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Teacher's Creativity In The VUCA Era: A Systematic Literature Review Using Bibliometric Analysis

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ABSTRACT

In VUCA era, teachers' creativity becomes crucial to help students overcome the surrounding rapid and complex changes. A creative teacher can create flexible, innovative, and responsive teaching methods responding to students' needs to face the unpredictable and unstable environment. Teachers' creativity also allows students to develop their critical, creative, and analytical way of thinking, along with teamwork and communication skill. Teacher creativity is so important that it is necessary to study how teacher creativity is viewed from the last five years research results, to provide a real understanding and follow-up in escalating teacher creativity. This systematic literature review is aimed to review research results related to the topic of teacher creativity. A systematic review protocol was designed and implemented in a systematic literature search procedure that was carried out on three data-based electronic platforms namely Sciencedirect, Emerald, and Springer Link. The literature selection protocol used the PRISMA method. The results of the literature study showed that the last five years' research on teacher creativity is related to technology, STEAM, self-efficacy, educational environment, creative disposition, creative thinking, student motivation, and interest. Collaboration from related parties is needed in creating teachers who are creative in teaching. Teachers must be open to technological developments and leaders of educational institutions must be able to create a creative and innovative environment so that teachers can confidently develop their creativity which will effectively create challenging and innovative learning experiences for students.

Keywords: *Bibliometric Analysis, Teacher's Creativity, VUCA Era*

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INTRODUCTION

The challenges of the 21st century are right before our eyes, and to face these challenges teachers or educators need to update their competencies (Caena & Redecker, 2019). Teachers or educators are generally responsible for the quality of graduates (Elisa et al., 2020). Graduates of an educational level must have adequate skills to have global competitiveness in the future. The development VUCA phenomenon in the 21st century has impacted changing the paradigm of human life.

The VUCA (Volatility, Uncertainty, Complexity, Ambiguity) phenomenon is one of the main challenges faced by educators, especially teachers (Chai & Kong, 2017; Zainab binti Ali, 2022). In this uncertain and rapidly changing situation, teacher creativity is key in preparing students to face a world full of uncertainty (Anderson et al., 2021). In addition, according to Susilowati & Suyatno, (2021), technological developments and globalization require teachers to continue to update and improve their skills in using technology. Teachers must be able to use technology effectively to facilitate the learning process (Anthony & Walshaw, 2009), as well as design technology-based learning experiences to fulfill students' needs (Boud & Prosser, 2002). According to (Delgado et al., 2021), technology also enables teachers to collaborate with teachers around the world and gain access to a wider range of educational resources. Therefore, teacher creativity in utilizing technology and integrating it into learning experiences is becoming more important (Sabella, 2022).

However, not all teachers have adequate creative abilities and skills. Some teachers are still bound by traditional and less innovative ways of teaching. Furthermore, some teachers may not have access to the training or professional development needed to enhance their creativity. School organizational culture that does not support creative and innovative behavior is also a cause of low teacher creativity, those are in contrast to research conducted by Prasetyo & Fadhillah, (2022) which says the construction of organizational culture for ideal performance consists of four main dimensions, one of which is developing human resources. These things become the background for solving problems because teacher creativity is the key to creating effective learning experiences for students in the VUCA era. Therefore, literature research on teacher creativity is very important to do to develop effective strategies for improving the quality of education. In this article, the results of research on teacher creativity and the VUCA phenomenon and its implications for education will be discussed.

Creativity Theory

Creativity is the ability to come up with useful and valuable ideas or innovations (Robbins & Judge, 2022). On the other hand, Sergeeva et al., (2020) stated that

pedagogic creativity is a pedagogical science that connects one's activities with social or natural changes according to needs based on the laws of reality and their goals. In addition, Ciechowska, (2017)said that creativity is a person's significant ability to act openly and creatively in response to constant positive change. According to La et al., (2022) creative activity is a psychological phenomenon that plays an important role in aspects of educational science in modern times. The same thing was expressed by (Uchenna & Nwagbo, 2021) in their research results that student interest in learning is influenced by educator creativity. Moreover, according to Raymundo, (2020), creativity is the ability to generate new ideas that are used to develop or refine and evaluate ideas for improvement. Creativity is a feature of pluralism, various perspectives, theories, assumptions, and different methods, and provides a debatable understanding of human creativity (Beghetto & Kaufman, 2022).

