showed that the way an individual imagines (regardless of how it is quantified, either on a personal level through self-report questionnaires or in terms of performance through tests) has a significant impact on the person's creative outcome. In Dziedziewicz and Karwowski's (2015) research, the concept of creative imagination was presented as a person's ability to generate and change mental images based on previous experiences in a transformative way, which the authors refer to as 'creative representation'.

To understand creativity and the functioning of the imagination, it is necessary to investigate its connections with other cognitive abilities. The analysis of historical and anecdotal evidence on the participation of imagery in enlightenment and breakthroughs, as well as in artistic expressions, shows that creative imagery is closely related to the clarity of abstract thinking and the ability to produce (Abraham, Windmann, Daum and Güntürkün, 2005). The fundamental components of creative imagery are the ability to experience new ideas and the ability to perceive concepts from another person, as well as the emotions or the user's deep engagement with a problem (Zhang and Chen, 2014). The study by Dikiy, Dikaya, Karpova, Lavreshina and Kagramanyan (2018) outlines the psychological parameters of highly creative artists, namely: high emotionality, tendency to affective reactions, high anxiety and excitability, and the need for self-actualisation.

Although the close relationship between the creative image and the cognitive processes still exists, we can say that the meanings of the terms "creativity" and "imagination" have been evolving for some time, and indeed they remain fuzzy and need additional explanations to enhance the understanding of their complexity. The study by Horng, Wang, Yen, Lu and Li (2021) noted the equivalent use of the terms creativity and imagination in common language. Although they are often used interchangeably, there are important differences between the two concepts. The term 'creativity' describes the process by which a person creates something new and socially useful. In contrast, the term "imagination" can be explained as the cognitive activity by which a new idea emerges in a human mind. The difference is that material has traditionally been the creative aspect, while imagination has been the mental aspect for a longer period of time. This distinction makes sense because the creation of the novel product valued by society can be a very laborious and complicated process in time. Many generations of researchers have interpreted the concept of creative imagination in different ways (Rozet, [1977] 1982; Vygotsky, [1930] 2004; Ward, 1994). It is usually accepted as the ability to manipulate mental representations of absent objects and to produce such ideas that are not only different from those already stored in the mind, but also different (Groyecka-Bernard, Karwowski and Sorokowski, 2021). Moreover, the development of imagination and creativity is correlated with the acquisition of knowledge and experience (Duffy, 2006). Furthermore, the results of the research by Gündoğan, Arı and Gönen (2013) have proven that an effective approach to the development of children's creative imagination can be a drama programme. Creativity is an important component of the process of "learning how to learn" and is at the core of successfully adapting to change (Shen, 2012). Furthermore, more attention should be paid to the phenomenon of imagination in the classroom, as it affects various areas beyond the visual surface and is one of the areas most in need of coverage (Viney, 2013). Furthermore, Mellou (1996) claims that young children's creativity can grow through the influence of environmental and pedagogical factors in three crucial aspects: the creative environment, creative programmes and the role of creative teachers and pedagogical approaches.

Significance of the Research

Imagine an educational environment where, instead of passively acquiring knowledge, learners engage in an intellectual exercise that leads them to vivid mental representations of complex ideas, problem solving, and unleashing their creativity. This is the power of creative imagery - the ability to generate, manipulate and use mental imagery - a cognitive skill that is often cited as very important for academic achievement and future success.

While some educators may still promote the repetitive learning and memorisation method, developing creative imagery skills is the way to open the door to the world for students. Encouraging students to visualise, analyse and synthesise data will give them the tools they need to learn actively, think critically and solve complex challenges. This is particularly important in the diverse world of the 21st century, where flexibility, originality of thought and the ability to find new solutions to existing problems are among the most valued qualities.

Despite its acknowledged importance, the inclusion of creativity in education remains largely unexplored. This research aims to bring about an understanding of the complexity of the relationship between creative imagery skills and the resulting academic success, with a focus on the risk of gendered nuances. By examining the prevalence of creative imagery skills among 8th grade students, the engagement of boys and girls in the class, and the so-called relationship between creative imagery and academic success, the study investigates the parts involved in the togetherness of these two entities by addressing some questions that seem crucial.

Ultimately, the research aims to make meaningful contributions to the body of knowledge that will accordingly provide insights into the effective practices and interventions that can promote creative imagery and thus improve academic performance - dash learning and teaching process literacy not only helpful in literacy courses, which have always been the focus of attention, but they can also be applied elsewhere. This is a perfect opportunity for educators to empower students by designing covers that build on these skills, enabling them to reach their full potential. So the potential for this research to change the way the education system works, making it more inclusive and empowered for every student, has great potential.

Research Aim and Research Questions

The main aim of this research is to explore the relationship between creative imagery skills and academic achievement among 8th-grade students. In addition, it seeks to identify any gender differences in these skills and achievement. To achieve these aims, the authors use descriptive, differential and correlational analyses.

Before looking at gender differences, it's important to first establish a descriptive understanding of the overall creative imagery skills and academic achievement levels within the whole group of students. This initial descriptive analysis provides a basis for subsequent comparative and correlational analyses.

The research questions guiding this study are as follows:

What are the prevailing levels of creative imagery skills and academic achievement among 8th grade students?

This question is essential to determine the baseline levels and distribution of creative imagery skills and academic achievement within the student group. Understanding these baseline levels is crucial for interpreting the results of subsequent gender comparisons and correlational analyses.

Do male and female students differ significantly in terms of their creative imagery skills and academic achievement?

This question directly addresses the existence of any gender differences in the measured variables. It allows for the exploration of potential differences between male and female students in terms of their creative imagery skills and academic achievement.

What is the nature of the relationship between creative imagery skills and academic achievement, particularly when examined separately for male and female students?

This question explores the possible relationships between specific aspects of creative imagery and academic achievement in different subjects. By stratifying the analysis by gender, it aims to uncover any unique patterns or differences in these relationships between male and female students.

Methodology

Research Design

A correlational research design was used in this study to investigate the relationship that exists between creative imagery skills and academic achievement in 8th grade students. This design was chosen because it is the best way to explore the relationship between two or more variables without manipulating them.

Descriptive analysis, which is used in most correlational research, is used to provide a preliminary understanding of the variables of interest. It serves as a basis for further comparative and correlational analysis.

Beyond correlational analysis, which is used to measure the strength and direction of the relationship between variables, correlational research also uses, as a rule of thumb, some of the difference analysis techniques, such as t-tests or Mann-Whitney U-tests, to compare the mean differences between groups on the variable of interest. This is a further step to the more complex nature of the association between the variables and the research of whether there are any essential differences between the particular groups on these variables.

The research method chosen in this study is the correlational research technique, which is valid to learn about the interrelationship between creative imagery skills and academic achievement. It allows researchers to look at the relationships between variables, to determine predictive relationships and to explore differences between genders.

Participants

The actual study sample for consideration under analysis was a total of 105 students from the eighth grade, including 52 male students and 53 female students from the same public middle school located in the province of Çanakkale, Turkey, which depicts a school that had been defined by the moderate level of the sociocultural and the socioeconomic background of the school environment. The parents of the respondents were from the nuclear family. It was also essential to note that respondents who were not included in the sample were those who were foreign students, the students with recognized learning disabilities and the students identified to have special talents thus broadening its generalizability and representation of the students from the eighth grade in the particular middle school in Çanakkale, Turkey.

