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Indonesian secondary teachers' creative teaching

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Abstract. Weak-quality curriculum and instruction, educators' negative views in developing creativity, and a lack of educator flexibility, independency, and well-certified professional development are known as some barriers to implement creative teaching. The present study investigates the convergent, construct and discriminant validity of creative teaching instrument. Moreover, the present study explores the issue of teachers' creative teaching in Indonesian secondary schools by focusing on types of subject (science and social study). We followed a survey research design, using simple random sampling. A total of 150 students, which comprise 65 (43.3%) science teacher (physics, chemistry, mathematics, biology)) and 85 (56.7%) social science teacher (economics, geography, English, Indonesian language, sociology) in secondary school, have finished the questionnaire. The 30 (20%) are male teachers, 120 (80%) are female teachers. Exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and one-way multivariate analysis of variance (MANOVA) are carried out to analyze the data sample. EFA showed that the teachers' data included a six-factor structure: instructional designs; curiosity; creative thinking; imaginative utilization; problem solving; and excursion. The outputs of secondary-order CFA indicated that the hypocritical model provided an suitable fit to data sample. Finally, results of the present study reveal a not significant difference in creative teaching among groups. However, significant differences of imagination sub constructs were observed between science and social science teachers.

Keywords: exploratory factor analysis (EFA), confirmatory factor analysis (CFA), creative teaching, secondary school teaching.

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INTRODUCTION

Learning is an interaction cycle of knowledge transfer and experience. Learning activities can run almost everywhere. Since learning is not limited to certain space and time, it can run both in classrooms and outside classrooms. In other words, teaching and learning process will take place as long as participants of the process interact one another. Learning can take place in a family, social community and even at schools. However, both formal and non-formal learning process require creativity. Creative thinking skills are important in diverse domain such as on a societal level (Hennessey & Amabile, 2010), a personal level (Collard & Looney, 2014), organizations (Mueller, Melwani, & Goncalo, 2012) and schools (Lucchiari, Sala, & Vanutelli, 2019; Rudibyani, 2019; Sukarso, Widodo, Rochintaniawati, & Purwianingsih, 2019) including higher education level (Borodina, Sibgatullina, & Gizatullina, 2019). Encouraging students creative thinking skills is one the basic purpose of today's learning (Gu, Dijksterhuis, & Ritter, 2019; Karp, 2017; Mhlolo, 2017; Singer, Sheffield, & Leikin, 2017; Syahrin, Dawud, Suwignyo, & Priyatni, 2019).

Interestingly, creativity for teachers in implementing their teaching process has received escalating interest during the last decade (Kettler, Lamb, Willerson & Mullet, 2018) aiming to not only for educational context but also the wider society (Craft, 1999). In a meta-analysis conducted by Gajda, Karwowski and Beghettom (2017), the prior research confirmed that creativity has positive effect toward academic achievement although it depends on the kinds of measures used to evaluate creativity. A teacher must know that a learning activity is set up through a creativity process. An activity deriving from the process requires a teacher to promote critical thinking to enhance learning process. A teacher

who has critical thinking presents a creative learning nuance. Extensive articles show that there is significant relationship between creative teaching toward student achievement and motivation (Soleymanpour, 2014) such as the students' proficiency in English language (Vasudevan, 2013). At the same time, Gajda, Beghettom and Karwowski (2017) also found that teacher behaviors related to promoting creativity in the classroom were richly connected to students' positive engagement, self-expression, and ideation.

The creative learning activity enables teachers to achieve learning objectives or learning goals (Barnes, 1990; Sanjaya, 2009). A creative teacher endeavors to think critically and do constructive activities. Creative teaching should be understood as an intentional activity, should be conducted specific methods and setting situations (Trnova & Trna, 2014) and determined by their self-beliefs (Ozkal, 2014). Moreover, creative thinking is mediated by social interactions because it is a multicomponent process (DeHaan, 2009). The students will get a lot of advantages if creative and critical thinking is applied by a teacher in a learning process (Coughlan, 2007). Creative and critical thinking learning enables a teacher to create a breakthrough or a new invention that is useful for both teachers and students. A teacher that has critical thinking can do his/her function as a facilitator in a learning process (Fisher, 2007). Critical thinking enables problems regarding learning process to be identified and then to be solved. As a result, learning activities can run smoothly. Solving the problems is important to make learning process run well and to ensure that learning goals are achieved. (von-Glasersfeld,1991; Woodward, 2001).

