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Creativity as Educational Objectives: From a Meta-theoretical Heuristic to Domain-specific Creative Behaviours

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ABSTRACT

The aim of this study was to explore the education expert and non-expert consensually rated nature of creativity operationalized as observable behaviour. When operationalized as observable behaviour akin to concrete educational objectives accessible to being taught, is creativity a construct valid both internationally and over time, and what are its distinguishing features? A representative sample of concretely stated behaviours descriptive of creativity displayed by children and adolescents was evaluated with high convergent validity by educational psychologists, specialists in gifted education, university students of teacher studies, and mathematics teachers (N = 208) on the level of creativity, and ten additional behaviour features. The results of the canonical correlation analysis suggest internationally and temporally stable and an educationally viable bridge between general creativity construct operationalization and measurement on the one hand, and the domain-specificity of creative behaviours and their features on the other. By viewing the general creativity construct as a meta-theoretical heuristic, and focusing on one group of domain-specific consensually rated creative behaviours and their progressive nature as educational objectives, the findings of this study are discussed in the context of general and gifted education.

INTRODUCTION

This study deals with the question of how creativity is perceived when it is behaviourally defined and with determining its distinguishing features as perceived in the minds of educators and students. In stating this question, the nature of the creativity construct is scrutinized, as are issues concerning the operationalization of creativity, its measurement, and its use in general and gifted education.

Originality and effectiveness (Runco & Jaeger, 2012) form the frugal core of the standard, bipartite definition of creativity. To elaborate on this definition, creativity in children and adolescents in this study is defined as the a) observable, manifest, socially acceptable behaviour consensually described as creative in a given social context, b) result of the interaction of abilities, knowledge, traits, task commitment and social influences, c) process at the end of which a person can potentially produce an observable original product (Rački, 2015a; 2015b; Rački, Bakota, & Flegar, 2015). As such, this definition puts the focus on the process (i.e. the explicitly stated creative behaviour), and on behaviour as a measurement unit.

Previous research suggests that when creativity is measured as a set of behaviours and accomplishments, analyses show that it can be divided into three broad, but not completely distinct domains, namely: a) everyday, b) scientific (or intellectual, mathematical, technical), and c) artistic creativity (emotional, expressive or performing), in line with the debate on the partial domain-specificity of creativity (Baer, 1998; Carson, Peterson, & Higgins, 2005; Conti, Coon, & Amabile, 1996; Han, 2003; Ivcevic, 2007, 2009; Kaufman, 2012; Milgram, 2003; Milgram & Livne, 2005; Runco & Bahleda, 1986; Silvia, Kaufman, & Pretz, 2009; Simonton, 2003; Wai, Lubinski, & Benbow, 2005). The infrequent co-occurrence of different creativity domains in polymathy (Root-Bernstein & Root-Bernstein, 2004) supports the notion of the domain-specificity of creativity, and of its importance to education. Beghetto and Plucker (2016) and Plucker, Beghetto, and Dow (2004), in their article entitled “Why isn't creativity more important to educational psychologists?”, emphasized the uses of creativity to maximize its potential contributions to attaining educational objectives. Creativity is explicitly stated as a cognitive process dimension in the taxonomy of educational objectives (Anderson & Krathwohl, 2001; Bloom, 1956). The relationships studied between creativity and academic achievement so far are not as great as one might expect of processes explicitly stated as forming the taxonomy of educational objectives. Based on the meta-analysis performed by Gajda, Karwowski, and Beghetto (2016), previous research demonstrated only a modest positive relationship, $r = .22$; 95% CI [.19, .24] between creativity and academic achievement, moderated by the types of measures used. The relationship of creativity and education, and especially gifted education, needs to be studied further, especially in regard to educational objectives. Creativity overlaps with general education and gifted education and giftedness in its currently used conceptualizations (see Renzulli, 1978, 1986; Subotnik, Olszewski-Kubilius, & Worrell, 2011), both of which are discussed in the following sections.

In the context of general education, its relationship to creativity, and in acknowledgement of the social transmission of knowledge and cognitive processes (see

Glăveanu, 2014; Lindqvist, 2003; Runco, 2015; Vygotsky, 2004), the fact is that the contemporary, societal, institutionalized dissemination of knowledge and cognitive processes is commonly bound to the role of the educator. Hence, the APA's Coalition for Psychology in Schools and Education recommendation from among the Top 20 principles of psychology for preK-12 teaching and learning (2015), that educators should pay attention to principle 8 (p. 14), that *student creativity can be fostered*. The authors suggest that contrary to the conventional wisdom that creativity is a stable trait (you either have it or you do not), creative thinking can be developed and nurtured in students, making it an important outcome of the learning process for students and educators. Based on the growing body of research on knowledge and creativity (see Weisberg, 1999), and creativity and intelligence relationships (Cropley, 1994; Karwowski, 2015; Karwowski, Kaufman, Lebuda, Szumski, & Firkowska-Mankiewicz, 2017; Kim, 2008; Silvia, 2008; Sternberg & O'Hara, 1999; Wai, 2014; Wai & Rinderman, 2017) in the context of education (see Baer, 2013), this study aims to explore and suggest some of the behaviours that may be fostered as student creativity.

In the context of gifted education, the domain-specific forms of complex creativity (e.g. a child creating remotely operated toys, or writing a novel), when operationalized as behaviour and understood in practice as educational objectives, may seem indistinguishable from the theoretical interpretations of giftedness. Namely, in some domains, creativity and giftedness are practically synonymous (see Sriraman, 2005). When giftedness is defined as a great performance (Subotnik & Jarvin, 2005) or as developing expertise (Sternberg, 2001), and creative development as the acquired expertise (Simonton, 2000), it comes as no surprise to find support for identifying and assessing creativity as a component of giftedness (see Kaufman, Plucker, & Russell, 2012). Gifted education, regardless of its many conceptions (see Ziegler & Heller, 2000), exhibits intense interest in creativity research not only because creativity is a construct in its theories and lifespan models (see Renzulli, 1978, 1986, 2011; Subotnik, Olszewski-Kubilius, & Worrell, 2011; Winner, 2000), but also because it is, to reiterate once more, a desired educational objective. That brings us a little closer to the aim of this study.

