



An Analysis of EFL Teachers' Digital creativity and Its Relation to Their Instructional Creativity: A Case of Indonesian Primary and Secondary Schools

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The current study was aimed to examine the Indonesian English as a foreign language (EFL) teachers' digital creativity and its relation to their instructional creativity. Using a survey design, the study collected the quantitative data from 422 EFL teachers across the Indonesian primary and secondary school levels. The data collected were analysed using the Rasch-based regression method. Results found that almost half of the participants had a low level of digital creativity, particularly in terms of creating digital content or products, using digital applications to create school-activity-related podcasts and attending digital courses. Low levels of instructional creativity were also found among the teachers. Teachers acknowledged that they had little success in integrating various teaching methods in the classroom and allowing students to evaluate their own learning process. Multiple regression analyses revealed that teachers' digital creativity and age could be associated with their instructional creativity, while gender and school level did not indicate any association. The study emphasises the need to increase digital creativity and instructional creativity of teachers through technology-based training, as it was observed that a substantial number of Indonesian teachers possessed limited digital creativity and exhibited difficulty in combining instructional methods and promoting student assessment in the classroom.

Penelitian ini bertujuan untuk mengevaluasi tingkat kreativitas digital guru Bahasa Inggris di Indonesia dan kaitannya dengan tingkat kreativitas mengajar mereka. Dengan menggunakan desain survey penelitian ini mengumpulkan data kuantitatif dari 422 guru Bahasa Inggris pada tingkat sekolah dasar dan menengah di Indonesia. Data yang terkumpul kemudian dianalisa menggunakan metode regresi berbasis Rasch. Hasil penelitian memperlihatkan bahwa hampir separuh partisipan memiliki tingkat kreativitas digital yang rendah, khususnya dalam menciptakan konten atau produk digital, menggunakan aplikasi digital untuk menciptakan podcast terkait dengan materi pembelajaran, serta kurangnya menghadiri pelatihan digital. Hal yang sama juga ditemukan dalam hal rendahnya kreativitas instruksional dikalangan guru. Penemuan ini memperlihatkan bahwa guru kurang berhasil dalam mengintegrasikan beragam metode pembelajaran dalam kelas dan kurang dapat membantu siswa dalam mengevaluasi kegiatan belajar mereka. Hasil Analisa regresi ganda menemukan dua faktor yang mempengaruhi kreativitas instruksional guru, yaitu faktor kreativitas digital dan faktor umur. Sedangkan faktor jenis kelamin dan level mengajar guru tidak dapat memprediksi kemampuan kreativitas guru. Hasil penelitian ini menekankan pentingnya pelatihan teknologi dalam meningkatkan kreativitas digital dan kreativitas instruksional guru Bahasa Inggris di Indonesia. Hal ini disebabkan



banyaknya guru yang memiliki keterbatasan dalam hal kreativitas digital dan kesulitan dalam mengkombinasikan metode instruksional dan membantu asesmen siswa di kelas.

Keywords: digital creativity, secondary schools, instructional activity, Rasch

Introduction

The advancement and use of technological devices are growing rapidly and assuming a prominent role in our lives. Millions of technological applications have been used to not only facilitate interaction and communication in our social lives, but also to serve as a medium for people to express their creative expression (Hoffmann et al., 2016). Specifically, some applications, such as Podcast, Flicker, and Instagram, are among hundreds of applications that enable people to express themselves creatively and to promote their ideas, thoughts, opinions, and valued contributions (Hoffmann et al., 2016; Loveless, 2003). In this context, the term "digital creativity" has been introduced in the literature to denote an individual's ability to yield novel and valuable ideas through the application of digital technologies (Shao et al., 2021, p. 1). Digital technology in such a context is employed to foster creativity among individuals and groups in particular contexts and organizational settings (Shao et al., 2021, p. 1; Thatcher & Brown, 2010; Zagalo & Branco, 2015).

In the educational setting, creativity has been regarded as a method that helps teachers promote meaningful learning experiences for the students (Dianawati & Mulyono, 2016). By integrating creative elements into teaching approaches, teachers can engage students in more dynamic and participatory ways, encouraging them to think critically, problem-solve, and discover novel ideas (Chiu, 2015; Liao et al., 2018; Stepanek, 2015). Unfortunately, little has been explored about the role of digital creativity and how it might contribute to teachers' instructional creativity, particularly in Indonesian online learning classrooms. Thus, the primary objective of the current study is to examine the level of teachers' creativity and its relation to their creativity in instructional practices in the digital classroom. Specifically, the study aims to answer two research questions: 1) what is the level of Indonesian primary and secondary school EFL teachers' digital creativity, and 2) can teachers' digital literacy and their demographic backgrounds be associated with their instructional creativity? The findings of the current study are of significance in contributing to the current literature on digital creativity and its effects on Indonesian teachers' creativity in classroom instruction. Furthermore, the findings of the current study can be used as a valued reference for education stakeholders to incorporate creativity in the process of teaching and learning in developing online curriculums.