In view of this context and of the nature of data collection using the Test of Creative Imagery Abilities (TCIA), the sample size with 105 is regarded as adequate for the conduct of this study. The TCIA is a test that takes a longer time than the other assessments, requiring the administration of the assessment and also scoring of the test individually as the process might take longer and use many resources as compared to other instruments. According to experts, a sample of more than 100 is required to achieve significant statistical power and representativity for cross-cutting analysis purposes to allow for efficient use of statistical computations like t-tests and correlations (Cohen, 1992).

Data Collection Tools

This section contains a detailed discussion of the specific procedures and methods for collecting precise information that was used to measure the level of creative imagery abilities and academic achievement of the participants. All the data collection tools used, including the characters with names and descriptions will be incorporated in this section and elaborate on their effectiveness

Test of Creative Imagery Abilities (TCIA)

The Test of Creative Images Abilities (TCIA) was created by Jankowska and Karwowski (2015) and it is a measure of an individual's creative imagery abilities. It is a test applicable to individuals ranging from 4 years old up to adulthood. The test taps into an individual's capacity to visualize and alter mental images. The test is made up of seven tasks; they all begin with the same simple graphic sign. The participant is provided with prompts to imagine as much of the images as possible and describes them using verbal or written forms. As a second step, they choose the most original image and draw it. They have the liberty to elaborate, modify, or add elements to their drawing. The test scoring parameters include three scales such as vividness, originality, and transformative ability. Each scale is rated between 0 and 2, the total score being the sum of the points acquired on the three scales. The TCIA is a useful tool for the assessment and stimulation of creative imagination since it has high validity and reliability. (Drawing samples from 3 participants are presented in Appendix 1.)

The LGS Examination

In addition to the TCIA, this study used data from the Turkish national high school entrance examination known as the "Liselere Geçiş Sistemi" or LGS. The LGS is a standardized test of exceptional repute and prestige that is developed and administered by the Ministry of National Education (MoNE), which is aimed at assessing the academic achievement of the 8th-grade students in the core subjects of Turkish. This examination is seen as a crucial point in the educational journey of students that are selected to join various high schools that offer quality education in the Turkish education system and this reinforces the significance of this examination.

Meanwhile in terms of this case study, the LGS consists of two different sessions that are interleaved and are all done on the same day, making it a unique form of assessment. The first session of this examination is intended to examine verbal aptitude which refers to the extent to which the students comprehend, understand, and apply the information provided in a standard test and this session is set to last for a total of 75 minutes. This session of verbal aptitude aims at checking students' ability to excel in various ways of communication as well as their reading and understanding skills that could result in their being preferred by various prestigious secondary schools within the country. It encompasses 50 multiple-choice inquiries, distributed as follows:

- Turkish language: 20 questions
- T.C. İnkılap Tarihi ve Atatürkçülük (History of the Turkish Revolution and Atatürk's Principles): 10 questions
- Din Kültürü ve Ahlâk Bilgisi (Religious Culture and Moral Knowledge): 10 questions
- Foreign Language (English): 10 questions

The second assessment session evaluates students' numerical and scientific abilities and lasts for a total period of 80 minutes during which 40 multiple-choice questions are asked. These questions are designated as follows:

Mathematics: 20 of the questions focus on mathematical abilities and operations

Science: Also, 20 questions revolve around scientific knowledge and practical applications of science

The LGS applies an elaborate scoring system for the tests of these subtests. Thus, for each subtest, the raw score is calculated using the number of incorrectly answered questions, whereby one-third of the number of wrong answers is presumed to be subtracted from the number of correct answers. With this scoring method, students are discouraged from randomly guessing as the consequences of guessing could be worse than if the answers had been left blank. The raw scores are then translated into a standardized score from

100 to 500. This then means that if a student answers all the questions correctly, he or she gets the highest score of 500 whereby he or she must be trying very hard to score that high. On the same note, if one answered all the questions wrongly, then they would get a score of 100, which indicates that they performed dismally. In the case of the below-performance of answer – the students, who don't give answers at all, are scored at a value of 200 approximately which is known as the base score.

Therefore, the LGS examination is a high-stakes assessment that has serious implications for the educational pathways of students. This is to say that the Ministry of National Education has established and follows very stringent protocols to provide uncompromised reliability and the validity of the examination. The MoNE has put in place extensive pilot testing, item analysis, and expert review to assess the quality of the test and its psychometric properties. The high note is that standard procedures for administration and scoring have been laid down to ensure uniformity and fairness across all candidates. This allows the overall testing environment to remain highly reliable as the types of students affected are the same.

In order to exploit the research component of the current study, we are using the LGS scores which are among the most recognized and trustworthy measures of academic achievement at the national level. Therefore, the LGS presents a stream of data that sheds light on students' performances in the core subjects, consequently allowing us to use them to probe into the research of the link between creativity of imagery abilities and academic successfulness in any manner possible.

Academic Achievement Scores

In addition to the TCIA and LGS scores, the current research has undertaken the process of supplementing individual academic performance scores, as reflected in students' end-of-year reports. These scores are an elaborate; holistic view of an individual's performance, based on a full academic year of rigorous examination, assessment and evaluation within the schools' educational settings. These assessments and evaluations are in line with the Grade 8 curriculum and the MoNE's overall assessment guidelines, ensuring that the assessments meet the high standards set for students and are part of the nation's initiative.

In order to ensure a high degree of uniformity and to guarantee the authenticity of the assessments available for subjects of equal importance, the sample was taken from only one school, which meant that all participants in the study were from one institution, thus providing a basis for comparability. Also, the assessment and evaluation processes involved in the study were carried out in a well-structured and planned manner by a group of subject officers, which ensured the uniformity of the assessment processes in different segments of the same class. This type of teamwork properly addresses the existing opportunities for potential errors due to lack of or different modes of assessment outside as well as between sections, thereby increasing the likelihood and integrity of the results of the research in terms of decisions made about students' academic performance.

The steps and techniques described above were reinforced by the validity and reliability of the measures concerned through the application of the school's internal quality control systems, or so-called internal assurance, supervised by teachers. The bulk of the work was carried out by teachers who were responsible for the framework of test construction and administration, as well as the assessments against which students were measured. Throughout the year, this was a continuous process that resulted in achievement scores measured on a scale of 0 to 100 and recorded in academic reports. In using these scores, the research used a considerable amount of coherently processed performance data, covering a given educational situation and secured with a significant degree of credibility and internal authenticity.

Data Collection Procedure

This current study additionally employed a multi-faceted data collection process that facilitated classified the diverse sources and procedures so that researchers could gather sufficient information regarding the creative imaginary capabilities of students and their academic performance. Ethical considerations were prioritized at every step during the data collection process that involved any individual involved in the

process. The consents that are also termed as the informed consents were obtained from school administration, teachers, and students or their legal guardians before engaging in the process of data collection. The consents and guidance ensured a systematic as well as an ethical procedure of collecting data which avoided harming the participants in any way or violating their rights.

LGS Examination

The data regarding the student's performance on LGS examination was further generated with a focus on the subjects of Turkish native language, English as Foreign Language, Mathematics, and Science. The official records received from the Ministry of National Education MoNE served as the basis for this data analysis. The quantitative analysis conducted on the information enabled a valid and much more accurate evaluation of the students' academic achievement through the use of standardized measures on the important areas of the subjects.