In order to point to commonalities in how creativity and giftedness are conceived, some theories of further interest are worth mentioning here. The Renzulli's three-ring definition of giftedness (Renzulli, 1986) asserts that creative-productive gifted individuals possess three clusters of traits: above average ability, creativity and task commitment. The manifestation of giftedness in Renzulli's model is displayed as an interaction among the three clusters and is not a stable trait. His conception of giftedness suggests that giftedness is a trait (or even more appropriately, *a set of behaviours*) to be developed.

In the actiotope model of giftedness, Ziegler (2005, p. 421) describes the *actions* of an individual within the *entire actiotope*. Similarly, Glăveanu (2013) uses the terms *actor, action, artifact, audience, and affordances*, endorsing a systemic, contextual and dynamic approach to creativity. This common sense or practical line of reasoning on individual creative behaviours or acts within contexts, in itself suggestive of heuristic strategies, was taken in this study as well.

By identifying the heuristics involved in different creative processes, as stated by Mumford and Norris (1999, p. 813), a vehicle for integrating theory and practice in the study of creativity may be found. The heuristical approaches of mapping shared features or identifying non-overlapping features were taken here as study approaches, using behaviours as the stimuli and mapping their shared features in the educators' and the students' minds by the use of canonical correlations. This was done in order to connect general creativity theory on the one hand, with the education for creativity on the other, exploring the education expert and non-expert consensually rated nature of creativity.

When operationalized as observable behaviour akin to concrete educational objectives accessible to being taught, is creativity a construct valid both internationally and over time, and what are its distinguishing features?

METHOD

Participants

The study participants (N = 208) were from Germany and Croatia and formed two study groups: the non-expert group (Students), and the expert group (Educators). The expert group included 15 German elementary and high school teachers specialized in gifted education, 18 Croatian mathematics teachers and nine educational psychologists. The ECHA Specialists in gifted education (i.e. European Council for High Ability) took part in this study in Germany during an in-service teacher education meeting and included teachers of various subjects specialized in giftedness and gifted education (nine women and six men, M_{age} = 36.6 years, age range: 22-62). They represented education experts familiar with creative productivity and high ability in elementary and high school students. The Croatian participants were: a) nine educational psychologists employed in preschool, elementary, or high schools, representing specialists in student behaviour (eight women and one man; age range: 22-65), b) 18 mathematics teachers, seven of whom were employed in elementary and 11 in high schools (15 women and three men; M_{age} = 33.9 years, age range: 25-64), and c) 166 female students taking a five-year teaching degree at university (age range: 22-28), in preparation for teaching all school subjects to children aged 6-12. All participants were middle class, educated, Caucasian men and women.

Materials and Procedures

The focus of this study was on the consensual analysis of behaviour pool (k = 313) based on the ratings provided by the participant groups. All participants gave their written consent and rated the concretely and concisely operationalized behaviours that children and adolescents displayed in their leisure time (i.e. self-initiated extracurricular activities). The behaviours were defined during the authors' years of prior research on children and adolescents by means of measuring traits using the act frequency approach (see Angleitner & Demtröder, 1988; Buss & Craik, 1983; Ivcevic, 2007, 2009; Ivcevic & Brackett, 2015) and were found to be a representative pool of behaviours ranging from those which were, theoretically, *low* to *high* in creativity (e.g. *I watch TV; I surf the Internet* -to-*I think up new experiments; I create new choreographies,* etc.). Care was taken to collect as broad a behaviour pool as possible, while following the definition of creativity stated in the introduction. The pool of behaviours was collected among 671 elementary school children (age range: 8-15 years). Some behaviours were displayed by *one* adolescent only (*I work on a magazine as an editor, e.g. school magazine*), while others by over 80% of the participants. Some of the behaviours were indicative of other, not studied constructs (e.g. *I play games on my PlayStation*), while others were clear and consensually agreed upon, indicative examples of creativity (e.g. *I make my own musical instruments*), across the artistic, scientific and everyday creativity domains. The years in which the data were collected are specified in the tables. Ten percent of the studied pool is presented in full in Table 3, mostly covering creativity in language, as one of the creativity micro-domains represented in the behaviour pool. The collection, refinement and exploration of creative behaviours is an ongoing project, and the behavioural features of a sample of 50 (see Rački, 2015a) and 21 creative behaviours (see Rački, Bakota, & Flegar, 2015) have previously been discussed. Behaviours were prepared in two forms for participants to rate -as cards and a questionnaire-given in one or the other form to the participant groups.

The groups of experts individually rated behaviours on subjectively defined personal criteria defining the creativity of each behaviour on a seven-point scale (*low* to *high*), which is comparable to the consensual assessment technique used in product evaluation (*CAT*; Amabile, 1996; Baer, Kaufman, & Gentile, 2004) and based on the hypotheses of usefulness of social judgment (see Funder, 1987; Jussim, Eccles, & Madon, 1996; Jussim, Harber, Crawford, Cain, & Cohen, 2005). The instructions given were: *Read through these behaviours that children and adolescents display in their leisure time. Based upon your own subjective criteria, rate how indicative each of the behaviours is for creativity, from low to high.* For the specialists in gifted education, the behaviours were

forward translated into German by two German-Croatian native speakers, while the answers were given on a scale with a reverse order of points in accordance with the previous grading experiences they have had as teachers. The behaviours were shuffled so that each rater (specialists in gifted education and the mathematics teachers) received a questionnaire containing the items listed in a different order. The psychologists had behaviours written in Croatian on 5 × 10 cm cards, individually presented and reshuffled after each psychologist's individual rating. The psychologists' task was to place each of the 313 behaviours into one of seven piles in front of them which represented *low* to *high* creativity. In this way, two methodologically different procedures were used to diminish the order and the method-effect in behaviour ratings. The mathematics teachers were randomly assigned to two groups of nine (the *creativity* and the *knowledge* raters). The students and the mathematics teachers received a questionnaire in which they rated each of the behaviours on a seven-point scale (*little* to *considerable*) on how much knowledge (factual/conceptual and procedural) each of the behaviours required for usual or standard performance, that is, how much theoretical and practical preparation was needed in order for each behaviour to be displayed by the student. Only this behavioural feature (*knowledge*) was rated by one educator group and the student group, for comparison. The remaining behavioural features were rated by the students.