Beaulieu, (2022) stated in his research that there are 3 indicators of creativity, namely (1) perceptions of creativity, (2) self-perceptions about creativity, and (3) perceptions of creativity in education. Meanwhile, according to Raymundo, (2020b) indicators of creativity are (1) developing and implementing new ideas, (2) being open and responsive, (3) showing originality and creativity (4) seeing failure as an opportunity to learn. Wijayanti, (2018) added in his research that indicators of teacher creativity consist of (1) fluency, (2) flexibility, (3) novelty, and (4) elaboration.

Bibliographical Analysis Concept

A bibliographic analysis is often used to analyze quantitative textual publication data, this analysis is part of scientometrics using statistical techniques for the scientific examination of a particular topic (Callon et al., 1991). Bibliographic analysis expands the view of a study based on the journal, articles, and authors (Merigó & Yang, 2017). Bibliographic analysis that is often used is the number of publications and the number of citations (Yu & Shi, 2015). This type of analysis yields useful information for researchers evaluating scientific activity (Rey-Martí et al., 2016).

RESEARCH METHODOLOGY

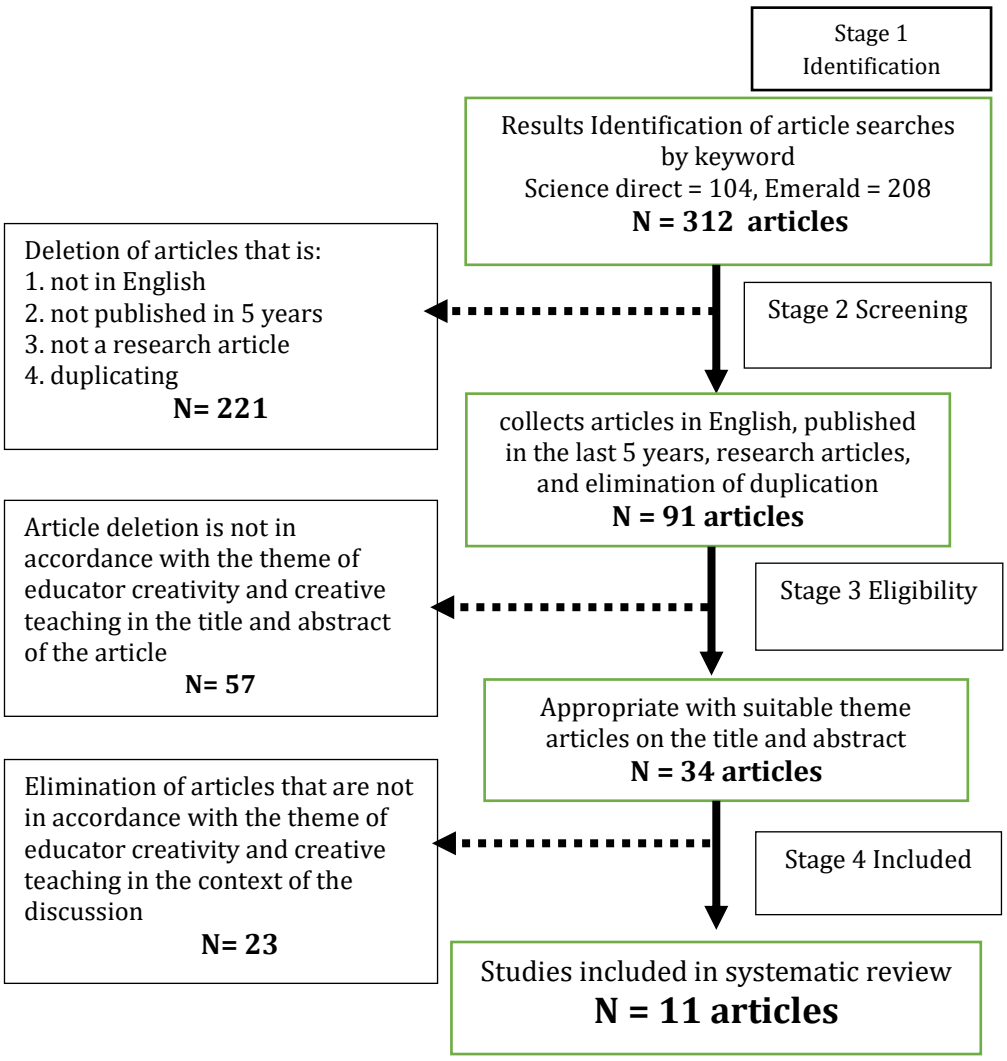
The method used in this study is a literature review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses / PRISMA method (Selcuk, 2019; Page et al., 2021), Campbell's systematic review (The Campbell Collaboration, 2020), and bibliographical analysis VOS Viewer software.