Academic Achievement Scores

To assess the academic achievement of students in Turkish, English, Mathematics, and Science, their achievements for the subjects were also obtained from the end-of-year report cards. The exams were managed by the respective subject teachers and they reflected an evaluation scale of less than hundred percent in that the assessment was done between 0-100. The achievement scales quantitatively measure how well the learners performed in the various subjects and the extent to which they understood and grasped the concepts being taught throughout the year. This data therefore, enables the researchers to establish the correlation that exists between these academic achievement scores and the creative imaginary capabilities of the students.

Test of Creative Imagery Abilities (TCIA)

The creative imaginary capabilities of students were assessed using the TCIA, a widely used instrument in the field of creative imagery. This procedure involved detailed steps to ensure the proper integrity of the TCIA results and eliminate biases in its enumeration.

Individual Administration: The TCIA test was administered individually to each student by the researchers in a controlled environment that had minimal distractions and was therefore conducive to the students. The quiet environment outside the school hours provided the appropriate setting within which the students' attention would be focused and students would be free from distractions when taking the test. The incorporation of focused, undivided attention when taking the TCIA test and provision of an appropriate atmosphere assured an equal opportunity for all students to exert their creative imagery abilities, through which high levels of accuracy and reliability in the correspondence results of TCIA were realized.

Phased Presentation: In order to avoid the possibility of cognitive overload or the risk of student fatigue, there was a determination to present a maximum of one figure per day to the student rather than a series of many figures in one day. This very slow and paced approach rode through to an entire period of seven days for the administration of the entire test method. This therefore paced approach made sure that the students had a lot of time to intelligently process all the figures, appropriately think and create creative mental imagery without the feeling of being rushed or indeed fatigued. Applicable attention was therefore required by the students by this method.

Flexible Timing: An important emphasis was placed on giving the students an environment where they could function in their very own pace and at their own time in order to complete the test. The students were free to take the test whenever they must have felt that they were mentally fit, relaxed and ready to absorb the content. Different students have different cognitive conditions and in a certain way each of them is unique with respect to the motivation and the house where the mind works best. Thus, this flexibility will be able to trigger the students to be totally committed to the process of the test and help them even more to generate a lot of creative ideas.

Researcher Guidance: As the administration of the test method took place, the researchers especially the trained researchers were always on hand to provide clarification and other forms of support to the students as a way of enhancing the whole process.

This comprehensive data collection strategy allowed for a rich and nuanced understanding of the relationship between creative imagery abilities and academic achievement, taking into account various facets of students' cognitive and academic profiles.

Data Analysis

The overall performance of the students on the Test of Creative Imagery Abilities (TCIA) and academic achievement tests was summarised using descriptive statistics - namely, means, standard deviations, frequencies, and percentages. These descriptive measures were the first step to understanding the students' achievement levels and their creative imagery skills.

In-depth statistics were applied to establish the link between students' capabilities for creative imagery and their academic achievements. Stated by the skewness and kurtosis values, which were the originality scale of the TCIA, the Mann-Whitney U test was used to determine differences in originality scores between male and female students. The obtained results were suggestive of a possible gender difference in performance in this specific aspect of creative imagination. Parametric tests were applied to the data that met the criteria of normal distribution. The independent samples t-tests were performed to measure gender differences in academic performance in Turkish, English, mathematics, and science. These tests showed whether there were statistically significant gender differences in the performance of male and female students within these subjects.

Pearson correlation and Spearman's rho correlation analysis were employed to examine the relationships between academic scores and various aspects of creative imagery skills, namely, which were vividness, originality, and transformativeness. By means of this analysis, the intention was to identify correlations between defined aspects of creative imagery and academic performance in various subjects.

For the tests conducted, both non-parametric and parametric tests were employed, and the results indicated that data analysis was reliable and suitable for the characteristics of the observed variables. The detailed analysis provided a precise understanding of the intricate interplay between creative imagery skills and academic performance, factoring in the relevant elements such as the gender and particular domains of creative imagery.

Research Reliability and Validity

In order to ensure the trustworthiness of the creative image assessed, the inter-rater reliability was verified through the involvement of two researchers who were independent of the research process. These researchers underwent extensive training in the scoring criteria and procedures that were presented in the TCIA manual (Jankowska & Karwowski, 2015). After this training, they independently evaluated a random sample of 20% of all drawings. The scores that the two raters assigned were then compared and analyzed using Cohen's kappa coefficient, the most widely accepted statistical criterion of the inter-rater reliability. The kappa value of .85 which was obtained is indicative of a high level of agreement between the two raters that is above the generally accepted level of .80 for good reliability (Landis & Koch, 1977). This whole process helped guarantee that the evaluation of creative imagery ability was consistent, stable, and objective, hence reducing some of the subjective aspects and differences in the images that could generate potential biases or inconsistencies.

In order to measure the creativity aspect of the drawings not only the evaluation was based on a peer-evaluation procedure, but also on a few selected students (three students) who were randomly assigned from the participant group were to present their view on the originality of the artwork. The aim of this approach was to use the experiences of the peer group to help students of that age to come up with a more

profound style of thinking regarding originality, which also affects the view taken by the students about the social context in which the drawings are made in the classroom and the situations they are in at the moment.

The three student raters were the ones who evaluated all the 105 drawings and they used their own opinion on what seems to be an original creation of their peers in assigning the originality scores to the artworks. This was a good opportunity for including peer opinions about originality the domains of which may be affected by a variety of things - like youth culture trends, collective experiences, or social norms within the target population - the students.

Among the three student coders, the inter-rater reliability has also been analyzed. The analysis confirmed that satisfactory agreement levels are existent, meaning that the students had a quite similar understanding of originality in the peer context. Such an originality assessment done by peers complements the expert ratings, offering a wider, multifaceted overall evaluation of the creative image shown in the drawings.

This approach, which is made up of different components such as both expert (researchers) and peer evaluations, gives support to the validity and reliability of the originality assessments. It ensures that the originality of the creative imagery is evaluated from both an expert perspective and the perspective of the students' peers, which gives a fuller insight into this construct in the context of the study.

Findings

At this stage of the study, the findings obtained regarding the research questions are presented.

Table1. Participants' scores of Creative Imagery Abilities Test

	Mean	Std. Deviation	Lowest possible score	Highest possible score	Lowest score achieved	Highest score achieved
Vividness	9.24	2.00	0	14	6	14
Originality	0.99	1.46	0	14	0	8
Transformativeness	3.27	2.75	0	14	0	11

Table 1 shows the descriptive statistics for the three scales of the Test of Creative Imagery Abilities (TCIA): Vividness, Originality, and Transformativeness. The data point to some fascinating aspects of the participants' creative imagery abilities. Specifically, the study shows the cognitive ability of Vividness to be the most dominant one since respondents are reported to have much more mental imagery that is detailed and elaborate compared to Originality and Transformativeness. The average score for the Vividness scale is 9.24, indicating that, on average, participants have this unique ability more than the other skills listed in the TCIA. It also tends to show the respondent's ability to indulge in the use of concrete details rather than abstract images, and many recent studies have shown that people are more inclined to use even the most verbose descriptions rather than giving or producing various bizarre visuals. However, originality is another scale that the participants have problems with, as it has the lowest mean score of 0.99, which means that it is difficult for the respondents to create unique and unusual images, as most of them are stuck with imitating and producing images that are usually considered unimaginative or commonplace. In other words, we can conclude that although imagery is rich in vivid mental images, the production of anything noticeably new within the imagery domain requires a different way of thinking or perhaps much more focused effort on the part of the subjects in such a situation. Originality may be related to novelty-seeking and exposure to wide and varied experiences, so future researchers would be wise to intervene in this direction. The Transformativeness scale is moderately transformative, with an average score of 3.27, which is somewhere between the Vividness and Originality scores. This means that although we see that the respondents have the ability to manipulate or transform their mental images to a moderate extent, there may be some further possibilities. On the dimension of image manipulation, the respondents show that they have a certain degree of mental flexibility and the ability to think imaginatively, but they do not make the best use of these abilities.