Literature Review

Creativity is perceived as a pivotal competency when engaging with complex problems of the 21st century (Henriksen et al., 2016). It can be perceived as a multifaceted construct, representing cognitive processes and decisions made in the production of creative output (Jones, 2012). Creativity is an essential adherent to effectively meaningful language learning within educational contexts (Dianawati & Mulyono, 2016). Accordingly, both students and teachers must demonstrate creative lenses during the teaching and learning activities in the classroom. This demand is especially pertinent in the digital age, where students must adopt creativity into the learning experience, utilizing online arenas for assignments and employing digital resources to construct creative outcomes. In parallel, teachers are also expected to be creative in utilizing the digital technology in teaching activities which requires advanced digital literacy. By incorporating creativity in their teaching practices, teachers could help students to develop their own creativity and increase their ability to solve problems (Dobbins, 2009). Such a teaching creativity can be embodied in teachers' creative and innovative materials and activities, enabling them to optimise students' learning experiences, thereby allowing them to attain effective teaching and learning (Brinkman, 2010).

The era of computers has undeniably brought new ways of learning into students' lives; however, in formal classroom settings, digital technology in secondary school classrooms has not widely been introduced until recently, when online teaching became a necessity. Students have been learning autonomously and creatively in out-of-school contexts with the help of user-friendly apps and platforms (Nunan & Richards, 2014). As a result of the world-wide pandemic, digital technology has become an integral part of (online) classrooms in many countries, creating both challenges and opportunities. Students' and teachers' creativity in using digital technology are more crucial for online learning than in the face-to-face classroom environment. To this end, teachers should think creatively about how to utilise technology for student learning. For instance, teachers can collaborate to design educational digital tools and materials for online learning (Glaveanu et al., 2020) or create an effective and fun learning process through game-based learning or quizzes (Sica et al., 2020). Furthermore, teachers need to excel in utilising technology, as their advancement in digital literacy will help them in online teaching more than those who ignore or do not use technology (Yeh & Lin, 2018). However, using technology alone will not necessarily result in creativity; rather, it can help students to be more critical in their learning habits.

In this paper, digital creativity is described as creativity that is supported by digital technology in some forms (M. R. Lee & Chen, 2015). This definition indicates that digital creativity will appear when the use of digital technology results in a variety of creative activities. It also occurs when students and teachers use digital technology to produce creative tasks within the learning and teaching process. In other words, digital creativity could be reflected as the combination of students' creativity and new technologies in the learning process (Sica et al., 2020). In reference to the teaching context, teachers' digital creativity and instructional creativity were operationalized to reflect their creative behaviour in digital and instructional activities. Using the digital creativity constructs of Hoffmann et al. (2016), teachers' digital creativity was indicated by their creative creation of digital applications and online activities, their participation in creative behaviour involving the use or creation of digital materials at schools, and their digital creative behaviour in expressing their thoughts, emotions, or interests.

Furthermore, Cropley's (1997) framework of creativity-fostering teachers' classroom behaviours was applied to measure teachers' instructional creativity, examining their ability to promote students' independent learning, to facilitate an integrative teaching style, to motivate divergent thinking, to delay evaluation of student ideas, to create a flexible learning environment, to allow students to assess their learning process, to give students the opportunity to ask questions and express their ideas freely, to enable students to work with various materials, and to support students in learning how to prevent and address issues and failures (A. J. Cropley, 1997; D. H. Cropley & Cropley, 2000; Soh, 2000). Despite its efficacy, it is critical to consider the various cultural and context-based factors that may shape the manifestation of instructional creativity in distinctive educational contexts. As a result, while such frameworks may provide initial leniencies for scrutinizing digital and instructional creativity amongst educators, more exploration is necessary in order to obtain a comprehensive perception of these constructs and their effectivity in fostering creative teaching approaches.