Search strategy and article selection procedure

This research is to obtain relevant and comprehensive studies on developing the creativity of teachers or educators. Literature searches are based on selected international reputable journal sources. Article searches were conducted in February 2023 on the Science Direct and Emerald databases using keywords. The keywords used are "Teacher Creativity" or "Creative Teaching". These keywords are contained in the title, abstract, and keywords used in the article. The selection process for suitable

articles is carried out using Mendeley software to easily manage the articles (Reis et al., 2022). The selection stages are illustrated in diagram 1 below.

Figure 1. PRISMA Flowchart of Literature Selection Stage



Bibliographic data analysis

The data obtained is in the form of metadata from ScienceDirect and Emerald platforms with the keywords "Teacher Creativity" or "Creative Teaching", then managed through Mendeley software. Metadata is used for bibliographic analysis with the help of VOSViewer software by analyzing the frequency of publications and citations about educator creativity and creative teaching. VOSViewer is analyzed using a distance approach visualized by a bibliometric network (Waltman et al., 2010).

RESULT AND DISCUSSION

The selection process for articles has been carried out with the criteria for article publication between 2019 and 2023, in the form of research articles, in English and meeting the criteria set by the researcher. The selection resulted in 11 articles being reviewed. The selection process protocol is depicted in the PRISMA flowchart Page et

al., (2021) in diagram 1. The details of the research sites of the 11 articles include 2 articles from the United States, 2 articles from China, 2 articles from Turkey, and each 1 article from Taiwan, Nigeria, Hong Kong, South Korea, and Germany. The results of the review are presented in table 1 below.

Table 1. Result of Reviewing 11 articles

NO	Authors, Country & doi	Journal's & Article's Title	Population & Sample	Method	Findings
1	Lamb & Firestone (2022), USA	Computers & Education: X Reality; *The moderating role of creativity and the effect of virtual reality on stress and cognitive demand during preservice teacher learning*	48 students and 2nd year prospective teachers	Learning experiments with microteaching and virtual reality, measurement techniques used in this study include real-time neurocognitive measurements of CD through hemodynamic responses, real-time measurements of ANS stress (HRV, GSR, and ST), and psychological/behavioural measurements of creativity and MF as measured through the Torrance Test of Creative Thinking (TTCT).	1. From the results of analysis of hemodynamic data and stress response data, it is shown that the protective factors of creativity and mental flexibility can moderate success and reduce cognitive demand and stress when using VR to develop skills related to learning 2. When unique students' cognitive, affective, and behavioral needs in the classroom are combined with a large number of students, the intensity of time and the ability of teachers or instructors become differentiator 3. Alternative way to reduce situational stress and excessive cognitive demand (CD) during learning activities is to promote skills that act as protective factors such as creativity and mental flexibility (MF). 4. Virtual reality (VR) overcomes some of the difficulties of microteaching by removing the audience effect allowing greater use of mental flexibility and creativity that can protect and reduce stress responses and cognitive demands.
2	Peng et al., (2020), China	Journal of Managerial Psychology; *Proactive personality congruence and creativity: a leader identification perspective*	Study 1 Leadership respondents = 5 staff respondents = 205 Study 2 Leadership	Polynomial regression and response surface analyses	1. Subordinate creativity in scenarios where leader and subordinates share a highly proactive personality (i.e. high alignment high) is higher than in scenarios of mismatch or low alignment low 2. Subordinate identification with leader mediates the indirect relationship between