In addition, studies may show more positive and negative results for transformativeness, which may provide information about the subjects' creative potential.

Figure 1. Distribution of Scores on the Test of Creative Imagery Abilities (TCIA)

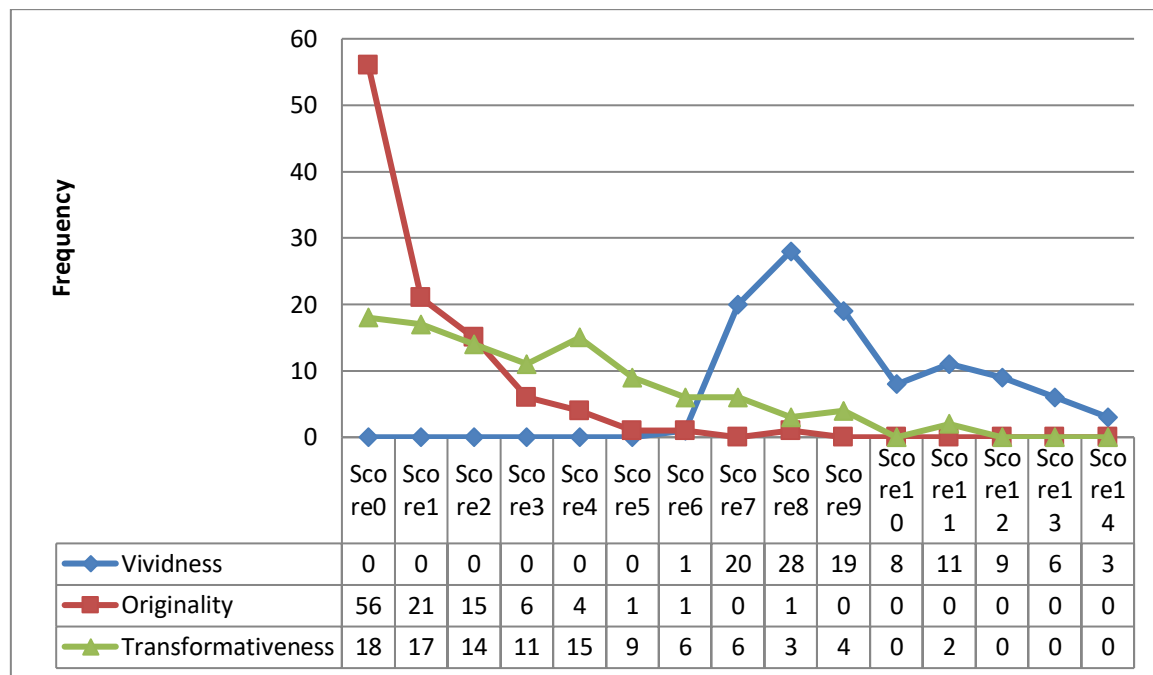


Figure 1 illustrates the distribution of scores obtained by participants on the three scales of the Test of Creative Imagery Abilities (TCIA): Vividness, Originality and Transformativeness.

Vividness: The Vividness scale shows a distribution that is skewed towards the upper end of the score range. This indicates a tendency for participants to score higher on vividness, suggesting that the majority of them are able to generate very detailed and elaborate mental images. Despite the presence of a few outliers, the mode of the distribution appears to be around 11 or 12, with a noticeable frequency of scores in the upper range and a few who managed to achieve even higher scores of 13 and above.

Originality: The originality scale, on the other hand, shows a distribution that is heavily skewed towards the lower end of the spectrum. This suggests that the challenge of generating unique and unusual imagery, particularly in an area where they can experiment with out-of-the-box mental imagery, has affected many of the participants. This is unfortunate because the ability to generate original forms of representation is very important in the acquisition of skills during training. It is therefore very important to help people develop this ability in the right way. The mode appears to be at the lowest score (0), which means that many scores for originality were well below average, with little or nothing original to indicate that their scores were clustered in this direction.

Transformativeness: The Transformativeness scale shows a distribution that is more balanced than the distributions of the other two scales, although it still shows a slight skew towards the lower scores. In particular, a few respondents scored higher, but this could not be generalised to the whole population. This outlines the situation of having a moderate level of ability to manipulate and transform mental images, unlike the previous two cases. However, this underlines the fact that the actual number of respondents who were able to achieve high scores was comparatively lower and this may have influenced the nature of the specific, suggesting that training in this specific area may have a noticeable impact on improving the transformativeness skills of participants.

Table 2. Academic Achievement Scores

		Score 0-49	Score 50-59	Score 60-69	Score 70-79	Score 80-89	Score 90-100	Mean	Std. Deviation
Turkish (native language)	f	9	6	15	14	23	38	79,32	16,53
	%	8,6	5,7	14,3	13,3	21,9	36,2		
English (foreign language)	f	14	12	10	16	14	39	76,93	18,95
	%	13,3	11,4	9,5	15,2	13,3	37,1		
Mathematics	f	10	11	10	13	17	44	79,09	18,91
	%	9,5	10,5	9,5	12,4	16,2	41,9		
Science	f	8	13	14	17	24	29	76,74	16,99
	%	7,6	12,4	13,3	16,2	22,9	27,6		

Table 2 is a detailed presentation and stepwise summary of students' academic performance and learning in various disciplines or subjects that are embarked on by students such as Turkish, English, Mathematics, and Science. Each subject has its own set of frequency and percentage distribution of scores, complemented by the mean and standard deviation for each subject. Within this document lies an at-a-glance elaboration of the academic performances of students in the aforementioned subjects as brought out in a lucid manner.

Based on the findings presented in Table 2, it is interesting to note that Turkish students who are native speakers appear to perform fairly well in their language, Turkish, as the mean score stands at a high of 79.32. This means an impressive 36.2% of the pupils managed to score between the 90-100 range, while another notable 21.9% managed scores between 80-89. These findings clearly indicate that there is a solid foundation and strong control of the Turkish language among the pupils in the class, thus showing the interest taken towards this subject by students in the learning institution. Such a consistency recorded by students in Turkish shows that the students recognize the significance of developing their native language skills as they form an integral part of their learning.

If we compare the performance of students in English as a foreign language in this assessment with that in the other subjects, we find a commendable performance, but it is still relatively low. The overall mean score for English was 76.93 out of 100, with the highest percentage of students in the upper band, where scores ranged from 90-100, being 37.1%. Interestingly, on the other hand, in the lower categories that affected the overall average, the mean score for English was similar to that for Turkish, with only a minority of students, 13.3%, scoring below 50. In particular, the results reflect the need for students to receive adequate English training to ensure that their results improve, unlike in the past.

