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The Relationship between Blended Mathematics Professional Training and Teachers' Creativity and Effectiveness

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This study aimed to examine students' responses towards teachers' creativity. It also evaluates the teaching effectiveness of secondary school mathematics teachers that had attended a year blended professional training program. A sample of 1000 students from various secondary schools was randomly assigned to rate 100 mathematics teachers. This was conducted using mathematics teachers teaching creativity scale (MT-CTS) and mathematics teachers teaching effectiveness scale (MT-TES). Furthermore, this research employed a validated and reliable five-point Likert scale of MT-CTS and MT-TES (1 = totally disagree, 2 = disagree, 3 = partially agree, 4 = agree and 5 = totally agree). After administering the questionnaires, the data were analyzed using structural equation modeling (SEM). The results showed a positive relationship between blended professional training on Mathematics teachers' creativity and their teaching effectiveness. The most dominant indicators of teaching creativity (confidence, teaching style & overcoming barriers) and effectiveness (opportunity for practice, cognitive aspects) were comprehensively elaborated. This study reveals its novelty in terms of students' emotional aspect, which resulted from the intensive cognitive tasks. Furthermore, it did not differentiate teachers' creativity and effectiveness before and after the blended training. Consequently, an experimental study is recommended to address this issue.

Keywords: blended training, relationship, teacher creativity, teaching effectiveness, mathematics

INTRODUCTION

Creativity and effectiveness are two essential parts of today's education objective (Arifani, Khaja, Suryanti, & Wardhono, 2019; Harris, 2016; Kandemir, Tezci, Shelley, & Demirli, 2019; Karp, 2017). Therefore, efforts have been made by the government,

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policymakers and curriculum designers, through teachers' professional trainings in order to yield creativity in teachers and students. Many fields of study such as English, Biology, Chemistry, Physics, Economics, Sports, and Civics education, tend to exploit creativity element as the center of the discussion, with an emphasis on teachers' and students' perspectives (Craft, 1998; DeHaan, 2009; Memmert, 2015; Scott, 1989).

Many research works have integrated creativity as a crucial variable in Mathematics teaching and learning domain because, it is considered as the core of education. Studies on mathematical fields have also involved different variables such as teachers and students, which aim to foster their creativity to solve mathematical problems. Conversely, research on teachers' creativity is never separated from other essential variables such as students' achievements, teaching effectiveness, motivation, classroom management, beliefs, attitudes, affection, and talents (Erdogan & Yemenli, 2019; Goldin, 2017). Furthermore, process and product-based approach of investigating these variables of creativity and effectiveness have been widely explored (Arifani & Suryanti, 2019; Khodabakhshzadeh, Hosseinnia, Moghadam, & Ahmadi, 2018). Khodabakhshzadeh et al., (2018), for example, investigating the influence of teachers' creativity and effectiveness was conducted using two different questionnaires from the perspective of the teacher. This was adequately criticized in terms of its subjectivity because, the subjects were the teachers that filled out the questionnaires. Consequently, Arifani & Suryanti (2019) proposed a more objective research on creativity and effectiveness using a similar instrument from the students' perspective. This was carried out to minimize the subjective sides of the teachers. Conversely, these different studies are not sufficient to contribute to the body of knowledge, since there is another vital variable by considering teachers' background of professional development.

However, many research works have failed to cover a crucial variable which makes Mathematics teachers creative by considering their professionalism. Previous studies have claimed that professional development is one of the influential factors necessary to enhance teachers' creativity (Arifani et al., 2019). Furthermore, due to technological advancements, the forms of teachers' professional development have also shifted from the traditional to blended model. This shift also influences many aspects of teachers' creativity elements such as planning, practices, and assessment tools. One form of modern teachers' professional development is implemented through a blended approach. The aim is to maintain a balance of creativity between the traditional and online teaching practices. It also measures the relationship between blended Mathematics professional training towards their teaching creativity.