			respondents = 5 Staff respondents = 222 collected from leader-subordinate dyads in China		leader-subordinate proactive personality and subordinate creativity maximized in high-high fit scenarios
3	Conradty & Bogner, (2020), Jerman	Smart Learning Environments; *STEAM teaching professional development works: effects on students' creativity and motivation*	207 out ouf 550 4th grader students participate	The structural equation model (SEM) that confirms the STEAM creativity model has a positive effect on motivation: Long-term professional development integrated into school life, sociocultural sustainability to realize creativity in the classroom.	1. Teacher's creativity causes the increase of students' self-efficacy 2. STEAM can be used to educate students to become successful scientists, as they need to develop creative thinking skills. 3. Creativity is closely related to motivation because creative subjects are the process of discovery as the most enjoyable experience
4	Kang, (2020), Korea Selatan	International Journal of Child Care and Education Policy; A multilevel analysis of factors affecting kindergartners' creative dispositions in relations to child-level variables and teacher-level variables	20 of kindergarten teachers and 195 children	Using Hierarchical Linear Models (HLM), this study examines the correlation between variables of 5-year-old children (children's creativity and their perceptions of a creative classroom climate), teacher variables (type of kindergarten, teacher's perceptions of organizational creativity), climate and teacher's creative disposition as well as the creative disposition of the child	1. The level of creative thinking of children and their creative disposition is higher in an exemplary kindergarten than in an ordinary kindergarten. 2. The level of creative disposition of teachers and their perception towards the creative organizational climate of teachers working in exemplary kindergartens scores higher than in ordinary kindergartens. 3. there is no direct correlation between creative dispositions of kindergartners and teachers' creative dispositions, creative dispositions of kindergartners are influenced by the type of kindergarten (i.e., the outstanding curriculum of an exemplary kindergarten) and teachers'

					perceptions towards the climate of organizational creativity. 4. Building a creative climate in kindergarten organizations is very important, not only for children but also for teachers in cultivating children's creative dispositions
5	Liu et al., (2020), Taiwan	Nurse Education Today Effect of creativity training on teaching for creativity for nursing faculty in Taiwan: A quasi-experimental study	42 of Capston Course Nursing Faculty students from 5 universities of science and technology in Taiwan	This quasi-experimental study used a pre-test post-test design to compare intervention and control groups	1. The results of the analysis of covariance (ANCOVA) showed that the TCM intervention group had significantly better post-test for creative teaching behavior and self-efficacy creative teaching than the control group. 2. Participation in creative workshops and strengthening teaching skills with classroom interdisciplinary teacher training can improve the quality of learning for creativity in nursing faculty. 3. Intervention programs in creativity can improve psychomotor competence and self-efficacy perceptions about learning for creativity, which can foster student creativity.
6	Beaulieu, (2022), Amerika Serikat	Journal of Creativity Creativity in science, engineering, and the arts: A study of undergraduate students' perceptions	432 undisclosed undergraduate students at universities in the Northwestern United States	The method used is a quantitative survey with 16 statements with 5 answer choices on a Likert scale, with constructs (perceptions of creativity, perceptions of self-creativity and creativity in tertiary institutions).	1. The three perceptual components of creativity (perception of creativity, perception of self-creativity and creativity in higher education) have a correlation. 2. Academic discipline is a significant predictor of creativity perception, with students in arts scoring 6.6% higher than students in engineering and 6.4% higher than science-related programs.
7	Uchenna et al., (2021),	Journal Of Critical Reviews	The study population was	This study used a comparative causal design	1. students who were taught by teachers with high levels of creativity had better

