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Self-efficacy in creativity and curiosity as predicting creative emotions

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ABSTRACT

Self-efficacy constructs could predict students' practices and affect in learning the sciences. Researchers have pointed at such constructs as predictors of students' mathematics achievement and performance. Self-efficacy was also studied as predictor of emotions in learning mathematics, though little research has done so regarding self-efficacy as predictor of creative emotions. Another predictor of creative emotions could be curiosity. The present study has a regression-based modelling design, where it examined whether a set of constructs of self-efficacy in creativity or/and a set of constructs of curiosity predict significantly creative emotions in mathematical problem solving. Five hundred Grade 8-10 students participated in the study. Data were collected using three self-report questionnaires that measured the research constructs. Data analysis used SPSS 21. Results from multiple regression indicated that the set of constructs of self-efficacy in creativity explained significantly 29.6% of the variance in creative emotions. Moreover, the set of constructs of curiosity explained 17.8% of the variance in creative emotions. Furthermore, three of the five independent variables had best prediction of creative emotions, explaining 32.9% of the variance in creative emotions. The results of the stepwise regression showed that self-efficacy in originality and stretching curiosity were the first two variables in a set of three variables that best explained the variance in creative emotions. The research results lead to the recommendation of developing the previous two constructs in classroom setting to cultivate students' creative emotions and thus their creative practices.

Introduction

Emotions play a fundamental role in students' interest in learning as well as in their persistence to accomplish educational tasks (Oriol, Amutio, Mendoza, Costa & Miranda, 2016). This role of emotions indicates the need for a deeper understanding of the antecedents that generate the different emotions throughout the learning process (Pekrun & Perry, 2014). The present research examines students' emotions towards mathematical problem solving (creative emotions) and attempts to verify two possible antecedents for it:

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self-efficacy in creativity and curiosity. In more detail, it intends to examine whether student's self-efficacy in creativity or curiosity predicts significantly his/her creative emotions in mathematical problem solving. In addition, it intends to study which set of variables from the five independent variable (three self-efficacy in creativity constructs and two curiosity constructs) could best predict students' creative emotions. Previous research has examined issues related to the three constructs considered in the present research, as constructs that impact self-efficacy in creativity (Mathisen & Bronnick, 2009), or those that are impacted by self-efficacy in creativity (Yu, 2013), or the relationship of curiosity level and creativity level (Rinkevich, 2014). Little research has been done on the antecedents of creative emotions; which the present research attempts to do. Below, we try to refer to research done on the three constructs considered by the present research and on creativity in mathematics education; a construct that the three research variables could be related to.

Mathematical creativity

Recently researchers in mathematics education have shown interest in mathematical creativity research (Leikin & Pitta-Pantazi, 2013; Ngiamsunthorn, 2020; Nugroho et al., 2020; Sriraman, Haavold & Lee, 2013). This interest has risen due to different factors as the call of researchers in mathematics education (e.g., Haylock, 1987). Another factor is the role of creativity in the 21stcentury by itself by its interconnectivity with other 21st century skills (Pásztor, Molnár, & Csapó, 2015). Specifically, problem solving and posing require creative ideas as expressed in the emergence of new and intriguing solutions and problems that extend the known ones and lead to new mathematical phenomena.

Researchers have been paying attention for creativity in the classroom as it impacts the different aspects of students' learning in general and mathematics education in particular (Daher & Anabousy, 2020). In spite of the attempt of various researchers to define mathematical creativity, no proposed definition has been universally accepted (Mann, 2006). Newell, Shaw and Simon (1962) say that problem solving becomes creative when one or more of conditions are satisfied. These conditions include: (1) the product has novelty and value; (2) the thinking requires modification or rejection of previous ideas; (3) the thinking is done in conditions of high motivation and persistence, and it takes place over either a considerable time or at high intensity; and (4) the problem as initially posed is vague or ill-defined. The definitions of creativity suggested by the various researchers can be divided into two categories: definitions related to the final product and those related to the process (Daher & Anabousy, 2018; James, Lederman, Gerard, & Vagt-Traore, 2004). Sternberg and Lubart (1999), who adopt the point of view of the end product, describe creativity as the ability to produce an unexpected work. Researchers who define creativity as a process describe it as the ability to think in a conceptual way. In the present paper, we adopt the definition of creativity as involving three components: fluency, flexibility, and originality (Guilford, 1975; Torrance, 1966). Our adoption of these components for studying the creativity of pre-service teachers in an educational context is supported by Silver (1997) who described the three components as agreed upon within the studying of creativity. This description is emphasized again by Sriraman, Haavold, and Lee (2013) who say that varying combinations of the three components were utilized to study mathematical creativity. In the present paper, fluency is related to the number of correct responses that a student gives for a problem. Flexibility is related to the number of response types proposed for a problem. Flexibility is also related to the number of solution strategies that a student has employed. Originality is related to the number of responses

