

# IS THERE A LINK BETWEEN CREATIVITY AND SCHOOL GRADES? RESEARCH WITH 9<sup>TH</sup> GRADE STUDENTS

Līga Roķe<sup>1</sup>

Riga Teacher Training and Educational Management Academy, Latvia University, Latvia

Emīls Kālis

Riga Teacher Training and Educational Management Academy, Daugavpils University, Latvia

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**Abstract. Background and Purpose.** The present study aimed to explore the relationship between creativity and school grades. **Material and Methods.** Creativity was measured by the Test for Creative Thinking – Drawing Production (TCT-DP) (Urban & Jellen, 2010). The participants (sample) consisted of 180 ninth grade students (104 females) with mean age of 15.1 years. **Results.** Both boys and girls with higher creative potential score in TCT-DP showed higher average school grade. The tendency was depicted that school grades in the subjects of natural sciences (except in geography) and arts relate most closely to creativity. Although no significant gender differences were found in any of the subjects, boys tended to show higher correlations. The general trend in the relationship between separate TCT-DP criteria and school grades is that the ability to draw a picture with strong expressive power, to make additions to the used elements, to compose a theme or gestalt of the given elements and to break away from two-dimensionality is significantly related to the average school grade independently of the gender. **Conclusion.** The results give grounds for further exploration of students' creativity in relation to the academic performance assessed by teachers.

**Keywords:** creativity, school grades, school subjects, gender differences.

## INTRODUCTION

The research on the relationship between creativity and academic achievement has been taking place since 1960s; nevertheless, the results are ambiguous. Discussions and research on this relation has ceased in the last decade, but the topic of the creativity's role in schooling results

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<sup>1</sup> Address for correspondence: Latvia University, Riga Teacher Training and Educational Management Academy, Scientific Research Institute of Pedagogy and Psychology, Imantas 7.liniija 1, Riga, Latvia, LV-1083. Phone: +371 26315685. E-mail: liga.roke@rpiva.lv.

is important still. Creativity is one of the challenges in the educational systems, and this paper aims to continue research on the possible contribution of creative abilities to the academic performance of students. Mainly because it can tell us much about the role of creativity in educational process and about opportunities that students are directly or indirectly given in order to put stimulate their creative abilities in acquiring new knowledge and learning skills. Apart from that, research on creativity and academic achievement is important in order to expand our understanding of factors which moderate creativity and school grades like gender, teaching style, assessment methods, students' personality variables, class composition variables, peer pressure, etc. Finally, ambiguous results in previous research point to the necessity to delve into the issue again, moreover, such a research has not been carried out in Latvia before.

Getzels and Jackson (1962) were the first who reported results of the research on the role of creativity in school results. Their findings were complemented by Torrance (1962), Yamamoto (1964) and Asha (1980), concluding that highly creative students performed as well or even better than low creativity students when the effect of intelligence was controlled. On the other side, there are also a number of researches which did not observe the relationship between creativity and academic achievement (Edwards & Tyler, 1966; Kim & William, 1993). During his research, Sierwald (1989) found negative (-.12) correlation between creativity test scores and school grades in the case of physics and surprisingly it was only .26 for arts. There are findings that reveal creativity to be related to higher levels of academic achievement in those subjects and tasks which require divergent and productive ability (Shin & Jacobs, 1973). More recent research showed correlation between creativity and school performance to be around  $r=.25$  for 9<sup>th</sup>-11<sup>th</sup> grade students in Germany, whereas correlation between creativity and intelligence was around .14 (Rindermann & Neubauer, 2004). Creativity predicted school performance in French and math among 8-12 years old children in Belgium – TTCT-Figural fluency, originality and flexibility had significant effects on performance scores for 12 year-olds, whereas only TTCT-Verbal flexibility predicted school performance for 8 year-olds (Hansenne & Legrand, 2012). Researchers in Pakistan compared creative thinking test results for high and low achievers in 10<sup>th</sup> grade and found out that differences

between samples were not statistically significant (Anwar, Shamim-ur-Rasool & Haq, 2012). Using multilevel analysis, it has become possible to explore the impact of different contextual factors (e.g., group influence, peer pressure, personality dimensions, etc.) on relationship between creativity and academic achievement. The research carried out in Poland recently showed that creative abilities did not correlate with students' Grade Point Average (GPA), but after of grouping students into classes, the multilevel control demonstrated potentially important differences: from positive strong and statistically significant to non-existent or negative ones (Gralewski & Karwowski, 2012). As we can see, the results obtained in researches are mixed and still do not present a clear picture.