The independent student groups individually rated behaviours, following similar instructions, except that their subjective ratings were required in questionnaires containing behaviours listed in a different order for these ten behavioural features, as listed in Table 1: *how much intelligence*, *task commitment*, *emotions* (perception, regulation and expression) does the behaviour require for usual performance, how *valuable* and *complex* is it, how much does it *cost in currency*, is it *for boys or for girls*, *younger or older* children, and how *frequently* is such behaviour perceived to be present in children and adolescents, on a seven point scale (*low* to *high*). The participants were unaware of the research goals.

The inter-rater agreements in all the participants' ratings of behaviour creativity and behaviour features were very high, with α in the .87-.97 range. Linear combinations of participants' ratings, with some transformed to meet distribution normality, serve as the measures of *k* behaviour features listed in Table 1.

RESULTS

Creativity in this study is hypothesized and shown to be on a continuum, from low to high, with instances of the collected behaviours occurring within the domains of artistic, scientific, and everyday creativity, to name but a few. The educational psychologists, the spe-

cialists in gifted education, and the mathematics teachers strongly agreed in their behaviour creativity ratings ($r \geq .8$, see Table 2), offering support in terms of convergence in social reality over time and therefore for criterion validity of the behavioural operationalization of creativity. If some behaviours are more, and some less indicative of creativity in the educators' minds, then what the students think of those behaviours when they rate their features may serve to mutually describe what is actually meant by *creativity*. It may also point to the educators' expectations placed on the students when *creativity* is required. A summary of the correlations for study variables is listed in Table 2.

Table 1

Summary of Psychometric Properties of the Participants' Ratings of Behaviour Features

	Participants and measures	*n*	*M*	*SD*	*α*	*ICC*[a]	Range		Skew
							Potential	Observed	
	Educators								
	Expert ratings of behaviour creativity:								
1	Educational psychologists (2012)	9	3.39	1.67	.96	.66	0 - 6	.00 - 5.89	- .65
2	ECHA Specialists in Gifted Education (2013)	15	3.10	1.17	.93	.38	0 - 6	.13 - 5.20	- .63
3	Mathematics teachers (group I; 2014)	9	3.71	1.03	.87	.40	0 - 6	.89 - 5.33	- .96
	Expert ratings of behaviour knowledge dependence								
4	Mathematics teachers (group II; 2014)	9	3.46	1.11	.91	.43	0 - 6	.67 - 5.89	- .21
	Students								
	Student ratings of behaviour features (2014):								
5	Intelligence	11	2.82	1.07	.93	.44	0 - 6	.18 - 5.18	.09
6	Task commitment	30	3.35	1.10	.97	.42	0 - 6	.18 - 5.54	- .41
7	Value	9	3.09	1.03	.91	.49	0 - 6	.00 - 5.67	- .11
8	Complexity	9	2.57	1.11	.92	.52	0 - 6	.00 - 5.44	.17
9	Knowledge	13	2.47	1.24	.95	.45	0 - 6	.15 - 5.31	.32
10	Age (*younger* to *older* children)	13	3.90	1.04	.94	.49	0 - 6	1.15 - 5.69	.31
11	Emotions	14	2.19	1.14	.93	.25	0 - 6	.50 - 5.25	.85
12	Costs	11	1.25	1.18	.94	.53	0 - 6	.00 - 5.09	.74
13	Gender appropriateness (*for boys* to *for girls*)	14	3.10	1.07	.96	.65	0 - 6	.43 - 5.64	.05
14	Frequency of occurrence	12	2.77	1.17	.92	.44	0 - 6	.50 - 5.83	.34
15	Creativity (2016)	30	3.70	1.32	.97	.45	0 - 6	.17 - 5.63	- .83

Note. $k = 313$. All values represent untransformed ratings.
[a] Intraclass correlation coefficient (ICC); absolute agreement of raters, single measure.

Table 2
Summary of Intercorrelations of Study Variables

	Participants and measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Educators														
	Expert ratings of behaviour creativity:														
1	Educational psychologists (2012)	—													
2	ECHA Specialists in Gifted Education (2013)	.84**	—												
3	Mathematics teachers (group I; 2014)	.77**	.78**	—											
	Expert ratings of behaviour knowledge depend-														
4	Mathematics teachers (group II; 2014)	.70**	.63**	.77**	—										
	Students														
	Student ratings of behaviour features (2014):														
5	Intelligence	.68**	.59**	.71**	.90**	—									
6	Task commitment	.62**	.55**	.68**	.87**	.81**	—								
7	Value	.59**	.53**	.69**	.87**	.83**	.86**	—							
8	Complexity	.64**	.53**	.61**	.84**	.85**	.83**	.78**	—						
9	Knowledge	.59**	.50**	.65**	.90**	.88**	.89**	.87**	.85**	—					
10	Age (*younger* to *older* children)	.48**	.37**	.56**	.78**	.76**	.79**	.83**	.72**	.82**	—				
11	Emotions	.32**	.47**	.31**	.05	–.02	–.01	.09	–.05	–.06	–.09	—			
12	Costs	–.00	–.00	.04	.15**	.13*	.37**	.25**	.26**	.33**	.38**	–.32**	—		
13	Gender appropriateness (*for boys* to *for girls*)	–.00	.04	–.09	–.34**	–.42**	–.33**	–.34**	–.40**	–.43**	–.43**	.37**	–.25**	—	
14	Frequency of occurrence	–.49**	–.28**	–.39**	–.64**	–.62**	–.71**	–.59**	–.68**	–.63**	–.71**	.28**	–.37**	.31**	—
15	Creativity (2016)[a]	.80**	.81**	.70**	.53**	.46**	.53**	.42**	.51**	.41**	.31**	.30**	.13*	.11*	–.35**