that no other student or very few proposed (Torrance, 1974). Studies on mathematics creativity report its positive effect on student learning (Lai, 2011; Mann, 2006),

Researchers are interested in factors that could influence students' creativity. Three factors are: emotions in creative thinking (Soroa, Balluerka, Hommel & Aritzeta, 2015), self-efficacy in creative thinking (Sánchez-Ruiz, Hernández-Torrano, Pérez-González Batey & Petrides, 2011) and curiosity (Rinkevich, 2014). The present research is interested in the prediction of creative emotions by self-efficacy in creativity and curiosity. Following, we describe these three constructs.

Creative emotions

Researchers claim that the human activity is not emotionally neutral. Researchers point at the relationship of emotions to different aspects of students learning as the cognitive aspect (Daher, 2011; Xolocotzin, 2017), the social aspect (Daher, 2015; May & Fray, 2010).), and the metacognitive aspect (Daher, Anabousy, & Jabarin, 2018; Tzohar-Rozen&Kramarski, 2014). Radford (2004, p. 53) discusses the role of emotions in information processing in general: "Information is not emotionally neutral. In the intelligent selection and processing of information we are guided by subconsciously assimilated emotional markers that are a result of acculturation." We argue that these emotions could be also conscious, affecting the processing processes of creativity. It highlights the important role of emotions, and specifically creative emotions, in knowledge construction and problem solving.

De Dreu, Baas, and Nijstad (2008) proposed a model in which positive emotions facilitate creativity by leading people to feel less constrained, and experience the situation as unproblematic, which would enable their cognitive flexibility. On the other hand, negative emotions facilitate perseverance and effort toward generating effective solutions to a problematic situation. Soroa et al. (2015) build on this model to stress that positive emotions encourage more expansive divergent thinking and novelty. In the present research, we examine what could predict students' emotions in creativity, rather than emotions as a predictor of other constructs.

Creative self-efficacy

Bandura describes self-efficacy as concerned with the beliefs in what one can do with whatever resources one can have or get (Bandura, 2007). As to self-efficacy in creativity, Tierney and Farmer (2011) say that it is the confidence of individuals in their own creative capabilities to create unusual outcomes or solutions. This confidence affects positively their expression of creativity (Yu, 2013). Individuals who feel creative self-efficacy have inclination to engage in broader searches for information (Tierney & Farmer, 2002), are more likely to access relevant knowledge and expertise from other individuals or from the group, which support them in developing new and useful ideas; i.e. creative ones.

Abbott (2010) suggests looking at two dimensions of creative self-efficacy: creative thinking self-efficacy and creative performance self-efficacy. The present research is interested in the creative thinking component, which is an individual's belief in his or her own ability to express creative thinking.

Curiosity

Kashdan et al. (2009) describe curiosity as having overlapping attributes with intrinsic motivation, flow, and other variables. They emphasize that it possesses unique characteristics as related to being interested in new things and possessing an open and receptive attitude toward whatever is the object of attention. So, when people feel curious,

they dedicate more attention to the object of their curiosity, which encourage them to persist on this object until goals are accomplished (Silvia, 2006). The educational function of curiosity lies in its encouragement of the curious student to learn and explore the object of her/his curiosity (Loewenstein, 1994).

Kashdan et al. (2009) argue that curiosity is related to two aspects. First, it could be expressed as the willingness to embrace the uncertain and unpredictable nature of everyday life. This is related to the embracing component of curiosity. Second, it could be expressed as the willingness to continually accumulate new abilities and experiences, which is related to people's inclination to stretch their capabilities. This is related to the stretching component of curiosity.