Some researchers propose that contradictory results on the relationship between creativity and school grades are due to gender differences (Ai, 1999). For example, Asha (1980) in his study found highly significant correlation between creativity and academic achievement among boys and less significant trend among girls; nevertheless, no separate academic subject areas were taken into consideration. Ai (1999) found out that different aspects of creativity and different academic subject areas mattered for boys and girls. Niaz, de Nuez and de Pineda (2000) concluded that the strength of relationship between creativity and school grades differed for different aspects of creative abilities: elaboration correlated strongly with school grades, whereas moderately with fluency, flexibility and originality, and strength of the correlation varied for different school subjects. After all, inconsistencies between the findings in relationship between creativity and academic achievement might be due to different test batteries used for creativity measurement (Ai, 1999).

Torrance Tests of Creative Thinking (TTCT) is one of the most often used battery for the assessment of creative thinking abilities, although recent publications include grounded objections to the validity of the TTCT (Almeida, Prieto, Ferrando, Oliveira, & Ferrandiz, 2008; Silvia et al., 2008), and the administration of these tests is very time-consuming. One of the recently developed creativity tests which try to avoid problems occurring with other creative thinking tests, is Test for Creative Thinking – Drawing Production (TCT-DP) developed by Urban and Jellen (2010). TCT-DP is a picture type test which assesses not only quantitative aspects of creative thinking (number of ideas, originality, etc.) but also qualitative aspects like wholeness, synthesis of elements, composition,

etc. The authors propose that TCT-DP is measuring creative potential in general, not only creative thinking abilities, since it includes criteria like boundary breaking, theme creation, humour and affectivity, symbolism and unusual manipulation. Good reliability and validity estimates, easy administration and wide range of measured creativity criteria were the reasons this test was chosen for the present research. The strength of TCT-DP is its applicability which is independent of respondents' drawing abilities and skills.

## **AIM OF THE STUDY**

Aim of the present study was to examine the relationship between creativity and school grades and to explore gender differences in these relationships.

## **MATERIALS AND METHODS**

### ***Participants***

The sample consisted of 180 students (58% girls) aged between 14 and 18 years ( $M=15.01$ ;  $SD=.35$ ). All of the students were in the 9<sup>th</sup> grade. The study involved students from 9 schools in big cities, towns and rural municipalities in Latvia.

### ***Instruments***

*Creativity*. Test for Creative Thinking – Drawing Production (TCT-DP; Urban & Jellen, 2010) consists of six figural fragments and a big square frame which is also an important element of the instrument. The subjects are asked to finish the uncompleted drawing begun by somebody, in whatever way they wish.

The drawings are assessed within 14 criteria: Continuations (*1Cn*), Completions (*2Cm*), New elements (*3Ne*), Connections made with a line (*4Cl*), Connections made to produce a theme (*5Cth*), Boundary breaking that is fragment dependent (*6Bfd*), Boundary breaking that is fragment independent (*7Bfi*), Perspective (*8Pe*), Humour and affectivity (*9*) with subcriteria of Humour (*9Hu*), Affectivity and emotions (*9E*), and Expressiveness (*9Z*), Unconventionality A – Unusual manipulation with test sheet (*10Uca*), Unconventionality B – Symbolism/Surrealism themes

(*11Ucb*), Unconventionality C – using signs (letters, numbers, etc.) to complement drawing (*12Ucc*), Unconventionality D – originality (*13Ucd*), Speed (*14Sp*).

The total score (*15Tot*) is calculated as the sum of these criteria. Test has two parallel forms A and B, and it is recommended to use both of them (Urban & Jellen, 2010) in order to acquire more reliable results.

The test was adapted in Latvia in 2011, showing inter-rater reliability between 0.796 and .988 for test criteria and .983 for the total score (Kālis, Krūmiņa & Rože, 2012).