In mathematics, the mean score achieved was 79.09, while the standard deviation was 18.91, indicating that although most students had average scores, a few had either very high or very low scores. The distribution of scores appears to be similar to other subjects in terms of difficulty, with the highest percentage of students scoring between 90 and 100 being 41.9% of the total. However, there is some cause for concern as the lowest score, between 0 and 49, is 9.5% of the total, suggesting that students' attitudes or understanding in this area of study may be low, negatively affecting their performance in this subject.

The subject of science showed a mean score of 76.74, which followed the trend of Turkish and mathematics. As a result, the majority of the students 27.6 and 22.9 showed a remarkable level of achievement in both categories of scoring around the range of 90-100 and 80-89 respectively. These results clearly indicate that a significant proportion of learners have achieved an excellent level of understanding

of scientific ideas in the vast majority of cases, coupled with an impressive level of concentration and excellence in their learning.

Table 3. LGS Scores

		Score 100- 199	Score 200- 249	Score 250- 299	Score 300- 349	Score 350- 399	Score 400- 449	Score 450- 500	Mean	Std. Deviation
Participant distribution according to LGS scores	f	1	11	19	17	28	15	14	349,74	77,92
	%	1,0	10,5	18,1	16,2	26,7	14,3	13,3		

In this analysis of student performance in relation to the LGS examination, all aspects relating to students are discussed and explained in detail. The table 3 gives a full explanation of all the distributions of LGS scores as they are given in different score ranges, starting from about 100 to about 199, up to the range of 450 and 500. In addition, the table provides an analysis of the mean and standard deviation of the LGS scores, which provides a basis for understanding the overall performance of students and the variation in individual scores.

From the analysis of the data in the table, a notable trend has been highlighted, as the clustering of scores is mainly evident in the upper score ranges. As this is easy to observe, a large number of students scored between 350 and 399, accounting for 26.7%, followed closely by those scoring between 400-449 and 450-500, accounting for 14.3% and 13.3% respectively, suggesting the remarkable performance of a large number of students in the LGS examination.

Another possible analysis of the available data on mean and standard deviation scores shows that the average LGS score recorded is an admirable 349.74 with a standard deviation of 77.92, showing how well distributed the students were, with most of them having scored above this mean, indicating that many students performed well. When such an impressive score and clustering of high scores results from the LGS examination, it means that there are bright students in the population and some of them are doing very well in the LGS.

Table 4. Gender Analysis I (Independent Sample t Test)

	Gender	n	Mean	sd	sd	t	p
Turkish (native language) Score	Male	52	73.30	17.09	103	-3.95	.000*
	Female	53	85.23	13.72			
Mathematics Score	Male	52	73.86	19.01	103	-2.90	.005*
	Female	53	84.22	17.52			
English (foreign language) Score	Male	52	73.93	18.91	103	-1.61	.109
	Female	53	79.86	18.71			
Science Score	Male	52	72.12	17.53	103	-2.86	.005
	Female	53	81.27	15.28			
LGS Score	Male	52	331.18	76.24	103	-2.48	.015
	Female	53	367.95	75.90			
Vividness	Male	52	8.54	1.61	103	-3.77	.000*
	Female	53	9.92	2.11			
Transformativeness	Male	52	2.29	2.11	103	-3.85	.000*
	Female	53	4.23	2.97			

*p<.05

An independent samples t-test was conducted to examine gender differences in academic achievement and creative imagery abilities. Female students scored significantly higher than male students on the Turkish (native language) test (female: $M = 85.23$, $SD = 13.72$; male: $M = 73.30$, $SD = 17.09$; $t(103) = -3.95$, $p < .001$). A similar pattern was found for Mathematics, where female students ($M = 84.22$, $SD = 17.52$) again outperformed male students ($M = 73.86$, $SD = 19.01$; $t(103) = -2.90$, $p = .005$). Likewise, on the Science test, female students ($M = 81.27$, $SD = 15.28$) achieved significantly higher scores than male students ($M = 72.12$, $SD = 17.53$; $t(103) = -2.86$, $p = .005$). However, although female students showed higher scores on the English (foreign language) test ($M = 79.86$, $SD = 18.71$) compared to male students ($M = 73.93$, $SD = 18.91$), this difference was not statistically significant ($t(103) = -1.61$, $p = .109$).

Regarding the LGS examination, a significant difference was observed between genders, with female students ($M = 367.95$, $SD = 75.90$) scoring considerably higher than male students ($M = 331.18$, $SD = 76.24$; $t(103) = -2.48$, $p = .015$).

In terms of creative imagery abilities, significant gender differences emerged in both Vividness (female: $M = 9.92$, $SD = 2.11$; male: $M = 8.54$, $SD = 1.61$; $t(103) = -3.77$, $p < .001$) and Transformativeness (female: $M = 4.23$, $SD = 2.97$; male: $M = 2.29$, $SD = 2.11$; $t(103) = -3.85$, $p < .001$). In both instances, female students demonstrated significantly higher scores compared to their male counterparts.

Table 5. Gender Analysis II (Mann Whitney U Test)

	Gender	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Originality	Male	52	50.13	2606.50	1228.50	2606.50	-1.05	.295
	Female	53	55.82	2958.50				

A Mann-Whitney U test was conducted to examine gender differences in Originality scores, which were non-normally distributed. No statistically significant difference was observed between male ($n = 52$, *Mean Rank* = 50.13, *Sum of Ranks* = 2606.50) and female students ($n = 53$, *Mean Rank* = 55.82, *Sum of Ranks* = 2958.50) on the Originality scale of the TCIA ($U = 1228.50$, $W = 2606.50$, $Z = -1.05$, $p = .295$).

Table 6. Correlation Analysis

		Female Students			Male Students		
		V**	O***	T**	V**	O***	T**
Turkish (native language) Score	Correlation	.124	-,122	.137	.395*	,231	.348*
	Sig. (2-tailed)	.375	,384	.327	.004	,100	.012
	N	53	53	53	52	52	52
Mathematics Score	Correlation	.149	-,046	.158	.393*	,184	.368*
	Sig. (2-tailed)	.286	,744	.259	.004	,191	.007
	N	53	53	53	52	52	52
English (foreign language) Score	Correlation	.150	-,013	.158	.375*	,346*	.323*
	Sig. (2-tailed)	.283	,924	.258	.006	,012	.020
	N	53	53	53	52	52	52
Science Score	Correlation	.179	-,101	.196	.407*	,267	.337*
	Sig. (2-tailed)	.200	,474	.159	.003	,056	.015
	N	53	53	53	52	52	52
LGS Score	Correlation	.181	-,066	.204	.415*	,270	.349*
	Sig. (2-tailed)	.194	,638	.143	.002	,053	.011
	N	53	53	53	52	52	52

*. Correlation is significant at the 0.05 level (2-tailed). **Pearson Correlation ***Spearman's rho Correlation

V: Vividness O: Originality T: Transformativeness

Table 6 delves into the intricate relationships between academic scores and LGS performance and the creative imagery ability dimensions of Vividness (V), Originality (O), and Transformativeness (T). The analysis is further stratified by gender, providing separate insights into male and female students, in addition to an overall assessment encompassing all students.

Focusing on **female students**, no statistically significant correlations were found between academic scores and LGS performance with Vividness, Originality, and Transformativeness.

Upon closer examination of the correlations between academic scores and creative imagery ability in **male students**, a more nuanced picture emerges.