In the present research, we want to examine student's curiosity and self-efficacy in mathematical creativity as predictors of student's creative emotions in mathematical problem solving. Furthermore, we want to examine which set of the five independent variables predicts best creative emotions in mathematical problem solving. Little research has been done on the antecedents of creative emotions in mathematical problem solving; what the present research attempts to do. In this research, we use theories of curiosity and creative self-efficacy that are not specific to mathematics education, so the paper constitutes an opportunity to use them in mathematics education.

Research rationale and goals

Research has suggested that emotions play a considerable role in the creative problem-solving process (Sas & Zhang, 2010). This indicates the need to cultivate positive emotions for problem solving, so that creative problem-solving occurs. To cultivate these emotions, we need to know the antecedents of emotions. The present paper attempts to do so when it considers two antecedents of creativity: self-efficacy in creativity and curiosity.

Though a plenty of research has been done on emotions as impacting creativity (Sas & Zhang, 2010), little research has been done on self-efficacy and curiosity as impacting creative emotions in mathematical problem solving, where we, in the present paper, attempt to do so. This will enable educators to have means for encouraging creative emotions, which will encourage students' creativity in mathematical problem solving, and, as such, will prepare them for the twenty-one century skills (Daher, Tabaja-Kidan & Gierdien, 2017).

Previous research has shown that self-efficacy affects positively students' creativity. For example, Hoseinzadeh and Sameri (2016) found that self-efficacy had significant positive effect on the creativity of students. Besides, curiosity was also related to creativity. Starko (2013) argues that a strong sense of curiosity is important in the early steps of the creative process. The present research was concerned with constructs related to self-efficacy and creativity: creative self-efficacy and creative emotions. We intended to verify whether the relations previously describes are also satisfied for the constructs in the present research.

Research questions

1. Do self-efficacy constructs (self-efficacy in fluency, self-efficacy in flexibility and self-efficacy in originality) predict significantly creative emotions in mathematical problem solving?
2. Do curiosity constructs (stretching curiosity and embracing curiosity) predict significantly creative emotions in mathematical problem solving?

3. Which set of variables from the five independent variables (three self-efficacy in creativity variables and two curiosity variables) could best predict creative emotions in mathematical problem solving?

Research Methods

Participants

The sampling is a stratified convenience sampling. We distributed the questionnaire among Grades 8-10 students from schools in Nablus Governorate in Palestine. The schools were chosen depending on their agreeing to distribute the questionnaire among their students. The sample consisted of 500 Grade 8-10 Palestinian students (251 female students and 249 male students) aged between 13 and 16 years old. Participants were 156 Grade 8 students (31.2%), 182 Grade 9 students (36.4%) and 162 Grade 10 students (32.4%). The sampling design employed was a non-probability convenience sampling.

Data collecting tools

The present study used three self-report questionnaires that served to measure the research constructs: creative emotions, self-efficacy in creativity and curiosity. The emotion scale was taken from Soroa et al. (2015), named by them as the 'divergent pleasant style' scale. The emotions scale includes five items as "While suggesting innovative solutions for a mathematical problem I tend to feel joy". The self-efficacy in creativity scale was taken from Abbott (2010). The scale is composed of 12 items that examine self-efficacy constructs: 4 self-efficacy in fluency items, such as "I can get a large number of different ideas or responses for a mathematical problem", 4 self-efficacy in flexibility items, such as "I can think of many types of ideas while considering the solution of a mathematical problem", and 4 self-efficacy in originality items, such as "I can think of ideas for the solution of a mathematical problem that no one else has". The curiosity scale was taken from Kashdan et al. (2009). This scale is composed of 10 items that examine two curiosity constructs: 5 stretching curiosity items, such as "I view challenging situations as an opportunity to grow and learn" and 5 embracing curiosity items such as "I am the type of person who really enjoys the uncertainty of everyday life". In the three scales, each item has 5 choices: 1: I strongly disagree, 2: I disagree, 3: I am not sure, 4: I agree, and 5: I strongly agree.