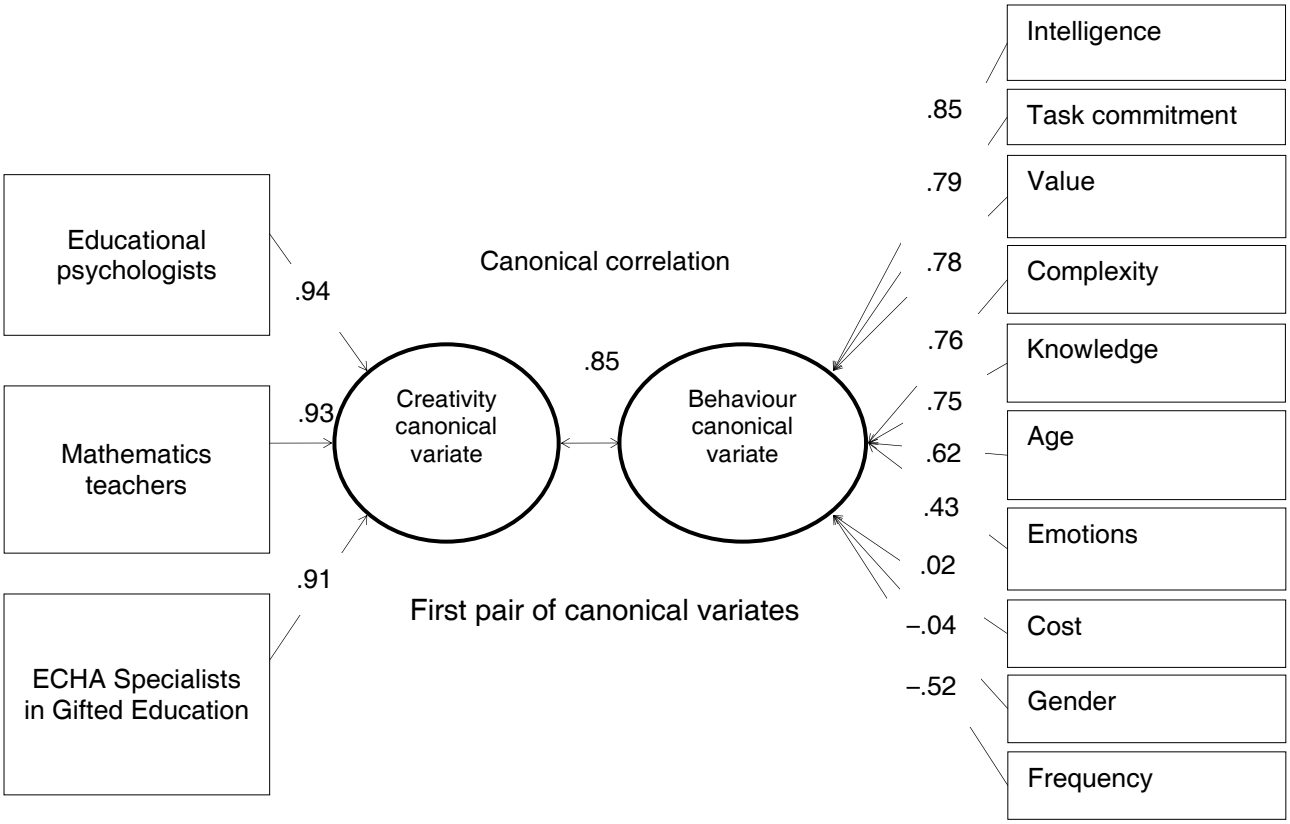
Note. k = 313. To improve the skew, all expert ratings of behaviour creativity, and the students' ratings of emotions and cost, were log-transformed. The students' ratings of knowledge and frequency were square-root transformed. Creativity (2016) ratings were transformed following the 1/(K – X) procedure. The transformed variables were also used in canonical correlation analysis. Pearson correlations are presented here.

[a]Creativity ratings of behaviours were made in 2016 by a group of third-year university students of Teacher Studies as an Educational Psychology course exercise. This was done in order to explore the four-year differential, the international and the inter-vocational stability of creativity construct conceptualizations (i.e. implicit theories; in all cases, the creativity r was ≥.7).

*p < .05. **p < .01.

The canonical correlations of data sets

In order to explore the relationships between creative behaviours and their distinguishing features, that is, how the set of educators' ratings of behaviour creativity (DVs) and the set of students' ratings of ten behaviour features (IVs) for k = 313 behaviours related to each other, a canonical correlation was performed. The first canonical correlation was .85 (73% overlapping variance), the second was .47 (9%), and the third was .42 (7%), with eigenvalues at 2.697, 0.281, and 0.213. With all three canonical correlations included, $\chi^2(30) = 533.26$, $p < .001$, and with the first canonical correlation removed, $\chi^2(18) = 134.44$, $p < .001$, and subsequently, $\chi^2(8) = 58.89$, $p < .001$. The first pair of canonical variates accounted for 84.5% of the total variance shared by all the root pairs, Wilks $\Lambda = .17$, $F(30, 881.24) = 23.92$, $p < .001$. Only the first pair was therefore interpreted due to the small proportion of variance explained by the additional pairs, indicative of some expert related group differences in implicit theories of creativity, not studied here. The proportion of the variance of the DVs accounted for and the redundancy was 86% and 63%, respectively. The variance of the IVs accounted for was 39% and the redundancy was 29%. This is a considerable overlap of the explained variance between the canonical variates in the first pair, in line with the aim of this study. Namely, with a cutoff of .3 used in the interpretation, the shared educators' concept of creativity was strongly related to the students' when taken as a pair, mutually describing-*creativity as intelligence-, age-, and commitment-dependent infrequent behavior that is valuable and complex, in a requirement of the acquisition of factual/conceptual knowledge and know-how, and/or emotion regulation, perception and expression*. The canonical loadings supporting these conclusions are displayed in Figure 1.



Note. k = 313. Creativity canonical variate corresponds to the educators' views of k behaviour creativity. Behaviour canonical variate corresponds to the students' views of features of k behaviours.

Figure 1. Loadings and canonical correlation for the first pair of canonical variates.

The expert and non-expert differences in behaviour ratings

Of importance to the conclusions presented in this study, especially those regarding education, are the similarities and differences between expert and non-expert behaviour ratings of behaviour *knowledge* dependence. Experts and non-experts may not share the same outlook on how much knowledge is needed for standard performance. A Wilcoxon test was conducted to evaluate whether students gave lower behaviour knowledge ratings than did the mathematics teachers. The results indicated a significant difference, z = -15.07, p < .001. The high correlation between the students' and the mathematics teachers' ratings of knowledge needed for standard behaviour performance, $r(313)$ = .90, p < .001, corroborated the finding that this is not a matter of disagreement in general, but in the absolute *degree* of the same construct (see Table 2). The correlation corrected for the attenuation due to the imperfect reliabilities of the ratings was .96. The difference in the overall behaviour knowledge demand rating may be indicative of some age and expertise related critical evaluation of one's own and children's readiness for different types of creative behaviour, with educators being more critical.