Changwong, Sukkamart, and Sisan (2018) assured that critical thinking can be implemented by identifying problems, reflecting what a teacher did, analyzing and criticizing problems, using a logical thinking, and evaluating what a teacher has done. Critical thinking is a means for a teacher to foster and achieve a creative learning (Nold, 2017; Paul & Elder, 2008). However, school's environment of accountability, creativity and innovation are prone to be reduced and unpopular in teachers' classroom activities (Schoen & Fusarelli, 2008). Kettler et al., (2018) found that teacher always fail to consider usefulness as an attribute of creative products and cannot depict the way by which those factors contribute to creative results. Further evidence comes from study conducted by Beghetto (2010) who found that teachers lack confidence in their content knowledge or pedagogy so that prevent creativity from students. Ucus (2018) discovered weak-quality curriculum and instruction, educators' negative views in developing creativity, and a lack of educator flexibility, independency, and well-certified professional development are known as some barriers to implement creative teaching. Therefore, a teacher is required to present creative activities supported by critical thinking concepts (Mustafa, Hermandra, & Zulhafizh, 2018) either directly or indirectly. Learning goals may not be achieved due to the absence of creative and critical thinking by a teacher. A teacher, with his competency and experience can present alternatives in learning activities (Nurutdinovaa et al., 2009).

Creative teaching also is influenced by subject related to science and social study. Ucus (2018) stated that teachers in social studies are greatly motivated and eager to preserve creativity in their students' learning. Lim and Noor (2019) investigated the effect of digital storytelling as a creative teaching approach to enhance students' writing skills. It showed that there is an improvement in students' achievement after several treatments of employing the digital storytelling tools. Faizuddin, An-Nuaimy and Al-Anshory (2016) explored teachers' creative teaching approaches in teaching Arabic as a foreign language. Creative teaching of teacher can be classified into three strategies which are; creativity in producing daily lesson plans, creativity during the teaching and learning process, and creativity in evaluating and assessing the results of teaching. In science, technology, engineering and mathematics (STEM) education, Chinese mathematics classrooms are also mostly teacher-led, and Chinese educators always spend a great deal of time to utilize their creative teaching approaches via several levels of professional development (Niu, Zhou & Zhou, 2017). Crăciun, Crăciun and Bunoiu (2016) found that teacher are more confident in digital skills, communication skills, and improve their own teaching activities when implementing creative teaching in science education. Conversely, Hoth, Kaiser, Busse, Döhrmann, König and Blömeke (2017) found that educators who have difficulty with understanding structural aspects of mathematics and logical reasoning have obstacle recognizing and promoting creative and high-achieving pupils.

Nevertheless, limited research study exists how social study and STEM education teacher in implementing creative teaching in their classroom. The current study focuses on the construct, convergent, and discriminant validity of instrument. Since discrepancies in cultural backgrounds seem to be progressively obvious (Clarke, 2013) especially associated with creativity-nurturing behaviors of educators (Kettler et al., 2018), the recent research have offered evidence on the construct, convergent, and discriminant validity of instrument (Hidayat, Habibi, Mohd Saad, Mukminin, & Wan Idris, 2018; Hidayat, Zamri, & Zulnaidi, 2018; Yong, Hutagalung, Hidayat, & Zulnaidi, 2020) for Indonesian settings. Creativity-nurturing behaviors is culture-sensitive and complex (Shao, Zhang, Zhou, Gu, & Yuan, 2019).

For example, Yong, Mannucci, and Lander (2020) found that cultural background provide diverse path of creativity-nurturing behaviors.

Moreover, The current paper also focuses on differences between STEM education teacher (physics, chemistry, mathematics, biology) and social studies (economics, geography, English, Indonesian language, sociology) in term of applying creative teaching method in their classroom. This extends the current literature and practices in considering these factors for STEM education and social studies. Therefore, our goal is to examine the convergent, construct and discriminant validity of creative teaching instrument and the possible subject issue. Research questions of the current research are what are the convergent, construct and discriminant validity of the instrument; and is there significant differences between STEM education teacher (physics, chemistry, mathematics, biology) and social studies (economics, geography, English, Indonesian language, sociology) in term of applying creative teaching method in their classroom.