Validity and reliability analysis

Validity and reliability analyses were performed for the six scales. To ensure face validity, the Arabic version of the questionnaire was presented to mathematics educators and teachers to give their opinion regarding the accuracy of items formulation as related to Grades eight, nine and ten. The necessary corrections were made to the formulation of the scale items in accordance with their comments. To ensure reliability, the questionnaire was distributed to an exploratory sample of thirty students. Cronbach's Alpha was computed for each of the five scales. This computation gave .86 for creative emotions, .81 for self-efficacy in fluency, .77 for self-efficacy in flexibility, .84 for self-efficacy in originality. It gave .78 for stretching curiosity and .80 for embracing curiosity. These reliability results indicate good reliability for the scales (Field, 2009) because they are around .80.

Data analysis

To answer the research questions, we computed at the beginning Pearson correlation coefficient between each of the two predictors in the present study (self-efficacy and curiosity) and between the outcome variable (Emotions). To determine the strength of the

correlation between two variables, we depended on Cohen (1988): 0.1 < | *r* | < .3 indicates small correlation, 0.3 < | *r* | < .5 indicates medium/moderate correlation and | *r* | > .5 indicates large/strong correlation, where *r* represents Pearson correlation coefficient.

To determine the variance percentage that the predictor explains of the outcome variable, as well as the regression weights of the predictors as determining the outcome variable, multiple regression analysis was performed. In addition, to examine the set of variables from the five independent variables that could best predict creative emotions, we carried out stepwise regression analysis. This type of regression fits our second goal of examine the set of variables that could best predict creative emotions. Our utilization of stepwise regressions follows the claim of researchers that these methods are used in educational and psychological research to assess the order of importance of predicting variables and to select useful subsets of these variables (Huberty, 1989; Thompson, 1995).

The collected data satisfied the assumptions of regression analysis (Grande, 2015). *First*, the dependent variable – creative emotions - is measured on a continuous scale. *Second*, there are two or more independent variables, which can be either continuous or categorical. Here, we have five independent ratio variables (self-efficacy in fluency, self-efficacy in flexibility, self-efficacy in originality, stretching curiosity and embracing curiosity). *Third*, there should be independence of observations (i.e., independence of residuals). To examine this independence, we used the Durbin-Watson statistic, which gave the DW statistic value of 1.945, which is accepted as it lies between 1.5 and 2.5 (Lester, Inman, & Bishop, 2014). In addition, the standardized residuals lie in a rectangular shape, emphasizing the independence of observations, as in Figure 1 (Grande, 2015).

Fourth, there needs to be a linear relationship between (a) the dependent variable and each of your independent variables, and (b) the dependent variable and independent variables collectively. To examine this assumption, we drew the normal probability plot of the regression standardized residual, which is shown in Figure 2.

The plot in Figure 2 is more-or-less around the line, which means that the relationship between the predictors and the outcome variable is linear. Being around the line, the plot also indicates that the residuals have normal distribution, which is the *sixth assumption* of the regression