The research outcomes point to the fact that there is a meaningful and significant correlation between the native Turkish scores of students and their two particular vividness aspects ($r = .395$, $p < .05$) and transformativeness ($r = .348$, $p < .05$). This indicates the fact that the students' language skills, as well as the advancement of their native language skills, may increase their creative images in students as proven by the results. This is indicative of the fact that if someone is more adept and more competent in their mother tongue, this can help the person in the image of the mind. On the other hand, it is significant to acknowledge that there was no statistically significant association shown in the research between the aspect of originality and the native Turkish language proficiency. This could mean that other issues could also contribute to the enhancement of creativity in this domain. Therefore, it would be imperative to check if these issues indeed could shape a student's creative capacity and take part in the education process.

The results of this research also demonstrate that there are statistically significant, moderate, positive relationships between the mathematics and science scores and vividness and transformability. The results in question include those pertaining to vividness ($r = .393$, $p < .05$ and $r = .407$, $p < .05$) and transformativeness ($r = .368$, $p < .05$ and $r = .337$, $p < .05$). This discovery indicates that students who possess sharp analytical thinking skills and strong scientific skills are able to establish specific vivid and transformative images that may be considered "re-creative" in nature. Contrary to intuition, originality does not appear to be strongly influenced by these two academic fields, as the results indicate a lack of interest.

Interestingly, the performance of English language learners as a foreign language shows a rather unique trend with the presence of significant positive correlations for the three fellow components of creative imagery namely Vividness where the correlation coefficient is $r.375$, $p < 0.05$ tagline, Originality where it recorded $r.346$, $p < 0.05$, and Transformativeness where it was found as $r.323$, $p < 0.05$. Indeed, this research finding implies that foreign language proficiency might perfectly have a wider scope for manifesting the impact in playing a vital role in the production of Vivid, Transformative, and Originality-like images in students using the English Language.

On the other hand, it is great to note that LGS scores which reflect overall academic achievement tend to also have a positive correlation with Vividness where the correlation coefficient is $r.415$, $p < 0.05$, and Transformativeness where it recorded $r.349$, $p < 0.05$. The above findings, therefore, suggest a link between general academic success and the two aspects of creative imagery namely Vividness and Transformativeness respectively with positive correlation coefficients above the average level of statistical bond.

These findings highlight the interrelationship involved between specific academic skills and the various dimensions of creative imagery abilities in male students. On the one hand, the results imply a consistent substantial relationship between general academic performance and two factors that characterize creative imagination that is Vividness and Transformativeness. However, it is acknowledged that Originality does not exhibit a certain direct link to academic achievement among men that requires further studies to unveil its true nature and whether there are factors that still contribute to such a connection.

Discussion

The research conducted in this study investigated the complex relationship between the creative imaging capabilities and academic performance of the eighth-grade students, especially paying attention to gender

differences. The careful assessment of the data provided some unique perspectives regarding the complex interactions between the creative imagery, academic success, and gender.

Our results led us to notice a noteworthy fact of the pronounced gender difference in creative imagery skills, which is statistically significant. Our results indicated that female students scored better than their male counterparts in both the Vividness and the Transformativeness dimensions. It supports previous studies that show that girls use more colored and emotional images in their mental activities than boys (Groyecka et al., 2020). However, even though there was a sizable and significant difference in the Vividness and the Transformativeness dimensions that were detected between both genders, the study did not find a statistically significant difference in the Originality scores. This finding was not corroborated by the results of other studies, which had reported significantly higher originality scores for males (Abraham et al., 2012). Reasons for the inconsistencies in these studies may belong to several areas and they deserve more attention. For further investigation potential research avenues can be the analysis of cultural aspects, the differences in learning environments, or the particular portions of the originality test used in the previous studies.

According to the findings of this particular study, it is observed that there are significant gender differences in respect of academic achievement of students in secondary schools within which the female students consistently performed exceedingly well more than their male counterparts in the study subjects of Turkish, Mathematics and Science. These results tallies with a growing of available literature that indicates a female advantage in the academic, especially in the fields based on language (Anderson & Graham, 2021). Nevertheless, it is very important to understand that this gender difference in academic performance appears to be generally subject to the particular subject that was being studied, the specific educational contexts under which the learners cat the given course and the existing cultural factors in the environment under which the students come from.

In addition, the specific study sought to establish the degree to which creative imagery abilities conferred a good performance among students regarding academic achievement scores when male and female students were analyzed separately. The research results were clear in that there exists a strong positive relationship between males' academic performance and their creative imagery, especially in Turkish, Mathematics, Science, and English subjects. The finding indicates that creative imagery, according to the results, appears to be an important and significant factor for the academic success of male learners. Conversely, findings from the current study revealed that there was no significant correlation in respect of the mean scores of female students, between creative imagery and academic performance. This unanticipated outcome requires further investigation so as to comprehensively appreciate the intricate and numerous factors contributing to the relationship between creative imagery and academic performance of female secondary school students.

This study adds to the existing body of literature that investigates the complicated relationship between creative imagery skills and academic success among individuals with varied creative abilities. This study reveals gender differences in creative imagery skills and academic performance that correspond to previous research findings. These results imply that female students tend to depict more controlled and emotionally involved vivid mental images in their imagination, whereas males may show the proclivity for creative and novel thought processes (Abraham et al., 2012; Groyecka et al., 2020). Nevertheless, the lack of a significant association between gender and originality scores indicates that the relationship between gender and originality might be more complicated than was previously assumed and may also be dictated by other factors.

This study reveals a strong association between creative imagination and academic success among male students, which is consistent with the outcomes of other studies claiming that creative imagery may be beneficial to such students by enhancing their problem-solving abilities, critical thinking ability, and creativity of innovative ideas that are imperative for academic success (Beaty et al., 2016). However, the study did not find a direct correlation between the aptitude for creative imagery and the level of academic achievement among female learners, pointing to a dearth of information regarding the variables that may give rise to the positive relationship between creative imagery and academic success in females. For further

research, it is advisable to take these variables into account and the interrelationships thereof as possibilities of elucidating the dissimilar trends in the male and female students under investigation. Possible variables that could interact with the effects of creative imagery and academic performance include the personal learning style, the motivation, and the self-efficacy of a user.

Conclusion

This study is significant as it offers deep insights and ideas which can lead to management and education methods and the way. Moreover, it goes far beyond the simple genesis of the relationships for eighth-graders on gender as well as creative imagery skills and academic skills, to empirically produce several important results that could possibly shake the very foundations of both educational practice and policy. This research indicates that there is a remarkable performance gap between the gender: the regular female eighth-grade students proved to be consistently better in the use of creative imagery, more particularly, in transformativeness as well as vividness, along with their solid performance in a relevant subject like English, science, and mathematics compared to their male counterparts. Moreover, the current results indicate that although these two aspects of development were significantly related to both female and male eighth graders' performance, the same were also connected in incredibly different and fascinating ways. There was, however, a major positive relationship between creative imagery and academic achievement among the male eighth graders, thus, giving strong proof of the point that creative imagery does in fact, significantly influence academic successes. Conversely, the same correlation between the two cognitive domains was not evident in the girls thus, making the observed results even more interesting as well as warranting further scrutiny on what could have been the cause of such a difference.