Many studies have examined digital creativity and teaching creativity to support students' learning process. Lee (2019), for example, examined the use of digital game-based learning (Her story) to stimulate students' creativity and motivation in EFL class. The study collected data from 25 Korean university students majoring in English (8 eighth sophomores, 13 juniors, and 4 seniors, while 16 females and 9 male students). The findings demonstrated that students experienced enhanced creativity as a result of using digital game-based learning methods. In short, it can be concluded that students' learning experience and teachers' teaching creativity, which leverages digital technology, influences students' creativity and learning process. Di Fuccio et al. (2020) investigated the application of a game-based learning model to promote digital creativity in Initial Teacher Education (ITE) contexts via the DoCENT (Digital Creativity ENhanced in Teacher education) Model, which is a five-stage methodology. As an output of the project, a Serious Game was created as a role-playing game intended to provide realistic interaction with the class, by posing a challenge for the user (the teacher or tutor). This study indicated that game-based learning using the DoCENT Model can aid the teacher, enabling them to create new learning models that incorporate

digital creativity into the classroom or learning environment. Rasheed et al. (2020) examined the relationship between students' engagement and creativity through the use of social media within graduate research training, finding that social media can assist in making students more engaged and creative throughout their research process. Additionally, Ghanizadeh and Jahedizadeh (2016) studied three aspects, namely teaching creativity and its influence on teacher burnout, teachers' teaching styles, and the impact of teacher burnout on teaching creativity. Data was collected from 193 EFL teachers teaching English in universities in Mashhad and Tehran, as well as 1,710 Irian EFL students. The results highlighted that teachers are capable of exercising creativity in their teaching style and employing interactional methods in the learning process.

The aforementioned studies suggest the value of integrating creativity into both digital and traditional classroom teaching and learning activities (Dianawati & Mulyono, 2016; Dobbins, 2009; Henriksen et al., 2016). It has been argued that creativity increases meaningful opportunities for learning, aiding students in the development of their creative-and-problem solving proficiency both in physical and virtual settings (M. R. Lee & Chen, 2015; Sica et al., 2020). However, an amplified presence of technology alone is not sufficient to assist contemporaneous activation of creativity. Research instead suggests emphasizing the importance of teacher instruction in encouraging and promoting student creativity may be more effective when teachers themselves incorporate their own creativity in their own instructional practices (S. M. Lee, 2019). Grounding itself in current views of pedagogical effectiveness, the primary aim of this research is therefore to observe digital relation to instructional creativity among EFL teachers instructing within such Indonesian secondary school classrooms.

Method

A survey design was employed to address the research questions of the current study. Prior to data collection, the protocol of the study was approved by the local ethics committee of the research and development institute, Universitas Muhammadiyah Prof. DR. HAMKA. Employing a non-probabilistic sampling method, the study collected quantitative data from 422 EFL teachers across Indonesian school levels, i.e. primary school teachers (N = 143), lower secondary school teachers (N = 170), and higher secondary school teachers (N = 109). Many of the teachers were female (N = 315) and male (N = 107); ages ranged from below 30 (N = 222), between 30 and 40 (N = 88) to above 40 (N = 112). Their participation in the study was voluntary and their names were anonymised during data analysis and publication of study findings. The teacher participants were also informed about the study and gave their consent. Table 1 below details the current study participants.

TABLE 1
The Current Study's Participant Before the Screening

Demography		N = 422
Gender	Male (M)	107
	Female (F)	315
Age	Below 30-year-old	222
	Between 30-40 year-old	88
	Above 40-year-old	112
Leve of teaching	Primary school teachers	143
	Lower secondary school teachers	170
	Higher secondary school teachers	109
School status	Private school teachers	220
	Public school teachers	202

Data Collecting Instruments and the Procedure

A five-point Likert scale questionnaire composed of two scales was adapted from the literature (i.e. A. J. Cropley, 1997; D. H. Cropley & Cropley, 2000; Hoffmann et al., 2016). In total, there were 42 questionnaire items for the two scales, along with four additional demographic questions. The first scale, the Creative Behaviour Questionnaire Digital (CBQD) scale, concerned the measurement of digital creativity. This scale was adapted from Hoffmann et al. (2016) and used to reflect participants' creative behaviour in digital activities, such as creating digital art, developing websites or applications, and creating song videos, etc. Originally, Hoffmann et al.'s (2016) scale was developed to explore global creativity behaviour in secondary school students. Nevertheless, general digital creative activities reflected in the scale were expected to be common in 2022 and therefore applicable to teachers, such as creating personal websites, podcast videos, and video blogs, as well as fundraising (e.g. Waldron, 2013; Zavyalova & Galvin, 2022) and using the internet to sell products (e.g. C. Shelton & Archambault, 2018; C. C. Shelton & Archambault, 2019).