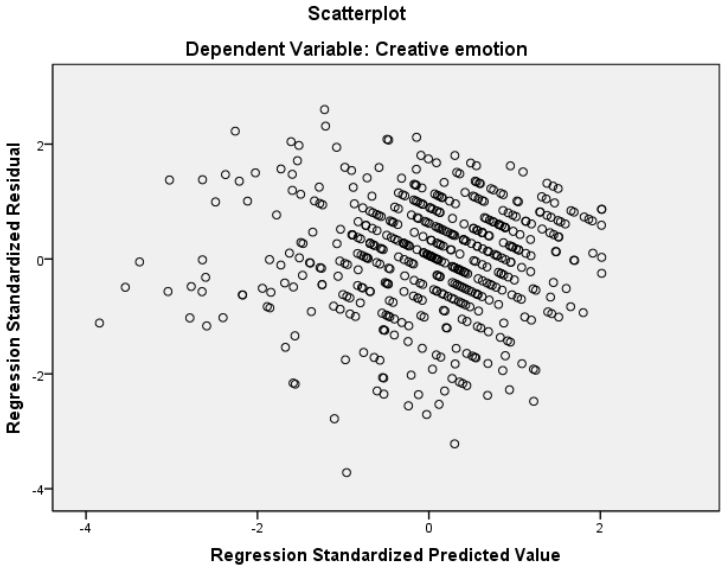

Figure 1. Standardized residuals

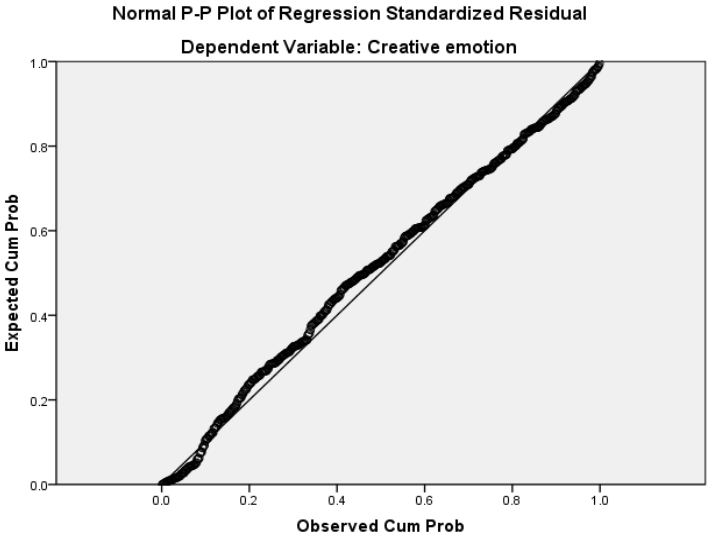

Figure 2. Probability plot of regression standardized residual

Seventh, the data must not show multicollinearity, which occurs when two or more independent variables are highly correlated with each other; i.e. greater than 0.9 (Dohoo et al., 1997). Computing correlations between the independent variables, all of them were less than 0.9, as in Table 1 in the results section, which proved the absence of multicollinearity.

Eighth, the predictor variables should correlate with the outcome variable with value more than .3, which is satisfied in our case, except in the case of embracing curiosity, as in Table 1 in the results section. We kept the embracing curiosity but expected it not to contribute meaningfully to explaining the variance of creative emotions.

Results and Discussion

Results

As a first step to answer the research questions, regarding the prediction of creative emotions by self-efficacy in creativity constructs and curiosity constructs, we first computed the Pearson correlations between every couple of the research variables. Table 1 shows these correlations, in addition to the variables' means and standard deviations.

Table 1

Means, standard deviations and bivariate correlations of study variables

	EmoC	SE-Fl	SE-Flx	SE-Or	St-C	Emb-C	M	SD
EmoC		.409**	.411**	.491**	.424**	.138**	3.63	.73
SE-Fl			.553**	.483**	.479**	.215**	3.93	.76
SE-Flx				.444**	.362**	.126**	3.63	.81
SE-Or					.377**	.188**	3.66	.84
St-C						.248**	3.98	.69
Emb-C							3.29	.63

**Correlation is significant at the 0.01 level

EmC=Emotions towards creativity, SE-Fl= Self-efficacy in Fluency, SE-Flx= Self-efficacy in Flexibility, Self-efficacy in originality, St-C=stretching construct of curiosity, Emb-C=Embracing construct of curiosity

Self-efficacy in fluency, flexibility and originality as predictors of creative emotions

The first question asked whether students' self-efficacy in fluency, flexibility and originality predict significantly their creative emotions. Table 1 shows that creative emotions had moderate relationship with each construct of self-efficacy in creativity. In

addition, the correlations between self-efficacy constructs (the predictors) are around $r = .5$, suggesting multiple regression is appropriate. This multiple regression was run to compute the prediction of students' creative emotions by self-efficacy in fluency, flexibility and originality. This regression analysis included the three self-efficacy constructs in the first step of the regression. The results of the regression indicated that the three components predicted significantly creative emotions (p<.01). In addition, the three self-efficacy constructs, as predictors, explained 29.6% of the variance (R2=.30, F(3,496)=70.99, p<.001). The appropriate regression equation turned out to be: creative emotions=1.40+.14*self-efficacy in fluency+ .16*self-efficacy in flexibility+ .30* self-efficacy in originality. The contribution of construct of self-efficacy in creativity was significant: t(496)=3.03, p<.01 for self-efficacy in fluency, t(496)=7.72, p<.01 for self-efficacy in flexibility and t(496)=3.87, p<.01 for self-efficacy in originality.