This notable discovery commands critical concerns regarding the underlying force driving the boys' and girls' academic success. A question worth asking is whether it is that so closely linked a connection between creative imagery and visualization that they are potent indicators of achievements in male students or is it perhaps that motivation and interest are more telling factors in attaining academic success for girls? Is it possible that these differences of cognitive styles are just a reflection of individual learning preferences e.g. men being more visual than women or are they related to male and female upbringing or the different ways schools would ask teachers to support students in their learning? It is therefore essential for researchers to investigate and elucidate these important issues so as to better comprehend the harmonious play of cognitive development, the peculiarities of individuals as well as sociocultural influences on the performance of students and also to locate directions for future research that would lend deeper awareness of such problems as well as help to find out ways ahead. The eventual mastery and comprehension of these subjects may in the long-run, play to the advantage of boys and girls as well as improved accommodation at the level of the learning processes in the educational system and the process of teaching and learning.

At the same time, the results of this study have major implications for the work of educators and educational institutions, challenging them to think critically about their own teaching and learning practices and strategies. In what ways can schools cultivate and enhance the creative imagery skills of eighth grade male and female students in order to create an optimal learning environment? Also, are the planning mechanisms for teaching tailored to meet the specific needs and promote the inherent potential of each gender? Looking at creative images, academic achievement and gender from a broader perspective, teachers and schools can aim to create an environment where the potential of each learner is harnessed and enhanced so that they become productive and positive contributors to society. However, through the careful and deliberate selection of creative learning programmes aimed at developing effective learning strategies for both genders, they can ensure that no student is left behind because of their gender. Overall, this study provides valuable insights not only into the relationships between individual cognitive qualities and learning outcomes, but also into how societies create opportunities for equity and inclusion, value diversity and recognise the diverse needs of all their members. Thus, this study provides remarkable insights into the relationship between creative visual thinking, academic achievement and the role of gender at the eighth grade level, and shows how to recognise the importance of these factors. Educational stakeholders need to consider how these findings can be applied and further extrapolated to create learning experiences that meet the needs of all students and enable them to thrive in school and succeed in life.

In addition, the descriptive statistics used to assess the phenomenon under analysis have brought to the fore a significant trend that cannot be dismissed. On a general premise, the results of the study have shown that the students have been able to put into practice their inner ability to explore the details and channel the processes of building extraordinary mental images that are absolutely in line with the inner aspects of the thinkers (high results in terms of vividness). However, the author points out that the students had extremely low scores for originality, which led to certain findings. The outlined results can be interpreted as a confirmation of the existing discrepancies in students' abilities, where inventiveness and the ability to explore new ideas are behind the photogenic ability to create on the basis of mental command. Such a conclusion becomes even more significant when the age characteristics of the eighth graders are taken into account, since these characteristics are in fact the basis for the formation of originality as one of the most important core competences, which includes critical thinking as well as problem-solving techniques, which are much needed for success in studies and in life in general in our lifetime.

Following the lines of an exploratory study, this paper is a call for a deeper understanding of the multidimensionality of the frameworks at play in determining students' likelihood of academic success. The urge to delve deeper into the issue points to the need to shift the emphasis from the trivial 'sedentary' inquiries to the complex ones that take into account the knowledge of individual learner differences. This opens up a field for the implementation of integrated training that takes into account the amazing possibilities of students' imaginative thinking and uses its potential to respond to the different needs of learners and to develop and refine their original ideas. Only in this way can we envisage an equitable education system that fosters originality and creativity and creates the conditions for the effective growth of future generations.

References

- Abraham, A., Pieritz, K., Thybusch, K., Rutter, B., Kröger, S., Schweckendiek, J., Stark, R., Windmann, S., & Hermann, C. (2012). Creativity and the brain: Uncovering the neural signature of conceptual expansion. *Neuropsychologia*, 50, 1906-1917.
- Abraham, A., Windmann, S., Daum, I., & Güntürkün, O. (2005). Conceptual expansion and creative imagery as a function of psychoticism. *Consciousness and Cognition*, Vol: 14, pp. 520-534.
- Abu-Akel, A., Webb, M.E., Montpellier, E., Bontivegni, S.V., Luechinger, L., Ishii, A., & Mohr, C. (2020). Autistic and positive schizotypal traits respectively predict better convergent and divergent thinking performance. *Thinking Skills and Creativity*, Vol: 36, pp. 1-14, <https://doi.org/10.1016/j.tsc.2020.100656>.
- Ahyani, A., Supriatno, B., & Surakusumah, W. (2021). Identification of creative imaginations of biology education students based on the wartegg test. *Journal of Physics: Conference Series*, 1806 (2021) 012168, doi:10.1088/1742-6596/1806/1/012168.
- Anderson, R. C., & Graham, M. (2021). Creative potential in flux: The leading role of originality during early adolescent development. *Thinking Skills and Creativity*, Vol: 40, 100813, pp. 1-12.
- Beaty, R.E., Benedek, M., Silvia, P.J., & Schacter, D.L. (2016). Creative cognition and brain network Dynamics. *Trends in Cognitive Sciences*, 20 (2), pp. 87-95.
- Blackmon, K.N. (2018). Creative self-efficacy and personality: From imagination to creativity. Unpublished Doctorate Thesis, University of North Texas, U.S.
- Bourgeois-Bougrine, S., Latorre, S., & Mourey, F. (2018). Promoting creative imagination of non-expressed needs: Exploring a combined approach to enhance design thinking. *Creativity Studies*, 11 (2), pp. 377-394.
- Campos, A., & Gonzalez, M. A. (1995). Effects of mental imagery on creative perception. *Journal of Mental Imagery*, Vol: 19, pp. 67-76.
- Chang, Y.S., Kao, J.Y., Wang, Y. Y., & Huang, S.C. (2021). Effects of cloud-based learning on student's engineering design creativity with different creative self-efficacy. *Thinking Skills and Creativity*, Vol: 40, 100813, pp. 1-12, <https://doi.org/10.1016/j.tsc.2021.100813>.
- Chiu, F.C. (2012). Fit between future thinking and future orientation on creative imagination. *Thinking Skills and Creativity*, Vol: 7, pp. 234-244.
- Cockbain, J., Vertolli, M.O., & Davies, J. (2014). Creative imagination is stable across technological media: The spore creature creator versus pencil and paper. *The Journal of Creative Behavior*, 48 (1), pp. 13-24.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155-159.
- Çakır, R., Korkmaz, Ö., İdil, Ö., & Erdoğan, F.U. (2021). The effect of robotic coding education on preschoolers' problem solving and creative thinking skills. *Thinking Skills and Creativity*, Vol: 40, 100812, pp. 1-13, <https://doi.org/10.1016/j.tsc.2021.100812>.
- Dikiy, I. S., Dikaya, L. A., Karpova, V.V., Lavreshina A.Y., & Kagramanyan, M.R. (2018). Psychological characteristics of art specialists with a highly productive creative imagination. *Psychology in Russia*, 11 (2), pp. 134-147.