LITERATURE REVIEW

Blended Professional Training

The emergence of technology in classrooms for teaching and learning has a significant impact on the professional development of Mathematics teachers. This effect is also seen from the emergence of blended professional training in the mathematics domain. Blended professional development aims at maintaining the harmony between traditional and online-based teachers (Arifani et al., 2019; Garrison & Kanuka, 2004; Kocoglu, Ozek, & Kesli, 2011; Owston, Sinclair, & Wideman, 2008). The underlying theory of implementing blended professional training was adopted from blended learning theory. The fundamental benefits of implementing traditional and e-learning professional trainings were considered as the underlying theory of blended practices for Mathematics teachers through meaningful interactions (Osguthorpe & Graham, 2003). The merits of applying technology such as blended learning and other technological media in teaching and learning have also been recognized (Amstelveen, 2018; Arifani et al., 2019; Brown, 2017; Drijvers, Doorman, Boon, Reed, & Gravemeijer, 2010; Drijvers, 2015; Guerrero, 2010; Rotger & Ribera, 2019; Taleb, Ahmadi, & Musavi, 2015).

The most outstanding works of the use of technology in Mathematics was shown by Drijvers (2015). The works reviewed several studies implementing technology in the Mathematics field, and also provided a logical summary of why a certain technology works or does not. Drijvers further specifies six cases of technology use in Mathematics such as sequencing calculus courses. Using computers for calculations made students more confident than the traditional method (Heid, 1998). Another example was a handheld technology & instrumental genesis, which enhances students' Mathematics learning (Doerr & Zangor, 2000; Drijvers et al., 2010). Online applet applications for algebra and geometry help students acquire knowledge on those two topics easily (Bokhove & Drijvers, 2012). Mobile smartphones using GPS also revealed positive results in Mathematics teaching and learning (Daher, 2010). Technology has been benefitial to the professional development of Mathematics teachers and studies have also shown positive results (Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2013).

Considering the above results of exploiting technology in Mathematics pedagogy, researchers have also attempted to take an advantage of implementing this blended professional training for the professional development of teachers. This was done across various fields of studies such as: foreign language (Arifani et al., 2019; Kocoglu et al., 2011); management (Arbaugh, 2000); business (Holsapple & Lee-Post, 2006); science and mathematics (Harrell & Harris, 2006).

Arbaugh (2000), for example, investigated effective internet-based courses in business programs using Lotus learning software CMC and virtual classrooms in the United States. This study was conducted within a 14-week semester program. However, results showed that students being taught using virtual classrooms were positively associated with their satisfaction in attending the course program.

Furthermore, in the field of science and Mathematics, Harrell & Harris (2006) examined the effectiveness of an online teacher certification program using two years of experimental study. The results showed that it significantly increases diverse teacher candidates in science and Mathematics. This also increases candidates teaching performance, and assuring teachers' satisfaction with the online course.

In different fields of study, the impact of implementing blended professional development for foreign language teachers has been investigated. For instance, Arifani et al., (2019) conducted a massive survey towards 120 teachers that attended blended professional training and 901 students from a provincial level in Indonesian senior high school. The results of this survey revealed that its implementation positively influences the teaching effectiveness and creativity of foreign language teachers.

Although, a positive contribution towards the development of the body of knowledge in different fields of study has been considered, this study did not observe the impact of comparing pre and post-blended training. Therefore, it is hard to explain the impact of implementing blended teachers' professional training by comparing their creativity progress from the pre to post-training programs. This study tries to determine the relationship between blended mathematics professional development training and the creativity and effectiveness of teachers, which is the most dominant components of all the indicators.