The scale was developed based on three main constructs: Digital Creativity Achievement (DCA), utilized to measure the digital applications and activities that the participants had created. There were 12 items in this construct (labelled with a "Q" and an item number in chronological order), including items Q2, Q8, Q11, Q12, Q13, Q14, Q17, Q25, Q26, Q27, Q28, and Q30. The second construct of the CBQD, School-Based Everyday Creativity (SBEC), related to the participants' creative behaviour in using or creating digital materials at schools, and included 10 items such as Q5, Q6, Q15, Q16, Q19, Q20, Q21, Q22, Q29, and Q31. The third construct, labelled Self-Expressive Creativity (SEC), was made up of 10 items used to measure the participants' digital creative behaviour in expressing their thoughts, emotions, or interests, including items Q1, Q3, Q4, Q7, Q9, Q10, Q18, Q23, Q24, and Q32. The psychometric analysis of the digital creativity scale was reported in Suryotputro et al. (2023).

The second scale concerning teachers' creativity in classroom instruction was measured using Cropley's (1997) framework of creativity-fostering teachers' classroom behaviors. This scale consisted of 10 questionnaire items reflecting teachers' activities which enable students to learn independently (Q33), utilize an integrative teaching style (Q34), stimulate divergent thinking (Q35), delay judgment of student ideas (Q36), promote a flexible learning environment (Q37), encourage students to evaluate their own learning process (Q38), nurture student inquiries (Q39) and expression of ideas (Q40), support work with multiple materials (Q41), and assist students in navigating difficulties and failure effectively (Q42) (A. J. Cropley, 1997; D. H. Cropley & Cropley, 2000; Soh, 2000). Table 2 summarises the scales used for collecting the quantitative data of the current study.

TABLE 2
Scale and Subscales for Data Collecting Instrument

Scale	Subscale (s)	N Items	Sources
		12 items	
	Digital creativity Achievement (DCA)	Item no: Q2, Q8, Q11, Q12, Q13, Q14, Q17, Q25, Q26, Q27, Q28, and Q30.	Hoffmann et al.'s (2016)
		10 items	
Creative Questionnaire (CBQD) scale	Behaviour Digital School-based every day creativity (SBEC)	Item no: Q5, Q6, Q15, Q16, Q19, Q20, Q21, Q22, Q29, and Q31.	Hoffmann et al.'s (2016)
		10 items	
	Self-expressive creativity (SEC)	Item no: Q1, Q3, Q4, Q7, Q9, Q10, Q18, Q23, Q24, and Q32	Hoffmann et al.'s (2016)
Creativity-fostering teachers' behaviors	classroom -	10 Item no Q33-Q38	Cropley's (1997) (A. J. Cropley, 1997; D. H. Cropley & Cropley, 2000; Soh, 2000).

The questionnaire was developed in the native language of Bahasa Indonesia to allow Indonesian teachers to comprehend each item (Zulaiha & Mulyono, 2020). As suggested in prior studies (Mulyono et al., 2020; Ningsih et al., 2021), the translation of the original questionnaire was done by the first author, and it was then proofread and validated by colleagues at the university, who were fluent in both Bahasa Indonesia and English. The validated questionnaire was read and re-read to maintain the intended meaning of the original one and to ensure that it was highly readable (Zulaiha & Mulyono, 2020). The questionnaire was created using a Google Form and the access link with consent information and instructions was distributed online to the research participants individually or through teacher community groups. The online distribution of the questionnaire was selected to facilitate the data collection process and to facilitate the retrieval of the data from the Google Form database (Ningsih et al., 2018).

Data Analysis and the Procedure

The collected quantitative survey data were analysed using the Rasch statistical method, given that the collected data were ordinal and thus needed to retain the same weights and intervals among the corresponding (DiStefano & Jiang, 2020; Hoi, 2020; Mulyono et al., 2020; Ningsih et al., 2021). Hoi (2020) argues that Rasch analysis enables the calibration between person and item measures onto the same interval scale, thereby promoting mutual interaction between the two measures and allowing direct assessments of the relative positions. Prior to the statistical analysis, the data underwent a screening process to help identify missing values and data from misbehaving participants. According to Goh et al. (2010), the self-administered survey was highly vulnerable to data coming from certain participants who did not seriously complete the survey questionnaire. Some authors suggest considering such types of data as outliers and recommend removing them from further data analysis (Linacre, 2010; Mulyono et al., 2020, 2021). In the Rasch analysis, the data that present a mean-square (MNSQ) higher than 2.0 logit were indicated to originate from the misbehaving participants and thus should be deemed as outliers. From the analysis, it was estimated that 24 out of 422 data possessed an MNSQ higher than the threshold of 2.0, and thus were excluded from further analysis. The remaining 398 data were then evaluated in relation to the research questions. The 398 sample is detailed in the following Table 3.