Table 3

Examples of Behaviourally Operationalized Creativity Arranged in the Order of the Level of Demand on the Factual, Conceptual and Procedural Knowledge for Standard Behaviour Performance as Rated by the Students of Teacher Studies

Examples of behaviours	Measures			
	Knowledge	Creativity	Intelligence	Task commitment
I write scientific articles.	5.31	3.93	5.00	5.39
I write critiques.	4.00	3.90	4.00	4.14
I write review reports (reviews).	3.69	3.53	3.82	4.18
I write books.	3.62	4.63	4.00	4.93
I write screenplays (detailed descriptions for films).	3.38	4.80	3.82	4.71
I write novels.	3.31	4.60	3.73	4.71
I write newspaper reports (newspaper articles).	3.31	4.30	3.18	3.57
I work on a magazine as an editor (e.g. school magazine or similar).	3.31	3.63	3.36	4.18
I debate (in a group or a debating club).	3.31	3.33	4.18	4.11
I write reports for a magazine or the Internet (i.e. a column in a newspaper or on the Internet).	3.15	4.23	3.45	4.43
I invent word riddles, anagrams, etc.	3.08	5.17	4.00	4.18
I write plays (dramatic scripts; skits or sketches).	3.00	4.80	3.27	4.00
I write poems (poetry).	2.92	4.83	3.36	4.14
I write dramas (plays).	2.92	4.83	3.55	3.75
I draw and write comic books (cartoon-novels).	2.92	3.87	3.18	3.79
I create crossword puzzles.	2.92	4.67	3.45	4.00
I write stories.	2.77	4.63	3.18	4.07
I write essays.	2.54	3.57	3.36	3.82
I invent new language rules.	2.38	4.17	3.00	2.86
I am inventing a new language.	2.38	4.70	2.91	3.57
I write literary compositions.	2.23	4.23	2.64	3.46
I write lyrics, songs that I sing.	2.15	4.83	2.91	3.68
I blog.	2.15	4.10	2.55	3.00
I invent new rhymes (I speak in rhyme).	2.08	4.90	2.82	3.00
I make picture books (I write and draw the text, write the words/ draw and paint images).	2.00	5.37	2.82	3.89
I retell/rewrite stories in my own way.	1.92	3.73	2.64	2.36
I invent new words.	1.77	5.57	3.18	3.04
I write interesting (entertaining) and funny letters or e-mails.	1.69	4.20	2.18	2.79
I keep a scrapbook (e.g. with poems and drawings).	1.31	4.00	1.91	2.21
I invent funny (entertaining) word accents.	1.15	3.87	2.18	1.79
I invent nicknames.	.77	3.80	2.09	1.89
I keep a diary.	.46	1.83	1.45	2.11

Note. Potential range 0-6 (*low* to *high*). All the measures presented here were gathered with students as behaviour raters. These 32 behaviours represent 10% of the studied (k = 313) behaviour pool. Out of these, 21 form the *Linguistic Creativity Scale* (*LCS*; Rački, Bakota, & Flegar, 2015) used with children and adults.

DISCUSSION

The results of this study point to the stability of the creativity construct over time and among study participants. *Creativity* in this study is a general model based on implicit theories concerning children's behaviours and their features, collected with participant groups involved in education. As such, this model of creativity is meta-theoretic, with all its biases. It appears heuristic and it may direct us towards asking new questions on creativity. It is important to notice that 'creativity as a meta-theoretical heuristic', a term already used by Baer (2012), does not actually describe itself or any of its general processes represented in the canonical variates. It does not explain how processes are applied, how they interact, and how they result in creative behaviours in different creativity domains and micro-domains. It simply shows that people follow some shared generalized rules and procedures while conceptualizing what creativity is, when given some behaviours to rate.

Specifically, by asking knowledgeable others to point to specific behaviours that describe creativity, and students to point out how much of a particular feature was required for each behaviour, the behavioural description of creativity was reached in this study with high convergence. The study participants mutually described creativity as-*intelligence-, age-, and commitment-dependent infrequent behaviour that is valuable and complex, in a requirement of the acquisition of factual/conceptual knowledge and know-how, and/or emotion regulation, perception and expression*. By viewing the general creativity construct as a meta-theoretical heuristic, the problem-solving guidelines are set for developing domain and specific micro-domain behaviour-based explicit theories of creativity-expertly, or otherwise established. Following these guidelines and focusing on the domain-specific consensually rated creative behaviours involving language and oral and written production within the behaviour pool, and their progressive nature when considered as educational objectives, the findings of this study are discussed in the context of general education, and gifted education in particular.

A point here is made regarding the results obtained on one of the behaviour features of importance to the further discussion. The behaviour features loading highly on this variate may be straightforward in their explanation, but the “and/or” in emotion ratings requires some discussion. Namely, ten percent of all the studied behaviours from the behaviour pool are presented in Table 3, chosen as some of the creativity behaviours and micro-domains rated overall higher on *emotions*. To what exactly did the students give weight in their ratings (emotion perception, regulation, *or* expression) remains unclear, as they were rated together. In line with this conundrum and stated equally enigmatically, the

creativity scholar J. P. Torrance, when asked how important he considered emotions for creativity on a scale from one to five, replied „*You asked me to weight on a five-point scale the importance of emotions on creativity. I would place it at a 4*"(personal communication, March 2002). The comparatively low loading of emotions as the rated behaviour feature on its canonical variate may reflect some of the following, or neither: the affective skew in creativity ratings for some behaviours (i.e. the Art Bias; Glăveanu, 2014; Kaufman & Baer, 2004; Rački, 2015b; Rački, Bakota, & Flegar, 2015), the general importance of emotion regulation ability in creative behaviour (Ivcevic & Brackett, 2015), or it may point to different affective dimensions involved in the creative process (Russ, 1993, 2003, 2013) in some creativity domains. Hypothetically, embracing emotional experiences and allowing them to influence thought (i.e. the arts), in comparison to deriving pleasure or joy in mastering complex and challenging tasks (i.e. the sciences), may prove to be distinct affective dimensions when applied to these two creativity domains. It is like comparing emotions coinciding with (un)productive thought (e.g. frustration in the face of failure to produce a solution to a problem, or joy in finding one) and emotions used as the medium, the objects or the contents of focused thought in producing, for example, a moving poem. A moving poem is, in terms of the definition of creativity-effective (i.e. in eliciting the author's originally felt emotions, or the intended emotions in readers). Even this surmise is probably more valid for some, in comparison to other functional language styles used in linguistic creativity and linguistic products (e.g. literary-artistic, scientific or journalistic), because language styles have rules to be followed for successful communication, inviting an even more detailed discussion of micro-domain specificity of creativity and affect, and other relationships.