Contribution/Originality

- The present paper contributes towards body of knowledge on the nature of Indonesian secondary teachers' creative teaching.
- The present paper examines the convergent, construct and discriminant validity of creative teaching instrument.
- The study also contributes towards body of knowledge on differences between STEM education teacher (physics, chemistry, mathematics, biology) and social studies (economics, geography, English, Indonesian language, sociology) in term of applying creative teaching method in their classroom.

METHODOLOGY

We followed a survey research design (Creswell, 2014). The population of the current study is secondary teacher in Riau Province, Indonesia. We selected simple random sampling. A total of 150 students, which comprise 65 (43.3%) science teacher (physics, chemistry, mathematics, biology) and 85 (56.7%) social science teacher (economics, geography, English, Indonesian language, sociology) in secondary school, have finished the questionnaire. The 30 (20%) are male teachers, 120 (80%) are female teachers. The questionnaire consists of 50 items measured on a five-point Likert-type scale. A five-point scale ranging from 1 ('strongly disagree') to 5 ('strongly agree') was employed in the creative teaching questionnaire. EFA was conducted using SPSS version 23.0 to examine a six-factor structure: instructional design; curiosity; creative thinking; imaginative utilization; problem solving; and excursion. This analysis was using he Kaiser–Meyer–Olkin (KMO) value, Bartlett's value, factor loading, and varimax rotation. Moreover, CFA utilizing AMOS 18.0 was performed to test dimensionality and factor-loading pattern were suitable to the Indonesian settings. We were employing chi-square (χ^2) ($P > 0.05$), Comparative Fit Index (CFI > 0.90), Tucker Lewis Index (TLI > 0.90) and Root Mean-Square Error of Approximation (RMSEA < 0.08) (Awang, 2012) to indicate goodness of fit. Cronbach's alpha coefficients, composite reliability (CR) and average variance extracted (AVE) to determine the reliability of the instrument, convergent and discriminant validity. Finally, we employ inferential statistics, that is, one-way multivariate analysis of variance (MANOVA), to determine the differences in teachers' creative teaching method.

RESEARCH FINDINGS

The KMO score of .920 and Bartlett's Test of Sphericity score of 6853.018 ($p<.001$), which reject the null hypothesis that the correlation matrix was an identity matrix. This indicated that the proportion of variance among the variables is quite high. Thus, the data in present research fulfilled the criteria for the EFA to generate meaningful outputs. All item communalities ranged from 0.524 to 0.923, which surpassed the 0.50 level for adequate explanation. A six-factor solution with eigenvalues more than 1 emerged from the EFA. Results of second order model depicted $\chi^2 = 1798.195$, $\chi^2/df = 1.550$, RMSEA = 0.061, TLI = 0.897 and CFI = 0.903. Although the item-level factor analysis of instrument provided an acceptable fit for Indonesian context as suggested by prior research, however, the loading factor for some items are poor. The model fit was only marginally enhanced since low or negative loading factor were removed. Therefore, model 2 was analyzed by removing items F50 (loading factor = .365), C15 (loading factor = .257), and E30 (loading factor = .308). Figure 1 shows the finalized model and standardized factor loadings.