*School grades.* The school grades in all school subjects and an average school grade from the semester following the research were used as a measure of academic achievement (GPA is not used as an indicator of academic achievement in Latvian school system).

### **Procedure**

TCT-DP was administered frontally during regular classes in the autumn of 2011. Testing lasted for approximately 35 minutes. The instruction was read aloud (it was not included in the written form). Two researchers were administering the testing since students working tempo or speed were different and it was essential to record the task completion time for each student. Time limit for the completion of each form was 15 minutes, but researchers did not stress limitations in time as in the instruction. When the first student completed the task, it was announced to the class that students could add the name of their drawing if they wished and if they found it useful to communicate their idea. The second test form was given to students right after they finished the first one with an instruction to continue the work as in the first task. Test was administered during the regular school hours, mostly in the first part of the day.

Information about school grades was obtained from class teachers at the end of the semester.

Descriptive statistics and reliability was calculated using R statistics (R Core Team, 2012) package *psych* (Revelle, 2012), while other procedures were conducted with *MPLUS Version 7* (Muthén & Muthén, 1998-2012).

## RESULTS

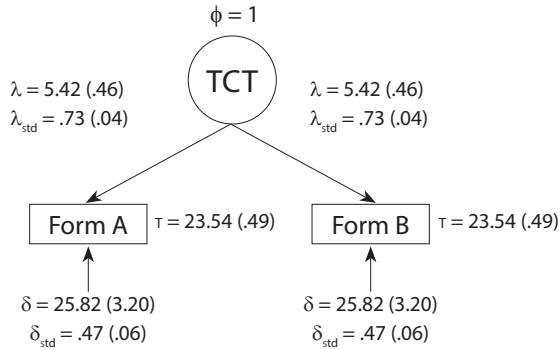
Inter-rater reliability was calculated following the procedure suggested by Raykov and Macoulides (2011, pp. 160–168) where reliability is obtained by dividing true variance by total variance. High reliability was found for the total TCT-DP score ( $\rho=.967$ , 99% confidence interval  $\rho=.959-.976$ ) and also for 13 criteria ( $\rho=.793-.981$ ), except for Speed (14Sp). Descriptive statistics for the TCT-DP total score and school grades is presented in Table 1. It shows that girls have higher TCT-DP results as well as higher average school grade compared to boys. What is more the highest score gained in girls sample is almost 10 points higher compared to boys.

**Table 1.** *Descriptive Statistics of the TCT-DP Total Score and Average School Grade among 9th Grade Students*

	M	SD	Min	Max
TCT-DP total score				
Total sample (N=180)	23.42	6.50	9.17	45.50
Boys (n=76)	22.07	6.37	9.17	35.67
Girls (n=104)	24.46	6.42	13.83	45.50
Average school grade				
Total sample (N=180)	6.61	1.21	3.4	9.56
Boys (n=76)	6.16	1.24	3.4	8.71
Girls (n=104)	6.94	1.09	3.6	9.56

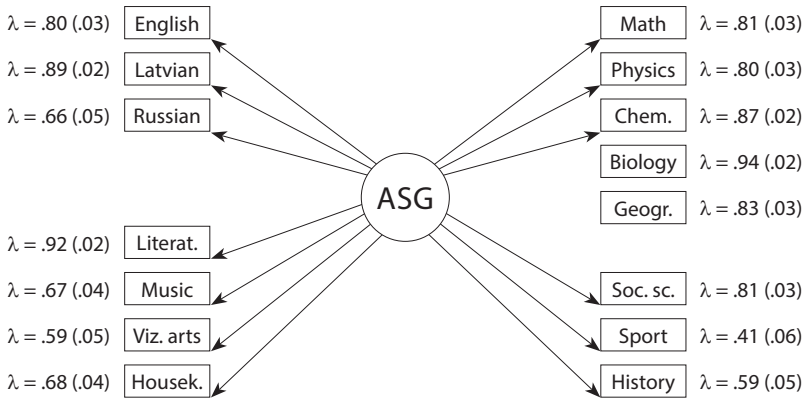
*Note.* TCT-DP: Test for Creative Thinking – Drawing Production; M – mean, SD – standard deviation, Min – minimum value, Max – maximum value.