TABLE 3
The Current Study's Participant After the Screening

Demography		N = 398
Gender	Male (M)	98
	Female (F)	300
Age	Below 30-year-old	202
	Between 30-40 year-old	87
	Above 40-year-old	109
Leve of teaching	Primary school teachers	132
	Lower secondary school teachers	162
	Higher secondary school teachers	104
School status	Private school teachers	207
	Public school teachers	191

After the screening process, further Rasch statistical analysis was conducted to answer the research questions. WINSTEP was utilized to conduct the analyses of Person measures and Rasch Wright map in order to explore the level of teachers' digital creativity and their creative behaviour in classroom instruction. Furthermore, item differential functioning (DIF) analysis was employed to ascertain if teachers' level of digital creativity and classroom instruction creativity varied across the participant demographic background. Finally, Rasch-based linear regression analysis was employed to comprehend the effect of teachers' digital creativity variable on their creativity in classroom instruction. This regression model, which utilized Rasch-calibrated person measures, was implemented using Jamovi and its fit was assessed based on the key goodness-of-fit requirements suggested by some authors (Hoi, 2020; Kline, 2016; Leguina, 2015; Pallant, 2016), including the assessment of R-squared and the F-test with associated p-value.

Findings

Descriptive Statistics and the Result of the Instrument Reliability Analysis

The descriptive and the reliability analysis were performed by evaluating the Rasch-statistical analysis of person and item measures. Table 4 below describes the descriptive statistics focusing on the person and item separation, and the reliability of the survey questionnaire.

TABLE 4
Descriptive Statistics and the Instrument Reliability

Scale	Global scale	Digital creativity scale	Instructional creativity
Person M (SD)	-0.64 (0.69)	-0.99 (0.79)	3.19 (2.53)
Item M (SD)	0.00 (1.02)	0.00 (0.65)	0.00 (0.50)
Cronbach Alpha	0.92	0.92	0.93
Person			
Reliability	0.91	0.85	0.88
Separation	3.11	2.40	2.72
Item			
Reliability	1.00	0.99	0.96
Separation	16.05	10.22	4.80

As shown in Table 1, the mean (M) and the standard deviation (SD) of the person measure were calculated as -0.66 and 0.57, respectively. Furthermore, the questionnaire exhibited a high level of internal consistency for the global scale and the two subscales ($\alpha > 0.90$). Subsequently, separation analyses were

carried out on the person and item measures to assess the questionnaire's ability to distinguish the ability of the participants when responding to items, as well as the item difficulty levels (Boone et al., 2014; Mulyono et al., 2021). Person separation, which reflected the reproducibility of person categorisation in a new sample when the same items were administered, was found to be 3.11. This logit value was above the threshold of 2, thereby displaying a high level of reliability ($r > 0.84$) (Chang et al., 2014). Moreover, the item separation, which represented the item's ability to yield categorical differentiation when applied in a new sample, was deemed sufficient. The separation values remained higher than the threshold of 3, and had a very high level of item reliability ($r > 0.95$).

Teachers' Level of Digital Creativity and Instructional Activity Across Demography

The first research questions explored the EFL teachers' level of digital creativity as well as their instructional creativity. To address this question, the person measure was stratified into three strata, reflecting a low level (where the logit values were below the mean), a medium level (the logit values between the mean and the mean plus one standard deviation) and a high level (the logit values above the mean plus one standard deviation). Moreover, the Rasch Wright map was employed to reflect the respondents' response item distribution for each domain. Table 5 below summarises the teachers' levels of each domain and Figure 1 presents the Rasch Wright map analysis.

TABLE 5

Level of EFL Teachers' Digital Creativity and Instructional Creativity (N=398)

Domain	Digital Creativity N-DC (%)			Instructional Creativity N=IC (%)		
	High	Medium	Low	High	Medium	Low
Logit value criteria	> -0.2	-0.9 – (-0.2)	< -0.99	> 5.72	3.19 – 5.72	< 3.19
Total teachers (N=398)	46 (12)	156 (39)	196 (49)	61 (15)	114 (29)	223 (56)
Gender						
Male (N=98)	18 (5)	52 (13)	28 (7)	20 (5)	25 (6)	53 (13)
Female (N=300)	28 (7)	104 (26)	168 (42)	41 (10)	89 (22)	170 (43)
Age						
< 30 y.o (N=202)	28 (7)	92 (23)	82 (21)	23 (6)	56 (14)	123 (31)
30 – 40 y.o (N=87)	9 (2)	38 (10)	40 (10)	18 (5)	26 (7)	43 (11)
40 y.o < (N=109)	9 (2)	26 (7)	74 (19)	20 (5)	32 (8)	57 (14)
School level						
Primary school (N=132)	7 (2)	49 (12)	76 (19)	20 (5)	33 (8)	79 (20)
Junior secondary school (N=162)	22 (6)	63 (16)	77 (19)	23 (6)	46 (12)	93 (23)
Senior secondary school (N=104)	17 (4)	44 (11)	43 (11)	18 (5)	35 (9)	51 (13)

Note. % from N_{total} (398), the percentage decimal is rounded.