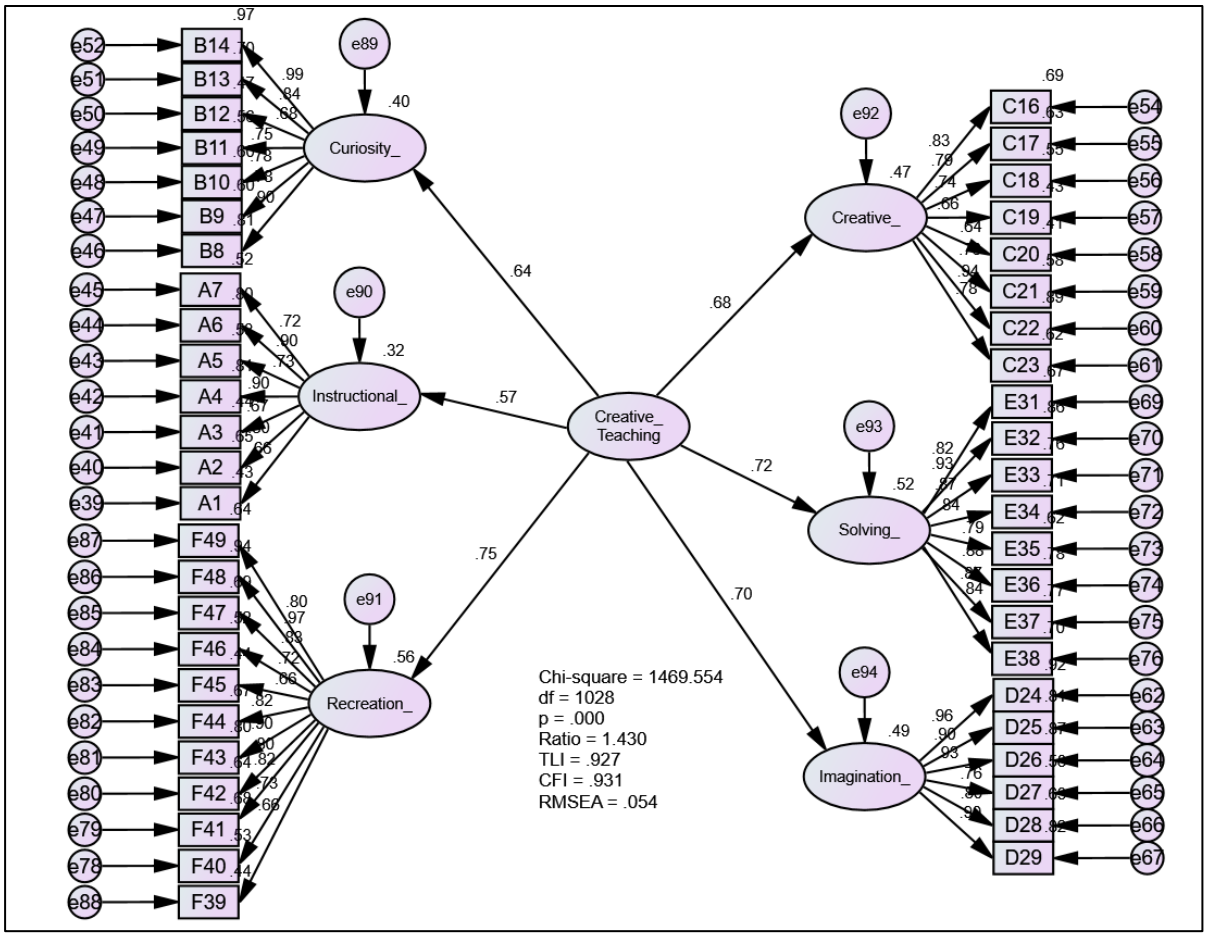

Figure 1. *CFA for creative teaching*

Figure 1 shows a measurement model for creative teaching between items and construction. Evaluation shows instrument provided a better acceptable fit for Indonesian context; χ^2 = 1469.554, χ^2/df = 1.430, CFI = 0.931, TLI = 0.927 and RMSEA = 0.054. Therefore, there are only 57 items for measuring creative teaching and are used in structural model analysis. All factor loadings of the creative teaching sub-constructs ranged from 0.655 to 0.986. Results of CFA for creative teaching indicated that the factor loadings surpassed the cut-off values of 0.50 (Hair et al., 2010). Average Variance Extracted (AVE) scores Composite Reliability (CR) scores and Cronbach's alpha scores are indicated in Table 1.

Table 1. *Reliability analysis for creative teaching construct*

Dimension	Cronbach's alpha	CR	AVE
Instructional design	0.907	0.911	0.599
Curiosity	0.929	0.934	0.673
Creative thinking	0.919	0.922	0.600
Imaginative utilization	0.951	0.953	0.772
Problem solving	0.956	0.957	0.735
Excursion	0.947	0.949	0.634

All AVE scores were higher than 0.50, providing evidence for the convergent validity of creative teaching scale while All CR scores were greater than 0.60. Cronbach's alpha scores also gave evidence for the reliability of creative teaching scale: 0.907 for instructional design, 0.929 for curiosity, 0.919 for creative thinking, 0.951 for imaginative utilization, 0.956 for problem solving, and 0.947 for excursion. Table 2 indicates relationships among the dimensions. All dimensions were significant (p<.01). The highest correlation was between creative thinking and problem solving (r = .559), while the lowest correlation was between curiosity and problem solving (r = .350). The square roots of all AVE scores were greater than the correlations indicated below them or to their left, which support the discriminant validity of the creative teaching scale.