In order to calculate correlations between TCT-DP score and school grades, Structural Equation Modeling (SEM) methodology was applied, thus, getting more accurate estimates where true variance is separated from error variance. Measurement models for the TCT-DP measures were specified according to the models obtained in the norm sample – equal factor loadings and intercepts across form A and B results were considered as good or acceptable fit for actual data, e.g. model fit for the total score of the TCT-DP:  $\chi^2=.413$ ,  $df=2$ ,  $p=.813$ ;  $RMSEA=.000$  (.00–.09);  $CFI=1.00$ ;  $TLI=1.018$ ;  $SRMR=.038$  (Figure 1).



**Figure 1.** Measurement model of the TCT-DP. Note.  $\phi$  – factor variance,  $\lambda$  – factor loadings,  $\tau$  – indicator intercepts,  $\delta$  – error variances, subscript *std* is for standardized parameters.

Average school grade (ASG) was obtained by bringing all subject grades into one factor model (Figure 2) under the assumption that the factor represents ASG and is the cause of fluctuation of grades in all subjects. After specifying correlations between some subjects (the largest correlation which is not accounted for by factor was found between visual art and music – .34 ( $p < .01$ )), a good model fit was obtained ( $\chi^2 = 86.62$ ,  $df = 68$ ,  $p = .063$ ;  $RMSEA = .045$  (.00-.07);  $CFI = .997$ ;  $TLI = .995$ ;  $WRMR = .481$ ).



**Figure 2.** Measurement model of Average school grade (ASG). Note.  $\Phi$  – factor variance,  $\lambda$  – factor loadings (standardized). Specified error covariances between subjects are not shown.

Measurement models for separate subject categories were also created by joining relevant school subjects in such groups: a) Foundations of sciences group included mathematics, physics, chemistry, biology and geography; b) Languages group included Latvian, English and Russian; c) Art group was created from Latvian literature, Music, Visual art and Housekeeping, d) Human and Society subjects group contained only two school subjects – history and social sciences. After the specification of models, correlations between measurement models were estimated – between the total TCT-DP score and all school subjects (Table 2), and between each criterion of the TCT-DP and four groups of school subjects (Table 3). Estimation of parameters for genders was performed employing Multiple Indicators Multiple Causes (MIMIC) (Confirmatory Factor Analysis (CFA) with covariates) model. Gender differences were tested with  $\chi^2$  test by comparing the model where correlation between measures is fixed for both genders versus the model where correlation is freely estimated for each group. Gender differences for means were also tested applying MIMIC model.  $\chi^2$  difference test revealed that girls outperformed boys in TCT-DP total score ( $\chi^2(1)=7.63$ ,  $p=.006$ ) and in ASG ( $\chi^2(1)=12.71$ ,  $p=.001$ ).

*Correlations between creativity score and school grades.* In SEM, completely standardized covariations ( $\phi$ ) between latent variables are interpreted as usual correlations (Brown, 2006, p. 54). Table 2 shows correlations between TCT-DP scores and ASG for boys and girls, and between TCT-DP scores and school grades in separate school subjects (school grades were used as category variables in calculations). Gender differences between these correlations were calculated with Chi-square difference test comparing original model to the model with equal restrictions for both genders in regard to covariance.

The correlation between the TCT-DP total score and ASG for the total sample is moderate and statistically significant ( $\phi$  (179) =.35,  $p<.01$ ), whereas it is  $\phi=.33$  ( $p<.01$ ) for boys and  $\phi=.26$  ( $p<.01$ ) for girls sample. Correlations between TCT-DP and grades for almost all school subjects are statistically significant varying from low to moderate, except for geography ( $\phi=.10$ ,  $p>.05$ ) and sports ( $\phi=.08$ ,  $p>.05$ ). This result is as an indicator of TCT-DP validity, since geography is a subject where the acquisition of factual knowledge plays the most important role, and sports grade is not supposed to have relation to creativity. Among the four



defined groups of school subjects the Art group has the highest correlation with the total TCT-DP score ( $\varphi=.39, p<.05$ ), followed by Languages group ( $\varphi=.34, p<.01$ ), Foundations of sciences group ( $\varphi=.33, p<.01$ ) and Human and Society subjects group ( $\varphi=.33, p<.01$ ).