Teacher Creativity and Effectiveness

Teachers' creativity and teaching effectiveness are two inseparable variables that have an effect on students' learning outcomes (Arifani et al., 2019). One of the common relationships between these two variables is achievement. It has been acknowledged that teachers' creativity and teaching effectiveness positively correlate to learning achievement (Kubitskey, Fishman, & Marx, 2003; Lovett, Meyer, & Thille, 2008; Vescio, Ross, & Adams, 2008; Vogt, 2019). Meanwhile, the term "teachers' creativity" refers to the application of new ideas in teaching and learning process. However, historically, this cannot be separated from the creativity test developed and initiated by Wallach & Kogan (1965) and Torrance (1974). Subsequently, teaching effectiveness is usually perceived from multidimensional views like professional, pedagogical, social and personal attributes (Arifani et al., 2019; Barry, 2010; Paolini, 2015).

In addition, different instruments have been established to measure teachers' creativity and teaching effectiveness (Barry, 2010; Calaguas & Glenn, 2013; Kandemir et al., 2019; Kulsum, 2000; Paolini, 2015; Pishghadam, Nejad, & Shayesteh, 2012; Torrance, 1974; Wallach & Kogan, 1965; Yıldırım & Yıldırım, 2019). The aforementioned scholars that initiated and developed these two different instruments classify common attributes of creativity and effectiveness. They consist of internal and external factors such as motivation, personality, teaching strategy, and environment. In the Mathematics domain, for example, two famous scholars have developed two seminal instruments of creativity and effectiveness of teachers (Calaguas & Glenn, 2013; Kandemir et al., 2019; Yıldırım & Yıldırım, 2019). Although, those two different instruments were well-designed, but in the Mathematics field, there is no study which measures teachers' creativity and teaching effectiveness using them. Consequently, this study bridges attempts to examine the different horizons of teachers' creativity and effectiveness from blended professional development training outlooks in the Mathematics domain.

Research Questions

- Research question (RQ 1): Is there any significant relationship between blended teachers' professional development and Mathematics teachers' creativity and effectiveness?

- Research question (RQ 2): What are the most dominant components of each indicator of teachers' creativity and teaching effectiveness?

METHOD

The participants of this study consisted of 100 mathematics secondary school teachers that attended a one-year in-service teachers' professional development program. This was conducted in four different universities at the provincial level in East Java, Indonesia. In addition, the project was funded by the Ministry of Education. The four host universities that enrolled in the blended teacher professional development were accredited as 'excellent' predicate from the Ministry of Education. It consisted of two public and private universities. Meanwhile, all the participants had to attend two semesters of professional training. In the first semester, they attended the hybrid professional training program using an Indonesian online learning system (*SPADA Indonesia).* In this stage, the participants joined one-semester long-distance training via online mode. However, during this training, they learned the following: ordinary differential equation (ODE) with its introduction and examples; separable, homogenous and first-order ODE; linear, exact and Bernoulli differential equation (Mathematics content knowledge). They also learnt about the characteristics of learners, teaching strategy, and assessment (pedagogical knowledge). Meanwhile, online forum discussions, quizzes, mid-test, and final exam were also conducted to assess their content knowledge on Mathematics and pedagogical aspects.

The next stage was the classroom training program. During this second stage, all participants stayed at the university dormitories for the whole semester. The traditional training program consisted of the following: teaching in the 21st century; Mathematics teachers' profession and development; teaching and learning of the subject; learners' characteristics; learning strategy and evaluation; designing a lesson plan; teaching media; peer and real classroom teaching practices at schools. Subsequently, during the peer and real teaching practices, two senior Mathematics lecturers (assistant or associate professors) regularly monitored the implementation of peer teaching in the classroom. Discussions, quiz, mid and final tests were administered during the traditional training activities.

At the end of the program, a set of questionnaires such as Mathematics teacher teaching creativity and effectiveness scales, that is, (MT-CTS) and (MT-TES) respectively were administered to 1000 students from various schools. This was carried out to observe their teachers' creativity enhancement. Furthermore, the students were assigned to complete the two questionnaires to ascertain whether the creativity and effectiveness of their Mathematics teachers had been enhanced after attending a year blended teacher training program.