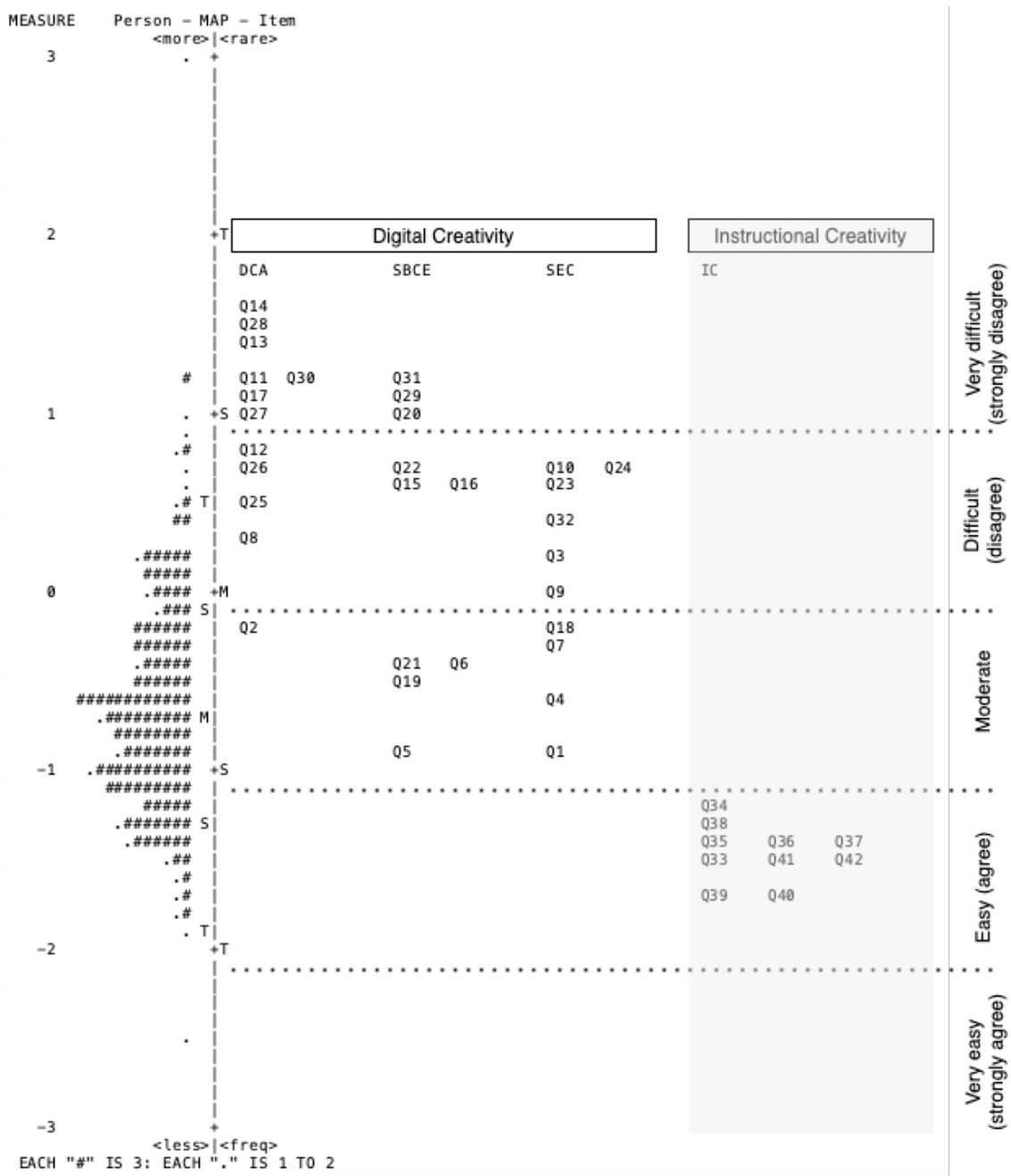


Figure 1. Rasch Wright map.

As illustrated in Table 4, it was demonstrated that roughly half of the teachers' participants possessed a low level of digital creativity (N-DC=196, 49%) and instructional creativity (N-IC=223, 56%), with some displaying a moderate level (N-DC=156, 39%; N-IC=114, 29%) and very few demonstrating a high level (N-DC=46, 12%; N-IC=61,15%). Such levels of digital and instructional creativity were also reflected across their demographic information, such as gender, age, and school level. As portrayed in Figure 1, teachers were demonstrated to have limited digital creativity achievement (i.e. winners of photography competitions (Q14) and digital art contests (Q28), selling digital products online (Q13), creating video game content (Q11), inability to use 3D printers (Q17), and contributing digital art in digital communities (Q27); logit value < -1.02).