**Table 2.** Completely Standardized Covariations or Correlation ( $\varphi$ ) between TCT-DP Total Score and School Grades

School subjects	$\varphi$ (S.E.) (N=180)	$\varphi$ (S.E.) (boys, n=76)	$\varphi$ (S.E.) (girls, n=104)
Average School Grade (ASG)	.35 (.08)**	.33 (.12)**	.26 (.11)*
Foundations of sciences	.33 (.08)**	.32 (.12)*	.25 (.10)*
Mathematics	.29 (.09)**	.39 (.13)**	.19 (.12)
Physics	.27 (.08)**	.30 (.12)*	.22 (.11)*
Chemistry	.36 (.08)**	.36 (.13)**	.25 (.11)*
Biology	.36 (.07)**	.30 (.13)*	.30 (.11)**
Geography	.10 (.09)	.02 (.13)	.07 (.11)
Languages	.34 (.09)**	.29 (.13)*	.29 (.12)*
Latvian	.30 (.08)**	.27 (.14)	.20 (.12)
English	.29 (.09)**	.30 (.14)*	.20 (.11)
Russian	.20 (.09)*	.11 (.15)	.21 (.11)
Art subjects	.39 (.09)*	.30 (.13)*	.29 (.12)*
Latvian literature	.33 (.08)**	.30 (.13)*	.23 (.12)
Music	.21 (.09)*	.10 (.12)	.11 (.13)
Visual arts	.31 (.08)**	.22 (.13)	.26 (.12)*
Housekeeping	.35 (.08)**	.32 (.12)**	.27 (.12)*
Human and society	.33 (.08)**	.23 (.12)	.28 (.12)*
History	.30 (.08)**	.21 (.12)	.31 (.11)**
Social sciences	.25 (.09)*	.22 (.12)	.16 (.13)
Sports	.08 (.10)	.15 (.16)	.13 (.13)

Note. TCT-DP: Test for Creative Thinking – Drawing Production; \* $p<.05$ ; \*\* $p<.01$ ;

The highest correlation in the Foundations of sciences group is between TCT-DP score and school grade in biology and chemistry ( $\varphi=.36, p<.01$ ). In mathematics the TCT-DP scores and the school grades do not

correlate significantly among girls in contrast to boys ( $\varphi=.19$ ,  $p>.05$  versus  $\varphi=.39$ ,  $p<.05$ ). Boys do also have higher correlation coefficients between TCT-DP score and grades in physics ( $\varphi=.30$ ,  $p<.05$  versus  $\varphi=.22$ ,  $p<.05$ ) and chemistry ( $\varphi=.36$ ,  $p<.01$  versus  $\varphi=.25$ ,  $p<.05$ ).

In the Languages group, TCT-DP score and school grades do not correlate significantly neither for girls, nor for boys, except in English where boys show statistically significant correlation ( $\varphi=.30$ ,  $p<.05$ ) in contrast to girls ( $\varphi=.20$ ,  $p>.05$ ).

The highest correlation in the Art group is observed between TCT-DP score and grade in housekeeping ( $\varphi=.35$ ,  $p<.01$ ) and Latvian literature ( $\varphi=.33$ ,  $p<.01$ ), and the lowest – between TCT-DP score and grade in music ( $\varphi=.21$ ,  $p<.05$ ). Correlations by gender groups show that TCT-DP has no correlation with Music grade neither for boys, nor for girls ( $\varphi=.10$ ,  $\varphi=.11$ ). This tendency is worth serious attention, since Music is the subject where creative abilities can be substantially expressed, as well as evaluated. Only boys have significant correlation between TCT-DP and grade in Latvian literature ( $\varphi=.30$ ,  $p<.05$ ), whereas only girls have significant relationship between TCT-DP score and visual arts ( $\varphi=.26$ ,  $p<.05$ ). Visual arts are one of the very few school subjects where girls show higher correlation between schooling results and TCT-DP score compared to boys.

There are significant weak correlations in the Human and Society subjects group between school grades and TCT-DP results for all subjects except sports. No statistically significant gender differences were found in the correlations between TCT-DP scores and ASG, and between TCT-DP scores and school grades in separate school subjects.