Instruments

This research aimed to measure the creativity of Mathematics teachers and their teaching effectiveness through the application of two different instruments namely (MT-CTS) and (MT-TES). In order to assess the degree to which the Mathematics teachers' training program promoted their creativity, MT-TES and MT–CTS questionnaire initiated by Kandemir et al., (2019) and Yıldırım & Yıldırım (2019) were applied. The MTCTS consisted of 31 items using the multiple-choice format from "always" to "never" range. It also contains seven multi-dimensional elements of the teaching creativity of mathematics teachers, namely: teaching style (7 items); innovative teaching practice (7 items); classroom climate (4 items); asking questions (3 items); overcoming barriers (4 items); and confidence (6 items). Furthermore, the MTTES comprises of five clusters, namely: conceptual understanding (11 items); cognitive aspect (5 items); providing an emotionally safe environment (4 items); opportunity for practice (2 items); and preparing students to learn (4 items).

Procedure and data analysis

The initial stage of this study began when the researcher became one of the professional trainers that taught Mathematics blended/hybrid teachers' professional program. This was funded by the Indonesian Ministry of Education at the host university. The researcher collaborated with three Mathematics lecturers from three other host universities. They all taught the program which lasted for two semesters. In the first semester, they taught both Mathematics content knowledge and pedagogical aspects to all trained participants. Furthermore, they carried out online discussions, quizzes, mid and final tests. However, during the second semester, the researcher and teams taught all participants in the traditional classroom model. As stated earlier, they taught the concepts of teaching in the 21st century; Mathematics teachers' profession and development, teaching and learning of the subject, learners' characteristics, learning strategy and evaluation, designing a lesson plan, teaching media, peer and real classroom teaching practices at the schools.

At the end of the program, all participants were sent back to their schools in other to carry out the real teaching practices as part of the blended training program. Meanwhile, during this session, the researcher and three other Mathematics lecturers sent paper-based questionnaires. Two different questionnaires were distributed to 1000 respondents from ten different schools (comprising of 100 responded from each schools). The questionnaire was not conducted in online format because, respondents were not allowed to bring their mobile phones during school sessions. This rule has been implemented in all Indonesian schools from elementary to senior high school level. Consequently, paper-based copies of MT-TCS and MT-TES were prepared and distributed to the students via the researcher herself and three other host lecturers during the real teaching practice session. Structural Equation Modelling (SEM) was applied to analyze the correlation after the data had been collected.

FINDINGS

- *Research question (RQ1): Is there any significant relationship between blended professional development and Mathematics teachers' creativity and effectiveness?*
- *Research question (RQ 2): What are the most dominant components of each indicator of teachers' creativity and teaching effectiveness?*

Before addressing the above research questions, it is necessary to explain two essential assumptions as the main requirement to yield valid findings namely normal distribution, and multi colinearity tests. The first assumption was fulfilling the normal distribution of the data. It was clearly stated that the data from both exogenous and endogenous latent variables were normally distributed.

Table 1
Normality test: one-sample Kolmogorov-Smirnov test

		Conceptual understanding	Cognitive aspect	Providing an emotionally safe environment	Opportunity for practice	Preparing students to learn	Innovative teaching practices	Classroom climate	Asking questions	Overcoming barriers	Teaching style	Confidence
N		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Normal Parameters[a,b]	Mean	5.0335	4.9763	4.9805	5.6227	5.5610	5.2480	5.5210	5.2176	4.9962	5.4959	3.4988
	Std. Deviation	.28144	.15733	.16525	.28962	.25879	.21252	.23235	.18667	.20378	.10688	.08453
Most Extreme Differences	Absolute	.198	.220	.217	.237	.226	.241	.211	.223	.247	.242	.242
	Positive	.198	.220	.217	.200	.226	.241	.211	.223	.247	.242	.242
	Negative	-.157	-.209	-.193	-.237	-.134	-.235	-.195	-.219	-.168	-.230	-.235
Test Statistic		.198	.220	.217	.237	.226	.241	.211	.223	.247	.242	.242
Asymp. Sig. (2-tailed)		.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

Table 1 illustrates that both teachers' creativity and teaching effectiveness were normally distributed. It could be seen from sig. 2-tailed values (0.00 <0.05). Since the sig. 2-tailed values were smaller than the *t*-value, the data was followed up with SEM analysis.