In the context of general education, the educational objectives focusing on attitudes and feelings, that is, the objectives in the educational taxonomy of the affective domain, or the domain of emotional response (see Anderson & Krathwohl, 2001), seem to correspond more closely to some creative behaviours, the communicative behaviours in Table 3 serving as an example, suggestive of some micro-domain specificities in affect, in need of further study. Likewise, behaviours from some other micro-domains may be more in line with the cognitive domain of educational objectives. In practical terms, creative teachers with sufficient knowledge of their subjects can easily turn the behaviours listed in Table 3 into teaching activities included in lessons, projects or sustainable programmes for nurturing progressive creative behaviours, as well as fostering their organization around higher order principles, in support of the development of excellence. It may be that creative behaviours of the highest complexity, regardless of modality, may require the highest levels of prolonged emotion regulation and expression (i.e. being *in love* with

one's work or showing *passion*; Csikszentmihalyi, 1996) to result in recognized creative expertise and eminence. Expertise and eminence are closely tied to giftedness theory and gifted education, as already stated.

In the context of gifted education, it may come as no surprise to find correlations in this study between the educators' creativity ratings and the students' intelligence ratings from .59 to .71, and creativity and task commitment ratings from .55 to .68 for the studied behaviour features. These relationships are probably artificially diminished when creative behaviour complexity is truncated, as is done when creativity is measured by means of the implementation of tasks of low complexity, such as divergent thinking tasks (i.e. *to write a novel* or *construct a proof*, in comparison to *drawing doodles*), and measures of *g* without taking into account the necessary commitment. Doing anything, including worthwhile creative work, requires motivation of some sort. To write a book or a theorem is hard work, both intellectually and emotionally, and educators and students acknowledge this in their ratings. Both behaviours are indicative of creativity, and when present in children and adolescents, they may point to giftedness. It may turn out that in general and gifted education the greatest obstacle to teaching for creativity-implying cognitive, affective and psychomotor creative educational objectives-lies in creativity too often depicted as playful, knowledge-lean, and devoid of prolonged commitment to both intellectual and emotional growth and regulation, and this is in need of further study.

By addressing issues of defining the behavioural features of creativity, its relationship to education, and the field of giftedness study, the question in the introduction, as to why creativity is not more important to educational psychologists, may be provided with an answer by the findings of this study. Namely, when operationalized as concrete behaviour, creativity readily becomes *very* domain-specific. It invites researchers into the arts, sciences, sports, or civic engagement studies, to name but a few. Nevertheless, the domain specificity of creativity is of highest importance to studies of creativity in education, because compulsory education consists of (school) subjects that display a similar quality of domain specificity (i.e. domains: the arts, and the sciences; and micro-domains: language, visual arts, chemistry, biology, etc). Moving away from the person as the focus of the psychological study, into the area of education, may leave educational psychologists in need of collaborating with subject experts in order to elucidate the psychology of creativity in their respective domains.

CONCLUSIONS

This study offered support for 1) the act-frequency and prototypicality approach for the reliable and valid operationalization of creativity as behaviour, 2) the applicability of the

consensual assessment technique to non-parallel behaviour and behaviour feature analysis, 3) inter-vocational, and 4) international agreement in creativity ratings of educational experts, 5) four-year stability of the creativity ratings, and 6) a mutually agreed educators' and students' heuristical definition of general creativity. The definition of general creativity in consensual terms, and the specific creative behaviours as educational objectives, with creativity as a socially observable behaviour accessible to being taught, serves to form a continuously renewable developmental bridge between creativity theory and its study on the one hand, and the prolonged and planned investment of educational efforts in creativity development on the other. Creativity as a meta-theoretical heuristic does not lend itself easily to immediate hands-on activities in education. The creative behaviours derived by the use of this heuristic and stated as educational objectives, on the other hand, do.

Limits and implications

Due to the lack of the ratio-based measurement of creativity, this study is grounded in the stability of the education experts and the students as raters, supported in this study. Based on the participants' comments, the behaviour pool should be broadened in further research in cooperation with the creativity micro-domain experts.

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REFERENCES

Amabile, T. M. (1996). *Creativity in context: Update to "The Social Psychology of Creativity."* Boulder, CO, US: Westview Press Inc.

American Psychological Association, Coalition for Psychology in Schools and Education. (2015). *Top 20 principles from psychology for preK-12 teaching and learning.* Retrieved from http://www.apa.org/ed/schools/cpse/top-twenty-principles.pdf

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. New York, USA: Addison-Wesley Longman.

Angleitner, A., & Demtröder, A. I. (1988). Acts and dispositions: A reconsideration of the Act frequency approach. *European Journal of Personality, 2*, 121-141. doi:10.1002/per.2410020207

Baer, J. (1998). The case for domain-specificity of creativity. *Creativity Research Journal, 11*, 173-177. http://dx.doi.org/10.1207/s15326934crj1102_7

Baer, J. (2012). Domain specificity and the limits of creativity theory. *The Journal of Creative Behavior, 46*(1), 16-29. doi: 10.1002/jocb.002

Baer, J. (2013). Teaching for Creativity: Domains and Divergent Thinking, Intrinsic Motivation, and Evaluation. In M. B. Gregerson, J. C. Kaufman, & H. T. Snyder (Eds.), *Teaching Creatively and Teaching Creativity* (pp. 175-181). New York: Springer.