*Creative thinking indicators and school grades.* In order to find out more about the creativity indicators or criteria as measured by TCT-DP in relation to school grades, the correlations between 14 TCT-DP criteria, ASG, and average school grade in four groups of subjects, as well as gender differences in these correlations were calculated. The results of the correlations in the total sample are depicted in Table 3, with gender differences added in the notes under the table.

ASG of 9th grade students correlates most closely with the sub-criterion of Expressiveness (9Z) ( $\varphi=.43$ ,  $p<.01$ ), Completions (2Cm) ( $\varphi=.41$ ,  $p<.01$ ), summary criterion of Humour and affectivity (9) ( $\varphi=.37$ ,  $p<.01$ ), New elements (3Ne) ( $\varphi=.31$ ,  $p<.09$ ), Connections made with a theme

(5Cth) ( $\varphi=.37, p<.01$ ) and Perspective (8Pe) ( $\varphi=.34, p<.01$ ), and slightly – with criterion of Connections made with a line (4Cl) ( $\varphi=.23, p<.05$ ). Thus, the ability to draw a picture with strong expressive power, to make additions to the used elements, to compose a theme of gestalt of the given elements and to break away from two-dimensionality is significantly related to the school grades obtained by 9th grade students. Other criteria do not have significant correlation with ASG, except those where gender differences were found: significantly negative correlation was observed between Speed (14Sp) and ASG for boys ( $\varphi=-.33, p<.01$ ), whereas no correlation was found for girls ( $\varphi=.11, p>.05$ ); Symbolism (11UcbSi) has positive significant correlation with ASG in boys sample ( $\varphi=.28, p<.05$ ) but it was not significant for girls ( $\varphi=-.13, p>.05$ ).

A similar trend is observed for the correlations between TCT-DP criteria and average school grade in four subject groups, i.e., summary criterion of Humour and Affectivity (9), Completions (2Cm), Connections made with a theme (5Cth), Perspective (8Pe), New elements (3Ne) and Originality (13Ucd) have significant and relatively high correlations with school grades in all four subject groups. More specifically, making completions to the given elements (2Cm) correlates most closely with the school grade in Languages group ( $\varphi=.43, p<.01$ ), but Adding new elements (3Ne), Composing theme from given and new elements (5Cth), Making perspective (8Pe) and Making the drawing expressive (9Z) correlates most closely with the school grade in Art subjects ( $\varphi=.39, p<.01$ ;  $\varphi=.42, p<.01$ ;  $\varphi=.45, p<.01$ ;  $\varphi=.48, p<.01$ ). Sub-criterion of originality (13Ucd) correlates most closely with the school grade in Foundations of sciences subjects ( $\varphi=.43, p<.01$ ). When analysing the sub-criteria of 9, only the expressiveness of drawing (9Z) has significant correlations with school grades, whereas the Humour and Affectivity sub-criteria do not correlate with school grades. It is worth noting that criterion of Speed (14Sp) significantly and negatively correlates with school grades, more specifically – with school grade in Foundations of sciences subjects ( $\varphi=-.22, p<.01$ ) and Languages subjects ( $\varphi=-.21, p<.05$ ), but not in Arts, and Human and Society subjects. The criterion of speed is an indicator of task motivation and involvement, that is, students who tended to spend more time on drawing could be more interested and put more effort into the task. Other TCT-DP criteria have insignificant positive or negative correlations with the school grade in four subject groups and ASG.

**Table 3.** Completely Standardized Covariations or Correlations ( $\varphi$ ) between 14 Criteria of the TCT-DP and Mean Grades in Four Groups of School Subjects and Average School Grade (ASG)