After accomplishing the first assumption, the next step was carried out to fulfill the second. In this stage, a multicollinearity test was also applied to the data. It aimed to assess both exogenous (teachers' creativity) and endogenous (teaching effectiveness) variables.

Table 2
Multicollinearity test

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.322	.287		1.123	.262		
	Innovative teaching practices	-.016	.055	-.025	-.281	.778	.150	2.051
	Classroom climate	.200	.015	.352	13.229	.000	.553	1.808
	Asking questions	-.030	.027	-.042	-1.087	.277	.265	3.777
	Overcoming barriers	.128	.013	.198	9.575	.000	.920	1.087
	Teaching style	.143	.105	.116	1.371	.171	.155	8.245
	Confidence	.748	.168	.478	4.454	.000	.134	9.418

a. Dependent Variable: Y_AVERAGE

Table 2 reveals that there were no multicolinearity issues between the two variables (exogenous and endogenous latent) with the VIF value of each being below 10. Meanwhile, the tolerance value was higher than 0.1.

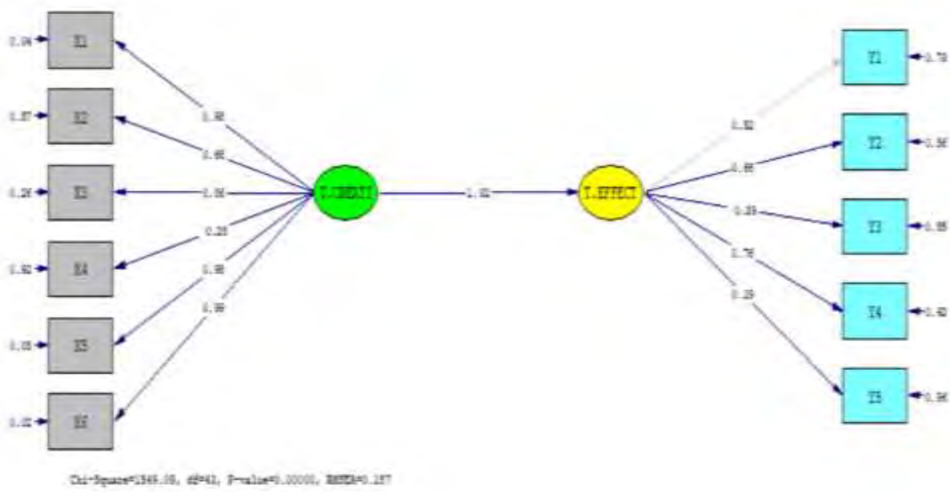

Figure 1
The correlation between teachers' creativity and teaching effectiveness *(Source: Lisrell softawre was applied)*

The following section described the results of the SEM analysis of the two variables (exogenous and endogenous). The exogenous latent variable was teachers' creativity. It consisted of six indicators. Conversely, the endogenous was teaching effectiveness which involved five indicators.

Figure 1 depicts the contribution of each manifest variable towards the latent. Firstly, the teachers' creativity variable was measured using six manifest variables X1 (teaching style), X2 (innovative teaching practice), X3 (classroom climate), X4 (asking questions), X5 (overcoming barriers), and X6 (confidence). Secondly, the latent variable teaching effectiveness was measured using five indicators, namely Y1 (conceptual understanding), Y2 (cognitive aspect), Y3 (preparing students to learn), Y4 (opportunity for practice), and Y5 (providing an emotionally safe environment).