Baer, J., Kaufman, J. C., & Gentile, C. (2004). Extension of the consensual assessment technique to nonparallel creative products. *Creativity Research Journal, 16*(1), 113-117. doi:10.1207/s15326934crj1601_11

Beghetto, R. A. & Plucker, J. A. (2016). Revisiting the relationship among schooling, learning, and creativity. In J. C. Kaufman & J. Baer (Eds.), *Creativity and reasoning in cognitive development*. New York: Cambridge University Press.

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals, Handbook 1, Cognitive domain* (Ed.). London: Longmans, Green and Co Ltd.

Buss, D. M., & Craik, K. H. (1983). The Act Frequency approach to personality. *Psychological Review, 90*(2), 105-126. doi:10.1037/0033-295X.90.2.105

Carson, S., Peterson, J. B., & Higgins, D. M. (2005). Reliability, validity, and factor structure of the Creative Achievement Questionnaire. *Creativity Research Journal, 17*(1), 37-50. doi:10.1207/s15326934crj1701_4

Conti, R., Coon, H., & Amabile, T. M. (1996). Evidence to support the componential model of creativity: Secondary analyses of three studies. *Creativity Research Journal, 9*(4), 385-389. doi:10.1207/s15326934crj0904_9

Cropley, A. J. (1994). Creative intelligence: A concept of "true" giftedness. *European Journal for High Ability, 5*(1), 6-23. doi:10.1080/0937445940050102

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: Harper Collins.

Funder, D. C. (1987). Errors and mistakes: Evaluating the accuracy of social judgment. *Psychological Bulletin, 101*(1), 75-90. doi:10.1037//0033-2909.101.1.75

Gajda, A., Karwowski, M., & Beghetto, R. A. (2016, August 18). Creativity and Academic Achievement: A meta-Analysis. *Journal of Educational Psychology.* Advance online publication. http://dx.doi.org/10.1037/edu0000133

Glăveanu, V. P. (2013). Rewriting the language of creativity: The Five A's framework. *Review of General Psychology*, *17*(1), 69-81. doi:10.1037/a0029528

Glăveanu, V. P. (2014). The psychology of creativity: A critical reading. *Creativity. Theories - Research - Applications, 1*, 10-32. doi:10.15290/ctra.2014.01.01.02

Han, K. (2003). Domain-specificity of creativity in young children: How quantitative and qualitative data support it. *Journal of Creative Behavior, 37*(2), 117-142. doi:10.1002/j.2162-6057.2003.tb00829.x

Ivcevic, Z. (2007). Artistic and everyday creativity: An act-frequency approach. *Journal of Creative Behavior, 41,* 271-290. doi:10.1002/j.2162-6057.2007.tb01074.x

Ivcevic, Z. (2009). Creativity map: Toward the next generation of theories of creativity. *Psychology of Aesthetics, Creativity and the Arts, 3*(1), 17-21. doi:10.1037/a0014918

Ivcevic, Z., & Brackett, M. A. (2015). Predicting creativity: Interactive effects of openness to experience and emotion regulation ability. *Psychology of Aesthetics, Creativity, and the Arts, 9*(4), 480-487. doi:10.1037/a0039826

Jussim, L., Eccles, J., & Madon, S. (1996). Social perception, social stereotypes, and teacher expectations: accuracy and the quest for the powerful self-fulfilling prophecy. *Advances in experimental social psychology, 29*, 281-388. doi:10.1016/S0065-2601 (08)60240-3

Jussim, L., Harber, K. D., Crawford, J. T., Cain, T. R., & Cohen, F. (2005). Social reality makes the social mind: Self-fullling prophecy, stereotypes, bias, and accuracy. *Interaction Studies, 6*(1), 85-102. doi:10.1075/is.6.1.07jus

Karwowski, M. (2015). Notes on Creative Potential and Its Measurement. *Creativity. Theories - Research - Applications, 2(1),* 4-16. doi:10.1515/ctra-2015-0001

Karwowski, M., Kaufman, J. C., Lebuda, I., Szumski, G., & Firkowska-Mankiewicz, A. (2017). Intelligence in childhood and creative achievements in middle-age: The necessary condition approach. *Intelligence, 64*, 36-44. doi:10.1016/j.intell.2017.07.001

Kaufman, J. C. (2012). Counting the Muses: Development of the Kaufman Domains of Creativity Scales (K-DOCS). *Psychology of Aesthetics, Creativity, and the Arts, 6*(4), 298-308. doi:10.1037/a0029751

Kaufman, J. C., & Baer, J. (2004). Sure, I'm Creative-But Not in Mathematics!: Self-Reported Creativity in Diverse Domains. *Empirical Studies of the Arts, 22*(2), 143-155. doi:10.2190/26HQ-VHE8-GTLN-BJJM

Kaufman, J. C., Plucker, J. A., & Russell, C. M. (2012). Identifying and asessing creativity as a component of giftedness. *Journal of Psychoeducational Assessment, 30*(1), 60-73. doi:10.1177/0734282911428196

Kim, K. H. (2008). Meta-analyses of the relationship of creative achievement to both IQ and divergent thinking test scores. *Journal of Creative Behavior, 42*(2), 106-130. doi:10.1002/j.2162-6057.2008.tb01290.x

Lindqvist, G. (2003). Vygotsky's theory of creativity. *Creativity Research Journal, 15*(2&3), 245-251. doi:10.1207/S15326934CRJ152&3_14

Milgram, R. M. (2003). Challenging out-of-school activities as a predictor of creative accomplishments in art, drama, dance and social leadership. *Scandinavian Journal of Educational Research, 47*(3), 305-315. doi:10.1080/00313830308599

Milgram, R. M., & Livne, N. L. (2005). Creativity as a general and a domain-specific ability: The domain of mathematics as an exemplar. In J.C. Kaufman & J. Baer (Eds.), *Creativity across domains: Faces of the muse.* London: Lawrence Erlbaum Associates Publishers.

Mumford, M. D., & Norris, D. G. (1999). Heuristics. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of Creativity*, *Vol. 1* (pp. 807-813). San Diego: Academic Press.