Criteria	Science $\varphi$ (S.E.)	Lang $\varphi$ (S.E.)	Art $\varphi$ (S.E.)	Hum $\varphi$ (S.E.)	ASG $\varphi$ (S.E.)
1Cn	-.07 (.08)	-.08 (.10)	-.05 (.08)	-.06 (.09)	-.04 (.09)
2Cm	.35** (.09)	.43** (.11)	.40** (.10)	.39** (.10)	.41** (.10)
3Ne	.35** (.05)	.23* (.11)	.39** (.09)	.33** (.10)	.31** (.09)
4Cl	.29** (.08)	.19 (.10)	.25** (.09)	.26** (.10)	.23* (.10)
5Cth	.38** (.08)	.33** (.09)	.43** (.08)	.37** (.08)	.37** (.08)
6Bfd	-.10 (.07)	-.11 (.09)	-.11 (.08)	-.13 (.09)	-.13 (.08)
7Bfi	-.05 (.07)	.09 (.10)	-.05 (.09)	-.09 (.14)	.03 (.09)
8Pe	.29** (.09)	.35** (.10)	.45** (.08)	.35** (.09)	.34** (.09)
9	.34** (.08)	.37** (.08)	.42** (.08)	.34** (.09)	.37** (.08)
9Hu	-.02 (.09)	.19 (.11)	-.02 (.10)	.08 (.09)	.18 (.10)
9E	-.12 (.09)	.04 (.10)	-.10 (.10) <sup>A1</sup>	-.01 (.08) <sup>A2</sup>	.06 (.10)
9Z	.44** (.07)	.42** (.08)	.48** (.07)	.39** (.08)	.43** (.07)
10Uca	-.05 (.09)	-.02 (.10)	-.16 (.09)	-.13 (.10)	-.05 (.10)
11Ucb	-.14 (.10)	-.03 (.10)	-.15 (.12)	-.05 (.10)	-.07 (.10)
11UcbSi	.13 (.07)	.07 (.08)	.12 (.09) <sup>A3</sup>	.13 (.09)	.08 (.08) <sup>A4</sup>
11UcbSur	-.12 (.08)	.06 (.09)	-.06 (.09)	-.02 (.09)	-.02 (.09)
11UcbFa	-.17 (.09)	.00 (.10)	-.22* (.09) <sup>A5</sup>	-.17 (.09) <sup>A6</sup>	-.06 (.10)
12Ucc	.02 (.10)	.14 (.12)	-.06 (.10)	-.02 (.07)	.13 (.11)
13Ucd	.43** (.11)	.29* (.14)	.32** (.12)	.27* (.13)	.25 (.13)
14Sp	-.22** (.08)	-.21* (.10) <sup>A7</sup>	-.04 (.09)	.00 (.06)	-.15 (.09) <sup>A8</sup>

Note. A – significant gender differences (m – male, f – female): A1 ( $m = -.39^{**} (.12)$ ,  $f = .04 (.11)$ ); A2 ( $m = -.31^{**} (.11)$ ,  $f = .26^* (.10)$ ); A3 ( $m = .30^* (.12)$ ,  $f = -.11 (.11)$ ); A4 ( $m = .28^* (.13)$ ,  $f = -.13 (.09)$ ); A5 ( $m = -.43^{**} (.13)$ ,  $f = .07 (.11)$ ); A6 ( $m = -.39^{**} (.11)$ ,  $f = .13 (.12)$ ); A7 ( $m = -.40^{**} (.11)$ ,  $f = .07 (.15)$ ); A8 ( $m = -.33^{**} (.11)$ ,  $f = .11 (.12)$ )

## CONCLUSIONS

The discussion on the relation between creativity and academic achievement has ceased lately, although the results of previous research tended to be ambiguous. The aim of the current study was to investigate the relationship between 9<sup>th</sup> grade students' creativity and school

grades. Both boys and girls with higher creative potential score obtained with TCT-DP tend to be assigned with higher school grades, but correlation between creativity score and school grades is more significant among boys. Indirectly, these results support the view that creativity to a certain amount facilitates adaptation and ability to respond to environmental demands – schooling requirements, gaining and retrieving knowledge, presenting knowledge and skills. The closer relationship between creativity score and school grades for boys points to hypothesis that girls invest more effort and are more motivated and diligent in the study process, whereas boys rely more on their inborn capacities, fluid intelligence and creative abilities. These assumptions should be tested in the future research.

When exploring correlations between TCT-DP results and separate school subjects, we saw a higher tendency for school grades in the subjects of sciences and arts (except geography and music) to be related to creativity score, and boys tend to show higher correlations, although no significant gender difference was found in any of the subjects. In general, these results confirm the validity of TCT-DP, and also point to the possibilities of creativity to be invested not only in art subjects, but in subjects of natural sciences as well.