Stretching and embracing curiosity as predictors of creative emotions

The second research question asked whether students' curiosity related to its two constructs predict their creative emotions. We performed the same computations as above. Table 1 shows that creative emotions had moderate correlation with the stretching component and small correlation with the embracing component. In addition, the correlations between predictors are of around r = .5, suggesting multiple regression is appropriate with the curiosity components, except for the embracing component because of the weakness of its correlation with creative emotions. To verify the prediction of creative emotions by the two curiosity constructs, multiple regression analysis that included the two curiosity constructs in the first step of the regression was run. This showed that the two curiosity constructs predicted significantly emotions towards creativity (p<.01). In addition, the two curiosity components, as predictors, explained 17.8% of the variance (R2=.18, F(2,497)=54.90, p<.001). The appropriate regression equation turned out to be: Emotions towards creativity=1.74+ .44*Stretching curiosity+ .04*Embracing curiosity. The contribution of the stretching component of curiosity to emotions towards creativity was significant (t(497)=9.91, p<.01) while the embracing component did not contribute significantly to emotions towards creativity (t(497)=.86, p=.39). We included the embracing curiosity in the equation because the whole model was significant.

The third research question asked which set of variables from the three self-efficacy-in-creativity components and the two curiosity components (the five independent variables) could best predict the students' creative emotions. We run stepwise analysis to examine this set, entering the five independent variables as predictors of creative emotions. The prediction model contained three of the five predictors and was reached in three steps with two variables removed: self-efficacy in fluency and embracing curiosity (see Table 2). The model was statistically significant, F(3, 496) = 82.55, p < .001, and accounted for approximately 32.9% of the variance of creative emotions (R2 = .33, Adjusted R2 = .33). Creative emotions was primarily predicted by higher levels of self-efficacy in originality and stretching curiosity, and to a lesser extent by higher levels of self-efficacy in flexibility.

The model results are shown in Table 3. Self-efficacy in originality received the strongest weight in the model followed by stretching curiosity and afterwards by self-efficacy in flexibility.

Table 2
Summary of the results on the stepwise models that predict creative emotions

Model	R	R Square	Adjusted R Square	SE of the Estimate	R Square Change	F Change
1	$.49_a$	.24	.24	.64	.24	158.10**
2	$.56_b$	.31	.31	.61	.07	47.82**
3	$.58_c$	.33	.33	.60	.02	18.91**

a. Predictors: (Constant), Efficacy in Originality
b. Predictors: (Constant), Efficacy in Originality, Stretching Curiosity
c. Predictors: (Constant), Efficacy in Originality, Stretching Curiosity, Efficacy in Flexibility
d. Dependent Variable: Emotion
** Significant at the 0.01 level

Table 3
Stepwise regression model summery

Model	B	SE-B	Beta	Pearson r	t	95.0% Confidence Interval for B
Constant	1.00	.18			5.69**	[.66, 1.35]
SE-Or	.28	.04	.32	.49	7.56**	[.21,.35]
St-C	.25	.04	.24	.42	5.82**	[.17, .34]
SE-Flx	.17	.04	.18	.41	4.35**	[.09, .24]

SE-Flx= Self-efficacy in Flexibility, SE-Or =Self-efficacy in originality, St-C=stretching Component of curiosity
Note. The dependent variable was creative emotions. R2 = .33, Adjusted R2 = .33.
** Significant at the 0.01 level

Discussion

Students' creativity, as part of high-order thinking, is attracting the attention of researchers as it prepares them for fruitful practices in everyday life and at work (Daher et al., 2017). Emotions in creativity could indicate different educational variables that show the success of students' creative learning. The present research intended to examine antecedents of students' creative emotions as they could shed light on the learning environment that encourages creative learning. Specifically, it intended to study whether the three constructs of self-efficacy in creativity or the two constructs of curiosity predict significantly creative emotions in mathematical problem solving. Previous research has shown that self-efficacy and curiosity could affect positively students' creativity (Hoseinzadeh & Sameri, 2016; Starko, 2013), which indicated the need for verifying related constructs, specifically creative self-efficacy and curiosity as predictors of creative emotions.