- Duffy, B. (2006). Supporting creativity and imagination in the early years (2nd ed.). Berkshire, UK: McGraw-Hill Education.
- Dziedziejewicz, D., & Karwowski, M. (2015). Development of children's creative visual imagination: a theoretical model and enhancement programmes, *Education 3-13*, 43 (4), pp. 382-392, <https://doi.org/10.1080/03004279.2015.1020646>
- Dziedziejewicz, D., Oledzka, D., & Karwowski, M. (2013). Developing 4- to 6-year-old children's figural creativity using a doodle-book program. *Thinking Skills and Creativity*, Vol: 9, pp. 85-95.
- Fedyk, M. and Xu, F. (2021). Creativity as potentially valuable improbable constructions. *European Journal for Philosophy of Science*, 11 (27), pp. 1-27. <https://doi.org/10.1007/s13194-020-00343-4>.
- Frith, E., Elbich, D. B., Christensen, A. P., Rosenberg, M. D., Chen, Q., Kane, M. J., Silvia, P. J., Seli, P., & Beaty, R. E. (2021). Intelligence and creativity share a common cognitive and neural basis. *Journal of Experimental Psychology: General*, 150 (4), pp.609-632. <https://doi.org/10.1037/xge0000958>.
- Gajda, A., Beghetto, R. A., & Karwowski, M. (2017). Exploring creative learning in the classroom: A multi-method approach. *Thinking Skills and Creativity*, Vol. 24, pp. 250-267.
- Ganiev, A.G., & Tashev, S.N. (2021). The role of "imagination" in the process of "creative thinking": Developing students' "imagination" and "creative thinking" skills in teaching physics. *Psychology and Education*, 58 (1), pp. 3569-3575.
- Garcia, J. G., & Mukhopadhyay, T. P. (2019). The role and efficacy of creative imagination in concept formation: A study of variables for children in Primary School. *Education Sciences*, 9 (3), pp. 1-18, doi:10.3390/educsci9030175.
- Groyecka-Bernard, A., Karwowski, M., & Sorokowski, P. (2021). Creative thinking components as tools for reducing prejudice: Evidence from experimental studies on adolescents. *Thinking Skills and Creativity*, Vol: 39, 100779, <https://doi.org/10.1016/j.tsc.2020.100779>.
- Groyecka, A., Gajda, A., Jankowska, D.M., Sorokowski, P., & Karwowski, M. (2020). On the benefits of thinking creatively: Why does creativity training strengthen intercultural sensitivity among children. *Thinking Skills and Creativity*, Vol. 37, pp. 1-8, <https://doi.org/10.1016/j.tsc.2020.100693>.
- Gündoğan, A., Ari, M., & Gönen, M. (2013). The effect of drama on the creative imagination of children in different age groups. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 28 (2), pp. 206-220.
- Horng, R.Y., Wang, C.W., Yen, Y.C., Lu, C.Y., & Li, C.T. (2021). A behavioural measure of imagination based on conceptual combination theory. *Creativity Research Journal*, <https://doi.org/10.1080/10400419.2021.1943136>.
- Hui, P.P., Chiu, W.C.K., Pang, E., Coombes, J., & Tse, D.Y.P. (2021). Seeing through and breaking through: The role of perspective taking in the relationship between creativity and moral reasoning. *Journal of Business Ethics*, <https://doi.org/10.1007/s10551-021-04876-3>.
- James, K., & Asmus, C. (2001). Personality, cognitive skills, and creativity in different life domains. *Creativity Research Journal*, Vol: 13, pp. 149-159.
- Jankowska, D. M., & Karwowski, M. (2015). Measuring creative imagery abilities. *Frontiers in Psychology*, 6, 1591. <https://doi.org/10.3389/fpsyg.2015.01591>
- Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159-174.
- Liang, C., Hsu, Y., Chang, C. C., & Lin, L. J. (2013). In search of an index of imagination for virtual experience designers. *International Journal of Technology and Design Education*, Vol: 23, pp. 1037-1046.
- Lindwall, A., & Nilsson, A. W. (2021). Exploring creativity management of design for additive manufacturing. *International Journal of Design Creativity and Innovation*, <https://doi.org/10.1080/21650349.2021.1951359>
- Makarevicz, V., & Ilisko, D. (2018). Creative imagination and its development in ontogenesis. *Rural Environment. Education. Personality*, Vol: 11, pp. 223-229.
- Mellou, E. (1996). Can creativity be nurtured in young children?. *Early Child Development and Care*, Vol: 119, pp. 119-30.
- Navikova, E. (2019). Comparative analysis of results of the pedagogical experiment on creative imagination development in speech impaired preschool children. *SHS Web of Conferences* 69, 00085, <https://doi.org/10.1051/shsconf/20196900085>.
- Ness, I. J., & Dysthe, O. (2020). Polyphonic imagination: Understanding idea generation in multidisciplinary groups as a multivoiced stimulation of fantasy. *Creativity Research Journal*, 32 (1), pp. 30-40, <https://doi.org/10.1080/10400419.2020.1712163>
- Nurchayono, N. A., Suryadi, D., & Prabawanto, S. (2019). Analysis of students' mathematical imagination ability in solving problems. *Journal of Physics: Conference Series*, 1179, doi:10.1088/1742-6596/1179/1/012044
- Palmiero, M., Nori, R., Aloisi, V., Ferrara, M., & Piccardi, L. (2015). Domain-specificity of creativity: a study on the relationship between visual creativity and visual mental imagery. *Frontiers in Psychology*, Vol: 6, pp. 1870-1870.
- Perrone, R. (2014). Relating creativity and imagination: Studying collective models of creative collaboration. *American Journal of Educational Research*, 2 (10), pp. 975-980
- Plucker J.A., Makel M.C. (2010). Assessment of Creativity. In J.C. Kaufman, J. Sternberg (Eds.). *The Handbook of Creativity*. Cambridge Handbooks of Psychology. UK: Cambridge University Press, pp. 48-73.
- Ren, F., Li, X., Zhang, H., & Wang, L. (2012) Progression of Chinese students' creative imagination from Elementary through High School. *International Journal of Science Education*, 34 (13), pp. 2043-2059, <https://doi.org/10.1080/09500693.2012.709334>
- Shen, T. (2012). Inspiring the creativity and imagination of university students during creative curriculum by teaching design. *Procedia - Social and Behavioral Sciences*, Vol: 45, pp. 615-620.

- Shevlin, H. (2021). Rethinking creative intelligence: comparative psychology and the concept of creativity. *European Journal for Philosophy of Science*, 11 (16), pp. 1-21, <https://doi.org/10.1007/s13194-020-00323-8>.
- Sternberg, R.J., & Kaufman, J.C. (2010). Constraints on creativity. In J.C. Kaufman & R.J. Sternberg, (Eds.). *The Cambridge handbook of creativity* (pp. 467-482). Cambridge University Press.
- Tsai, K. C. (2012). Play, imagination, and creativity: A brief literature review. *Journal of Education and Learning*, 1 (2), pp. 15-20.
- Viney, M. W. (2013). An investigation of imagination in public education. Unpublished Master Thesis, Colorado State University, U.S.
- Yazgan, A. D. (2021). Investigation of the relationship between pre-service teachers' lateral thinking levels and problem-solving skills. *Kuramsal Eğitim Bilim Dergisi [Journal of Theoretical Educational Science]*, 14(1), pp. 20-37. <https://doi.org/10.30831/akukeg.793247>
- Zabelina, D.L., Friedman, N.P., & Andrews-Hanna, J. (2019). Unity and diversity of executive functions in creativity. *Consciousness and Cognition*, Vol: 68, pp. 47-56.
- Zhang, H., & Chen, L. (2014). A study on the impact of science venues upon Chinese students' creative imagination. *Proceedings of PICMET '14: Infrastructure and Service Integration*, pp. 447-451.

Appendix 1. Drawing Samples of Participants (Each drawing features a image in the upper left corner designed to encourage creative imagery in students.)