From the teachers' creativity variable, it was shown that the indicators of X6 (confidence) 0.99, X1 (teaching style) 0.98, and X5 (overcoming barriers) 0.96 hold the highest scores than other teachers' creativity indicators. Furthermore, the other indicators X3 (classroom climate) 0.86 and X2 (innovative teaching practice) 0.66 hold as the second-highest scores. Conversely, X4 (asking questions) 0.28 had the lowest score.

Therefore, from the teaching effectiveness variable, the indicators of Y4 (opportunity for practice) 0.76 and Y2 (cognitive aspect) 0.66 had the highest scores than the other indicators. Conversely, indicator Y3 (preparing students to learn) 0.39 and Y5 (providing an emotionally safe environment) 0.19 had the lowest scores.

In addition to analyzing the effect of teachers' creativity and teaching effectiveness, the analysis was also carried out by applying goodness of fit statistics (GOF). This was performed to determine whether the above SEM analysis model was valid or not.

Table 3
The goodness of fit statistics

Components	Value
Root Mean Square Error of Approximation (RMSEA)	0.08
Normed Fit Index (NFI)	0.86
Comparative Fit Index (CFI)	0.86
Incremental Fit Index (IFI)	0.86
Relative Fit Index (RFI)	0.81
Goodness of Fit Index (GFI)	0.88
Adjusted Goodness of Fit Index (AGFI)	0.86

Table 3 portrays the validity of each criterion from the goodness of fit statistics (GOF).

The score from RMSEA was 0.08 which fulfilled the validity criteria ≤ 0.08. In addition, the scores of NFI, CFI, IFI, RFI, GFI, and AGFI were also valid because it approached the value of 0.90.

DISCUSSION

This research aimed at elaborating on the effect of attending one year blended Mathematics teachers' professional training towards their teaching creativity and effectiveness from the perspective of students. The results revealed that there was a significant correlation between Mathematics teachers' creativity and teaching effectiveness. It was also ascertained that after attending a year blended professional training program, the students observed that their Mathematics teachers became creative and effective. However, all indicators of teachers' creativity and teaching effectiveness also yielded positive correlations. Specifically, the Mathematics teacher creativity indicators which had the highest correlations rested on "confidence" (0.99), "teaching style" (0.98), and "overcoming barriers" (0.96). Meanwhile, the lowest correlation occurred in the indicator of "asking questions" (0.28). Afterward, under the Mathematics teaching effectiveness indicators, "opportunity for practice" (0.76), and "cognitive aspect" (0.66) hold the highest correlations. Conversely, the indicator of "providing an emotionally safe environment" (0.19) had the lowest correlation.

The above results showed that all Mathematics teachers that attended a year blended professional development enhanced their creativity and teaching effectiveness from the students' perspectives. Similarly, they perceived their Mathematics teachers as creative and effective according to the questionnaires (MT-TCS and MT-TS) which they filled out. These results were quite similar to that of Arifani & Suryanti (2019). Furthermore, a similar study in a foreign language setting was conducted using different creativity and teaching effectiveness questionnaires. It also showed that the students perceived that their teachers were more creative and effective after they attended a year blended teachers' professional development program. Consequently, it was recommended that one-year duration for a comprehensive training program fosters teachers' creativity and effectiveness.

In addition, the next results showed that the most dominant indicators of Mathematics teachers' creativity referred to three items, namely "confidence", "teaching style" and "overcoming barriers". It also revealed that the students perceived that their mathematics teachers were more confident, had better teaching style, and could solve learning barriers. These results are positive because on attending a one year blended professional training, they learned pedagogical content knowledge. This was possible through the workshop of designing an innovative lesson plan, peer teaching practices, case studies, solving mathematics classroom problems through peers and senior mathematics lecturers from a university, as well as best practices sharing. In addition, the workshop activities were designed for innovative teaching improvements and fostering mathematics learning for students. These were carried out to boost the confidence of mathematics teachers and enhance their teaching style and ability to solve mathematical learning barriers. These discoveries were supported by other previous studies which asserted that collaborative peer and reflective teaching, as well as mentoring activities for the sake of teachers' professional development could foster their confidence, teaching style and ability to solve mathematical barriers (Pancsofar & Petroff, 2013; Reupert & Woodcock, 2010).