The research results indicated that each set of constructs, whether self-efficacy constructs or curiosity constructs could predict significantly creative emotions in mathematical problem solving. The self-efficacy constructs explained 29.6% of the variance of creative emotions while the curiosity variables explained 17.8% of the variance of creative emotions. The findings that the three self-efficacy constructs explain 29.6% of the variance of creative emotions indicate that self-efficacy could be a predictor of emotions, here in creativity. The results add to the research on the contribution of self-efficacy to students' learning (Callaman & Itaas, 2020). Further research on other educational constructs is needed to verify these findings concerning the previous research constructs of self-efficacy in creativity and creative emotions. Moreover, the research findings indicated, in the case of curiosity as predictor, that the extent of explanation was 17.8% of the variance of creative emotions, which indicates that other constructs are needed to explain creative emotions. Again, the results of the present research add to previous research that

pointed at an interplay of other important factors in the relationship between curiosity and academic performance (Abakpa, Abah & Agbo-Egwu, 2018), here the interplay between curiosity and creative emotions.

In addition to the previous claims, looking at each of the five predicting variables, the results showed that the self-efficacy in originality construct explains more variance of the creative emotions construct than the other two self-efficacy constructs (self-efficacy in fluency and self-efficacy in flexibility). At the same time, the results showed that the stretching curiosity construct explains more variance of the creative emotions construct than the embracing curiosity construct. These results were supported by the stepwise regression analysis that was carried out to answer the third question that verified the set of variables that could best predict the students' creative emotions. The results of the stepwise regression showed that self-efficacy in originality and stretching curiosity were the first two variables in a set of three variables that best explained the variance in creative emotions. This centeredness of self-efficacy in originality could be a result of the centeredness of originality as an expression of creativity, where different researchers point at originality as expressing creativity or as correlated with it more than the other constructs. Acar, Burnett, and Cabra (2017) found that originality was the strongest correlate of both creativity and innovation among four major factors of creativity—originality, value, surprise, and aesthetics. Moreover, Leikin and Kloss (2011) point at originality as the main criteria for determining creativity. Leikin and Kloss (2011) say that the close relationship of originality and creativity is "consistent with the common view of creativity as production of novel ideas" (p. 1092).

In addition to the above, the main role of stretching curiosity, as predictor of creative emotions, could be related to the expressions of its items, where these expressions are related to accepting challenges. Ivtzan et al. (2016) and Wong (2017) argue that positive motivation and meaningful growth can result from challenges. This indicates that the acceptance of challenges would lessen the negative emotions associated with creative problem solving. Finally, note that the highest correlations of creative emotions with the independent variables are with self-efficacy in originality and stretching curiosity, which also indicates their centeredness for creativity in general (Runco, 1993) and creative emotions in particular.

Conclusion

Little research has studied antecedents of creative emotions. The present research intended to study this issue. Namely, it intended to study self-efficacy in the components of creativity (self-efficacy in fluency, self-efficacy in flexibility and self-efficacy in originality) as predictors of creative emotions. In addition, it intended to study two components of curiosity (stretching curiosity and embracing curiosity) as predictors of creativity. The research results indicated that three of the five independent variables had best prediction of creative emotions, explaining 32.9% of the variance in creative emotions. The results of the stepwise regression showed that self-efficacy in originality and stretching curiosity were the first two variables in a set of three variables that best explained the variance in creative emotions. The research results lead to the recommendation of developing the previous two constructs in classroom setting to cultivate students' creative emotions and thus their creative behavior. This recommendation, if adopted by mathematics teachers, could contribute to the creative doing of students in contexts of learning mathematics as problem solving contexts.

Little research has been done on self-efficacy and curiosity as impacting creative emotions, where we in the present paper attempt to do so. We came upon important results concerning creative self-efficacy and curiosity as predictors of creative emotions. More research is needed to verify the present research results. The limitation of the present study lies in taking into consideration only two constructs as predictors. Future studies could take additional variables, like the motivation construct, as predictors. In addition, future research could use different research designs as structural equation modelling.

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