We also aimed to explore which of the specific criteria of creativity measure relate most closely to school grades. It would provide more information about the indicators of creative capacities which are more likely to facilitate obtaining and retrieving knowledge at school or which are evaluated by teachers when assessing a child. We concluded that the abilities to draw a picture with strong expressive power, to make additions to the used elements and also to add a completely new elements to the given elements, to compose a theme or gestalt of the given elements and to break away from two-dimensionality were significantly related to the average school grade as well as to the grades in the subjects of Foundations of sciences, Languages, Arts, and Human and Social sciences groups obtained by 9th grade students. Interestingly, the criteria which regard crossing the boundaries or breaking away from the limits set in the task had no correlation with school grades whereas uniqueness of answers (originality) related most closely to the subjects of Foundations of sciences group. We hypothesize that breaking boundaries, as reflected in this picture type test, is the quality which is not acknowledged in school, but could reflect student's tendency to risk and

difficulties to adapt to requirements at school. Whereas originality, as an indicator of being free from functional fixedness and from premature closure of solutions, has a serious potential to help in succeeding in the studies of natural sciences.

Although we do not claim to make strict conclusions about the content or methods in Music, the results raise questions if students have opportunities to express their creative abilities in such subjects since no correlation was found between creativity scores and school grades in Music. Music should be the one subject where creativity is promoted and evaluated seriously.

The results give ground for further exploration of creative thinking involvement in the educational process and in the assessment of academic performance.

The limitations of the research are small sample size (especially for boys) since the statistical methods used require larger data set. Other variables, for example, intellectual abilities should have been controlled. Measures of verbal creativity would be of essential importance in further research to continue the topic. Possibly, additional gender differences would be found in correlations between verbal creativity and school grades.



IEGULDĪJUMS TAVĀ NĀKOTNĒ



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## ARYRA RYŠYSTARP KŪRYBIŠKUMO IR PAŽYMIŲ MOKYKLOJE? 9 KLASĖS MOKINIŲ TYRIMAS

Līga Roķe

Rygos Pedagoginio ir ugdymo vadybos akademija, Latvijas universitetas, Latvija

Emīls Kālis

Rygos Pedagoginio ir ugdymo vadybos akademija, Daugpilio universitetas, Latvija

**Santrauka. Darbo problema ir tikslas.** Šio tyrimo tikslas buvo ištirti ryšį tarp kūrybiškumo ir pažymių mokykloje. **Metodai.** Kūrybiškumas vertintas naudojant *Kūrybinio mąstymo piešimo testą (Test for Creative Thinking – Drawing Production (TCT-DP))* (Urban & Jellen, 2010). Tyrimo imtį sudarė 180 devintos klasės mokinių (104 mergaitės), kurių amžiaus vidurkis – 15,1 metų. **Rezultatai.** Tiek berniukų, tiek mergaičių, gavusių aukštesnius TCT-DP testo kūrybinio potencialo balus, pažymių vidurkiai mokykloje buvo aukštesni. Stebėta tendencija, jog pažymiai už gamtos mokslų (išskyrus geografiją) ir menų dalykus buvo stipriausiai susiję su kūrybiškumu. Nors statistiškai reikšmingas skirtumas tarp lyčių, lyginant mokykloje dėstomus dalykus, nestebėtas, tačiau berniukų grupėje koreliacijos buvo žymesnės. Nagrinėjant priklausomybę tarp atskirų TCT-DP kriterijų ir pažymių mokykloje, stebėta bendra tendencija, jog gebėjimas nupiešti ekspresyvių piešinių, papildyti duotus elementus, sukomponuoti temą ar gešaltą iš duotų elementų ar peržengti dvidimensiškumą yra statistiškai reikšmingai susiję su pažymių vidurkiu mokykloje nepriklausomai nuo lyties. **Išvados.** Gauti rezultatai suformuoja pagrindą tolimesniems tyrimams, nagrinėjantiems ryšį tarp mokinių kūrybiškumo ir akademinį rezultatų.

**Pagrindiniai žodžiai:** kūrybiškumas, pažymiai, mokomieji dalykai, lyčių skirtumai.

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