Furthermore, teachers were observed to have limited use of digital application for school-based everyday creativity (i.e. creating podcasts, and attending digital courses; logit value < -1.02). Analysis of the differential item functioning (DIF) from the digital creativity scale items revealed that teachers' responses were statistically disparate on various aspects, particularly with regards to posting photos on social media, creating podcasts, attending digital art courses, and fundraising (DIF contrast > 0.5 logits and $p_{\text{Rasch-Welch}} < .05$).

It is interesting that, although teachers claimed to promote creative behaviour during their instructional activities (see Figure 1), the results of the person measure assessment showed that many of them had a low level of instructional activity (N-IC = 223, 56%), with some having a moderate level (N-IC = 114, 29%) and very few having a high level of creativity (N-IC = 61, 15%). Teachers acknowledged that they had little success in integrating various teaching methods in the classroom (Q34) and allowing students to evaluate their own learning process (Q38). This condition was equally reflected across gender, age, and school level demographics. However, several aspects such as teachers' ability to enable students to learn independently, to employ an integrative teaching style, and to help create a flexible learning environment differed significantly amongst teachers' age demographics (DIF contrast > 0.5 logits and $p_{\text{Rasch-Welch}} < .05$).

The Association of Digital Creativity and Demographic Aspects to Teachers' Instructional Creativity

The second research question was concerned with whether or not teachers' digital literacy and their demographic background could be associated with their instructional creativity. To address this, two multiple regression models were proposed and assessed to establish whether teachers' digital creativity (DC) could predict their instructional creativity (Model 1) and whether, in addition, teachers' demographic background could predict their instructional creativity (see Table 6). Prior to the regression analyses, the assumption of linearity of the data was examined and revealed that the data were normally distributed (Kolmogorov-Smirnov statistics $p > 0.01$) and no collinearity was found ($VIF < 5$).

TABLE 6
Regression Model Analysis

Predictor	Model 1 $F=32.2, p<0.01; R^2=0.075$			Model 2 $F=8.67, p<.001; R^2=0.117$		
	β	SE	t	β	SE	t
Intercept ^a		0.195	20.72*		0.356	9.58*
DC	0.274	0.154	5.67*	0.325	0.161	6.46*
Gender:						
Female-Male				0.109	0.293	0.951
Age:						
(30-40 yo) – (<30 yo)				0.350	0.316	2.81*
(40 yo <) – (<30 yo)				0.435	0.297	3.71*
School level:						
J Sec – Primary School				0.021	0.286	0.190
H Sec – Primary School				0.103	0.324	0.812

Note. β =standardised estimate, SE=standard error, Confidence interval=95%

* $p < 0.01$

The regression analysis presented in Table 3 revealed that the values of key goodness-of-fit indicators were adequate for both Model 1 ($F=32.2, p<0.001; R^2=0.075$) and Model 2 ($F=8.67, p<0.001; R^2=0.117$), and the difference between them was also statistically significant ($F=3.75, p<0.01; \Delta R^2=0.042$). Despite the model fitting adequately, it could only explain 7.5% and 11.7% of the variance for Models 1 and 2, respectively. Furthermore, the regression coefficients for digital creativity and age demographics were

found to be statistically significant ($p < 0.01$). Age was an especially strong predictor of teachers' instructional creativity ($\beta > 0.340$), compared to their digital creativity variable ($\beta = 0.325$).

Discussion

The advancements in digital technology and the two-year COVID-19 pandemic have had an undeniable impact on how people choose and utilise such technology for their day-to-day lives, including the way teachers and students deploy it for educational purposes. Literature has shown that teachers learnt, and implemented, the use of various types of technology to facilitate and support their teaching practices (e.g. Cardullo et al., 2021; Flores & Gago, 2020; Mulyono et al., 2021), and to find support for, and mitigate, their mental issues of loneliness and for self-expression (Chung & Chen, 2018; Ningsih et al., 2021). Consequently, teachers have been found to have improved their technological knowledge and competences, and to have used certain digital applications for creative activities. However, there is limited evidence in the literature as to whether or not teachers' digital creativity can be related to their instructional creativity in the classroom environment. Therefore, the present study aims to examine the extent of teachers' digital creativity, together with their instructional creativity, in Indonesian school classrooms, where English is taught as a foreign language. To this end, the general scale of digital creativity, together with the creativity-fostering behaviour framework, is employed to guide the current research, and the data collected through five-point Likert-scale instruments is analysed through the Rasch-based regression method.