Table 2. *Correlation among dimension*

Variable	1	2	3	4	5	6
1.Instructional design	(.77)					
2.Curiosity	.442**	(.82)				
3.Creative thinking	.440**	.409**	(.77)			
4.Imaginative utilization	.494**	.352**	.522**	(.88)		
5.Problem solving	.467**	.350**	.559**	.520**	(.86)	
6.Excursion	.470**	.428**	.553**	.410**	.438**	(.80)
Mean (standard deviation)	4.27(.52)	4.33(.51)	4.25(.52)	4.04(.60)	3.80(.64)	4.22(.58)

Note: **Correlation is significant at the 0.01 level (two-tailed)

General patterns of mean differences

The mean and the standard deviation for teachers based on types of subject on sub-construct of creative teaching scale are indicated in Table 3.

Table 3. *Mean and standard deviation for the sub-constructs of creative teaching scale*

Dimension	Subject	
	Science	Social science
Instructional design	4.29(0.42)	4.24(0.42)
Curiosity	4.33(0.45)	4.33(0.54)
Creative thinking	4.24(0.54)	4.25(0.49)
Imaginative utilization	3.90(0.54)	4.14(0.62)
Problem solving	3.77(0.67)	3.81(0.61)
Excursion	4.16(0.58)	4.27(0.58)

As indicated in Table 3, the overall patterns of the mean scores for teachers on sub-constructs of creative teaching indicated that social science teacher were higher than science teacher except for instructional design.

One-way MANOVA for significant subgroup differences

We performed one-way MANOVA to determine the difference in teachers' creative teaching on the basis of types of subject. In the aspect of types of subject, there were statistically significant differences in teachers' creative teaching of Wilks' Lambda = .936, F (1, 148) = 1.639 and sig = .141 (p>0.05). Eta squared showed a value of .064. However, there were significant differences in teachers' sub-construct imagination [(F = 5.816, sig = .017, p<0.05)] by types of subject (see Table 4). Conversely, there were no significant differences in teachers' sub-construct instructional design [(F = .281, sig = .597, p>0.05)], curiosity [(F = .000, sig = .991, p>0.05)], creative thinking [(F = .004, sig = .950, p>0.05)], problem solving [(F = .115, sig = .735, p>0.05)] and recreation [(F = 1.283, sig = .259, p>0.05)].

Table 4. *Manova result of the mean score of creative teaching*

	Independent Variable	Type III SS	df	SS	F	Sig.	η^2
Types of subject	Instructional design	.077	1	.077	.281	.597	.002
	Curiosity	3.017E-5	1	3.017E-5	.000	.991	.000
	Creative thinking	.001	1	.001	.004	.950	.000
	Imaginative utilization	2.042	1	2.042	5.816	.017	.038
	Problem solving	.047	1	.047	.115	.735	.001
	Excursion	.432	1	.432	1.283	.259	.009

DISCUSSIONS

Guided by frameworks on creative teaching of teachers, the principal aim of the present research was to validate creative teaching scale which gauge the extent to which secondary teacher promote creative learning in their classroom activity. It also examined differences between STEM education teacher

(physics, chemistry, mathematics, biology) and social studies (economics, geography, English, Indonesian language, sociology) in term of applying creative teaching method in their classroom. Generally, the all items of creative teacher had good psychometric properties to confidently measure teachers' creativity in their classroom. EFA results showed that the teachers' data included a six-factor structure: instructional design; curiosity; creative thinking; imaginative utilization; problem solving; and excursion. However, EFA results also indicated that three items were removed. The outputs offer another evidence from Indonesian context that the commonly accepted creative teaching questionnaire s are truly general. Our findings of research corroborated those of previous studies (Kettler et al., 2018; Shao et al., 2019; Yong et al., 2020) depicting that creativity-nurturing behaviors is culture-sensitive and complex components.