Different discoveries from the teachers' creativity category also reflected from this study. It was revealed that "asking question" indicator had the lowest correlation. This implied that the students observed that their mathematics teachers reduced the frequency of asking them questions. This is unique but likely to happen when mathematics teachers' creativity was enhanced. It also implied that the enhancement of teachers' creativity, innovative teaching strategy, applying interesting teaching media, ability to solve students' mathematics problems, as well as facilitating learners' to learn from this innovation, results in making them reduce their frequency of asking questions. This discovery was supported by Graesser & Person (1994) which claimed that the frequency of asking questions did not positively correlate to students' achievement.

Furthermore, in regards to the mathematics teachers' teaching effectiveness category from the MT-TES questionnaires, the students responded positively towards the indicators of "opportunity for practice" and "cognitive aspect". They claimed that their mathematics teachers that attended a one year blended professional training, had the highest responses on those two indicators of effectiveness, namely "opportunity of practice" and "cognitive aspect". One of the possible reasons was because of the shift in teacher-functioned model from teacher to student-centered learning. Teachers did not explain mathematical concepts at their teaching activities but were liable to facilitate their students with projects, meaningful tasks, and more practices with mathematical problem-solving techniques. Therefore, students' cognitive aspect was empowered optimally and the teaching practices were more effective as well. In addition, Seidel & Shavelson (2007) and Ball & Forzani (2009) revealed that one of the most dominant factors of teaching effectiveness, laid on the teaching process which emphasized students' learning activities. Teaching effectiveness was no more observed from the students' achievement itself.

Conversely, the last result from the teaching effectiveness category revealed that "providing an emotionally safe environment" indicator obtained the lowest correlation. It implied that the students perceived that their mathematics teachers relied mostly on their task learning activities. This possibly happened because mathematics teachers merely focused on developing students' practical activities in solving mathematics related tasks. Therefore, students' emotional factor was a little bit neglected. This result is different from several previous studies which claimed that effective teaching could reduce students' boredom. Furthermore, it was also asserted that teaching effectiveness and students' boredom are indirectly proportional (Burić & Kim, 2020; Hwang & Choi, 2020; Marquis, Cheng, Nair, & Martino, 2020; Obergriesser & Stoeger, 2020; Strait et al., 2020). Therefore, the result of this study presented a different notion. In addition, when mathematics teachers relied on cognitive mathematics tasks in teaching and learning activities, their students' emotional sides were neglected.

CONCLUSION AND RECOMMENDATION

The results showed that mathematics teachers that attended a year blended teacher professional development program enhanced their teaching creativity and effectiveness. This was validated through the responses of both MT-TCS and MT-TES questionnaires filled out by the students. Furthermore, their responses revealed that teachers' approach to teaching mathematics was improved in terms of "confidence", "teaching style" and "overcoming barriers". Meanwhile, for the effectiveness aspect, "opportunity for practice" and "cognitive aspect" were considered the most dominant responses asserted by the students. In addition, these results correlated positively between teachers' creativity and effectiveness in all indicators of both categories. The results also portray its novelty in terms of students' emotional aspect. The students observed that the creativity and effectiveness manifested by their mathematics teachers made them bored in accomplishing all mathematical tasks offered by their teachers. Therefore, mathematics teachers must balance students' cognitive and emotional aspects. It is also essential for mathematics teachers to maintain harmony between the two variables by estimating students’ psychological factors such as emotion, boredom, and burnout.

However, this study did not consider mathematics teachers’ creativity and effectiveness before and after attending a year blended teachers’ professional development. Therefore, the findings could not explain the improvement of creativity and effectiveness. A further research which requires an experimental study to portray the improvement of creativity and effectiveness before and after attending a year blended teacher professional development is recommended.

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