The findings of the current study supported the reliability properties of the two scale items (i.e. digital creativity scale and instructional creativity scale) employed for the data collection instruments. Both item and person reliabilities were found to be satisfactory and the evaluation of both item and person separation indicated that the scales were able to distinguish between the items and the participants' ability to respond to them. In other words, the persons and item measures, as well as the reliability and separation analyses, revealed the acceptable use of the questionnaire items to elicit teachers' responses to the digital creativity and instructional creativity scales. These findings thus suggested that the two scales of digital creativity and instructional creativity could be used in future studies on a similar topic within the Indonesian school context.

The assessment of the Wright map from the participant measures revealed that almost half of the participants had a low level of digital creativity, particularly in terms of creating digital content or products, using digital applications to create school-activity-related podcasts and attending digital courses. Low levels of instructional creativity were also found among the teachers, despite their claims of having promoted creative behaviour during their teaching practices. It is interesting that teachers' low levels of digital and instructional creativity were found across different demographic domains, such as gender, age, and school-level. These findings have highlighted the conditions in which many Indonesian teachers have limited knowledge and experience of using diverse types of digital technology and are accordingly constrained in their ability to select better technologies for their teaching practices. The plausible explanation for teachers' low levels of digital technology might be related to several factors, as suggested by Karaca et al. (2013), such as their demographic characteristics, beliefs, attitudes and technological knowledge and competence, and more importantly the availability and accessibility of the technology applications themselves.

Multiple regression analyses were performed using Rasch-calibrated-person measure data to examine if teachers' instructional creativity is associated with their digital creativity and demographic background (Hoi, 2020). The results supported the proposed models; however, the assessment of model-fit analysis should be viewed with caution, as the models only explained less than 20% of the variance in instructional creativity. Despite many teachers possessing low digital creativity, the regression analysis revealed that teachers' digital creativity and age could be associated with their instructional creativity. Gender and school level, however, failed to indicate any association with instructional creativity. This suggests that the variables of digital creativity and age can be used to predict teachers' instructional creativity in the

classroom, with age background being the stronger predictor compared to the digital creativity variable. This empirical evidence generally confirmed the general hypothesis of the TPACK (Technological, Pedagogical, and Content Knowledge) framework, suggesting that teachers' instructional methods for teaching with technology were particularly associated with their knowledge and competence in using the technology themselves (Henriksen et al., 2016; Nazari et al., 2019; Scherer et al., 2018; Schmidt et al., 2009; Sing et al., 2010). It should, however, be noted that the varied use of digital technology demonstrated in the current study was not necessarily implemented for teaching and learning purposes. The findings of the current study could be interpreted as suggesting that teachers' learning and use of digital technology for any general purpose could promote potential benefits for their teaching activities, particularly in selecting the appropriate type of technology. More importantly, the current study implies the need for further technology training for teachers to enable them to select varying applications for their teaching. A study by Dogan et al. (2021) provided evidence that when teachers positively perceive their technological competence for instructional purposes, they reflect positive beliefs and usefulness of the technology. In other words, the findings of the current study emphasises the need to increase digital creativity and instructional creativity of teachers through technology-based training, as it was observed that a substantial number of Indonesian teachers possessed limited digital creativity and exhibited difficulty in combining instructional methods and promoting student assessment in the classroom.

Conclusions and Limitations

In brief, the findings of the current study have showed that many of Indonesian EFL teachers possessed a low level of digital creativity, especially when it came to generating digital content or products, creating school-activity-related podcasts using digital applications, and taking part in digital courses. Low levels of instructional creativity were also quantified among the teachers. They unlikely achieved success in combining and varying teaching methods in the classroom and giving their students the chance to assess their own study process. Multiple regression analyses revealed that teachers' digital creativity and age were associated with their instructional creativity, whereas gender and school level did not demonstrate any association. These findings imply the need for further technological training for teachers, so that they can choose varying applications for their creative teaching.

However, it should be noted that the current study had certain limitations. First, the current study was limited in its scope as it adopted the Creative Behaviour Questionnaire Digital (CBQD) scale, thus only allowing for the exploration of teachers' general creativity in the aspect of digital application usage. Consequently, teachers' utilisation of digital technology to facilitate their creative teaching was not made apparent and requires further research. Secondly, a self-administered questionnaire was used, which has the potential to promote biased responses, as the participants may be more likely to provide socially desirable answers. Consequently, it is suggested that further research employ other data collection methods, such as interviews, to address this issue and avoid potential errors. Additionally, the study's participants were selected via non-probability sampling, with a domination of female teachers, indicating that the findings cannot be generalised to all samples of EFL teachers' populations.

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