At the same time, the outputs of secondary-order CFA depicted that the hypocritical model supported an acceptable fit to data sample. It means that the suggested model of creative teacher scale are good indicators of measuring creative teaching of secondary teacher in Indonesia. The model fit values of this model meet the fit index as suggested by the previous researchers; $\chi 2/df<5.0$, $p>0.05$, RMSE <0.08, CFI>0.90 and TLI>0.90 (Arbuckle, 2009; Awang, 2012; Brown & Cudeck, 1992; Hooper, Coughlan & Mullen, 2008). In addition, discriminant and convergent validity were reached in the present study. AVE scores in the current research were higher than desirable standard (.05), providing evidence for convergent validity. The square roots of all AVE scores also were greater than the matrix correlations indicated between dimensions, supporting the discriminant validity of the creative teaching scale. The findings of this study are consistent with those of prior research (Hidayat et al., 2018; Yong et al., 2020) indicating that Indonesian cultural backgrounds have provided another evidence for validity and reliability of instrument. We concluded that the sameness of the current study and the past publication on the sub-constructs of creative teaching emerge from the similar group of data sample. However, in Indonesian setting, only 47 items are retained to measure teachers' creativity in their classroom activity.

Note that creative teaching of teacher in Indonesian reported higher degrees of curiosity than instructional design, creative thinking, imaginative utilization, and excursion. At the same time, problem solving skills are the lowest degrees of creative teaching of teacher. Our the current work supports previous research (Beghetto, 2010) indicating teachers lack confidence in their content knowledge or pedagogy so that prevent creativity from students. Similarly, Kettler et al., (2018) found that teacher always fail to consider usefulness as an attribute of creative products and cannot depict the way by which those factors contribute to creative results. However, it is vital to note that this paper concentrated only on the convergent, discriminant and construct validity of the creative teaching scale, which was major limitation. Future researcher can manage the creative teaching scale concentrating on creative of teachers by establishing the concurrent validity of the current scale. Ind addition, the hypothesis about the convergent, discriminant and construct validity of the creative teaching scale for other regions in Indonesia and school level should be examined in the future. The findings of the study have several vital practical implications for the maintenance of creativity-nurturing behaviors in the classroom surroundings. Educators should offer students with great chance to tackle the complex problem by joining together. This is in line with the statement of Sanjaya (2009) showing that the creative learning activity enables teachers to achieve learning objectives or learning goals.

Regarding creative teaching of secondary teachers, results of the present study reveal a not significant difference in creative teaching between science and social science teachers. However, significant differences of imagination sub constructs were observed between science and social science teachers. We provide next evidence that social science teachers have more imagination than science teachers in Indonesian settings. Our study supports previous research (Chapman, 2008; Faizuddin et al., 2016; Golombek & Klager, 2015; Hoth et al., 2017). One interpretation for this result is linked to their a cognitive mental, reflected in imaging, imagining-that, and imagining-how. For example, language education teacher are able to imagine (objects and events), circumstance or situation (imagining-that), and how they feel certain things, as well as speak in certain ways (imagining-how). This is line with study done by Faizuddin et al., (2016) stating that Arabic teachers' implement creative teaching that can be classified into three strategies which are; creativity in creating daily lesson plans, creativity during the teaching and learning process, and creativity in evaluating and assessing the results of teaching. However, Chapman (2008) conducted research on the effect of imagination in their learning. The findings suggested that the prospective educators indicated lack of understanding of inquiry-based teaching of secondary mathematics. Again, teachers who have trouble with understanding structural aspects of mathematics and logical reasoning have obstacle recognizing and promoting creative and high-achieving pupils (Hoth et al., 2017). Therefore, Chapman (2008) recommend the mathematics teacher encourage the borders beyond their initial thinking.

CONCLUSIONS

A teacher should endeavor to present a creative learning. Extensive articles show that there is significant relationship between creative teaching toward student achievement and motivation although it depends on the kinds of measures used to evaluate creativity. The all items of creative teacher had good psychometric properties to confidently measure teachers' creativity. EFA showed that the teachers' data included a six-factor structure: instructional design; curiosity; creative thinking; imaginative utilization; problem solving; and excursion. The outputs of secondary-order CFA revealed that the hypocritical model provided an suitable fit to data sample. It means that the suggested model of creative teacher scale are good indicators of measuring creative teaching of secondary teacher in Indonesia. Finally, results of the present study reveal a not significant difference in creative teaching between science and social science teachers. However, significant differences of imagination sub constructs were observed between science and social science teachers.

CONFLICT OF INTEREST

None

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