Plucker, J., Beghetto, R. A., & Dow, G. (2004). Why isn't creativity more important to educational psychologists? Potentials, pitfalls, and future directions in creativity research. *Educational Psychologist, 39,* 83-96. doi:10.1207/s15326985ep3902_1

Rački, Ž. (2015a). Domain, Gender and Age Differences in the Creative Behavior of Children. *Društvena istraživanja, 24*(4), 467-485. doi:10.5559/di.24.4.01

Rački, Ž. (2015b). Effects of the educationists' implicit theories of creativity on its evaluation by means of the Idiosyncratic Creativity Contents Constellations. *Suvremena psihologija, 18*(2), 145-158.

Rački, Ž., Bakota, L., & Flegar, Ž. (2015). Word knowledge as predictive of linguistic creative behaviors. *Review of psychology, 22*(1-2), 11-18.

Renzulli, J. S. (1978). What Makes Giftedness? Reexamining a Definition. *Phi Delta Kappan, 60*(3), 180-184, 261. doi:10.1177/003172171109200821

Renzulli, J. S. (1986). The three-ring conception of giftedness: A developmental model of creative productivity. In R. J. Sternberg, & J. E. Davidson (Eds.), *Conceptions of giftedness* (pp. 53-92). New York: Cambridge University Press.

Root-Bernstein, R. S., & Root-Bernstein, M. (2004). Artistic scientists and scientific artists: The link between polymathy and creativity. In R. J. Sternberg, E. L. Grigorenko, & J. L. Singer (Eds.), *Creativity: From potential to realization* (pp. 127-151). Washington, DC: American Psychological Association.

Runco, M. A. (2015). A Commentary on the Social Perspective on Creativity. *Creativity. Theories - Research - Applications, 2*(1), 21-31. doi:10.1515/ctra-2015-0003

Runco, M. A., & Bahleda, M. D. (1986). Implicit theories of artistic, scientific, and everyday creativity. *Journal of Creative Behavior, 20*(2), 93-98. doi:10.1002/j.2162-6057.1986.tb00423.x

Runco, M. A., & Jaeger, G. J. (2012). The Standard Definition of Creativity. *Creativity Research Journal, 24*(1), 92-96. doi:10.1080/10400419.2012.650092

Russ, S. W. (1993). *Affect and creativity: The role of affect and play in the creative process.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Russ, S. W. (2003). Play and creativity: developmental issues. *Scandinavian Journal of Educational Research, 47*(3), 291-303. doi:10.1080/00313830308594

Russ, S. W. (2013). *Pretend play in childhood: Foundation of adult creativity.* Washington, DC: American Psychological Association.

Silvia, P. J. (2008). Another look at creativity and intelligence: Exploring higher-order models and probable confounds. *Personality and Individual Differences, 4*, 1012-1021. doi:10.1016/j.paid.2007.10.027

Silvia, P. J., Kaufman, J. C., & Pretz, J. E. (2009). Is creativity domain-specific? Latent class models of creative accomplishments and creative self-descriptions. *Psychology of Aesthetics, Creativity, and the Arts, 3*(3), 139-148. doi:10.1037/a0014940

Simonton, D. K. (2000). Creative development as acquired expertise: Theoretical issues and an empirical test. *Developmental Review, 20,* 283-318. doi:10.1006/drev.1999.0504

Simonton, D. K. (2003). Scientific creativity as constrained stochastic behavior: The integration of product, person, and process perspectives. *Psychological Bulletin, 129*(4), 475-494. doi:10.1037/0033-2909.129.4.475

Sriraman, B. (2005). Are giftedness and creativity synonyms in mathematics? *The Journal of Secondary Gifted Education, 17*(1), 20-36. doi:10.4219/jsge-2005-389

Sternberg, R. J. (2001). Giftedness as Developing Expertise: A theory of the interface between high abilities and achieved excellence. *High Ability Studies, 12*(2), 159-179. doi:10.1080/13598130120084311

Sternberg, R. J., & O'Hara, L. A. (1999). Creativity and intelligence. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 251-272). Cambridge, UK: Cambridge University Press.

Subotnik, R. F., Olszewski-Kubilius, P., & Worrell, F. C. (2011). Rethinking giftedness and gifted education: A proposed direction forward based on psychological science. *Psychological Science in the Public Interest, 12*(1), 3-54. doi:10.1177/1529100611418056

Subotnik, R. F., & Jarvin, L. (2005). Beyond expertise: conceptions of giftedness as great performance. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (2nd ed., pp. 343-357). New York, NY: Cambridge University Press.

Torrance, E. P. (1995). Insights about creativity: Questioned, rejected, ridiculed, ignored. *Educational Psychology Review, 7*(3), 313-. doi:10.1007/BF02213376

Vygotsky, L. S. (2004). Imagination and creativity in childhood. *Journal of Russian and East European Psychology* [English translation], *42*(1), 7-97.

Wai, J. (2014). Experts are born, then made: Combining prospective and retrospective longitudinal data shows that cognitive ability matters. *Intelligence, 45*, 74-80. doi:10.1016/j.intell.2013.08.009

Wai, J., & Rindermann, H. (2017). What goes into high educational and occupational achievement? Education, brains, hard work, networks, and other factors. *High Ability Studies, 28*(1), 127-145. doi:10.1080/13598139.2017.1302874

Wai, J., Lubinski, D., & Benbow, C. P. (2005). Creativity and occupational accomplishments among intellectually precocious youth: An age 13 to age 33 longitudinal study. *Journal of Educational Psychology, 97*(3), 484-492. doi:10.1037/0022-0663.97.3.484

Weisberg, R. W. (1999). Creativity and knowledge: A challenge to theories. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 226-250). Cambridge, UK: Cambridge University Press.

Winner, E. (2000). The origins and ends of giftedness. *American Psychologist, 55*(1), 159-169. doi:10.1037//0003-066X.55.1.159

Ziegler, A. (2005). The Actiotope Model of Giftedness. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (2nd ed., pp. 411-436). New York, NY: Cambridge University Press.

Ziegler, A., & Heller, K. A. (2000). Conceptions of giftedness: A meta-theoretical perspective. In K. A. Heller, F. J. Mönks, R. Sternberg, & R. Subotnik (Eds.), *International handbook of research and development of giftedness and talent* (2nd ed., pp. 3-22). Oxford, England: Pergamon.

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