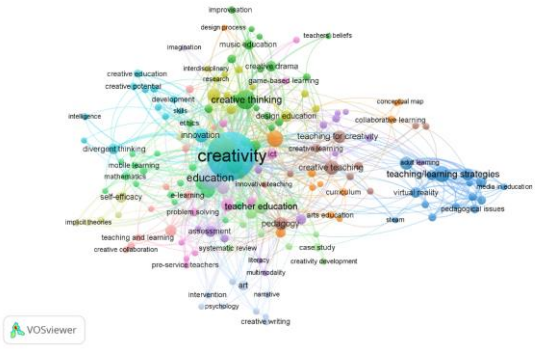
	Nigeria	The Impact of Teacher Creativity Fostering Behaviour on Students' Interest in Biology in Enugu State, Nigeria	5693 biology students and 62 high school biology teachers with a sample of 270 students and 24 teachers.	(ex-post facto)	interest in biology than students whose teachers had medium or low levels of creativity 2. male students have a higher interest in biology in relation to teacher creativity. 3. a conducive teaching and learning environment is recommended in biology classes to increase students' interest in biology 4. Student interest in biology can be generated and maintained through motivation, a series of relevant induction techniques, the use of effective instructional strategies, and especially the use of imaginative or creative approaches.
8	Huang et al., (2019), China	Teaching and Teacher Education What really counts? Investigating the effects of creative role identity and self-efficacy on teachers' attitudes towards the implementation of teaching for creativity	167 kindergarten teachers in China	Structural equation modeling with bootstrapping estimation	1. teacher creative self-efficacy mediates the relationship between creative role identity and teachers' positive implementation attitudes 2. Process-focused self-efficacy was found to be significantly related to teachers' positive implementation attitudes, whereas product-focused self-efficacy was not significant
9	Ayyildiz & Yilmaz, (2021), Turki	Thinking Skills and Creativity 'Moving the Kaleidoscope' to see the effect of creative personality traits on creative thinking dispositions of preservice teachers: The mediating	The sample consisted of 1320 prospective teachers in various fields of study	Quantitative research approach with survey methods	1. creative personality traits positively predict creative thinking dispositions through the learning environment and teacher coaching behavior 2. Creative learning environments and teacher coaching behaviors also have a positive mediating effect.

		effect of creative learning environments and teachers' creativity fostering behavior			
10	Demirtaş & Batdal Karaduman, (2021), Turki	Thinking Skills and Creativity Adaptation of the SenSel creativity-sensitization and self-questionnaire for educators and teachers into Turkish and its relationship with mathematical thinking skills	The sample consisted of classroom teachers in Turkey's Southeastern Anatolian city with 509 classroom teachers as respondents.	The research approach was quantitative using survey method. Confirmation factor analysis was carried out with the Lisrel program to test the fit of the model of the test item-factor structure during the adaptation phase, and Cronbach's Alpha coefficients and McDonald's Omega coefficients were calculated for reliability analysis.	1. A significantly positive relationship was found between the classroom teacher's sensitivity to creativity and the level of mathematical thinking 2. The class teacher's sensitivity to the phenomenon of creativity predicts the level of mathematical thinking. 3. Creativity and mathematical phenomena predict each other from different angles
11	Chen & Lo, (2019), Hongkong	Journal for STEM Education Research From Teacher-Designer to Student-Researcher: a Study of Attitude Change Regarding Creativity in STEAM Education by Using Makey Makey as a Platform for Human-Centred Design Instrument	249 high school students in Hongkong	The research approach used is the Mix-Method method	1. participants are motivated to think from different perspectives and combine ideas in different ways that haven't been tried before 2. a significant increase in students' creative attitudes shifting was shown from the paired sample t-test on the dimensions of originality, flexibility, fluency and elaboration through the STEAM project. 3. there is a difference in the level of Flexibility after the respondents participate in the STEAM project.

Results of bibliographic analysis with VOSViewer

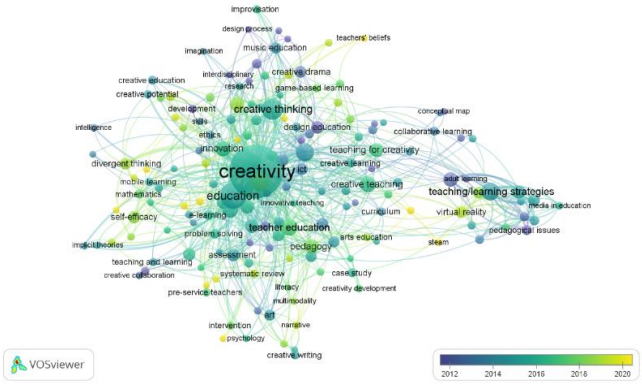
The results of metadata co-occurrence analysis of article keywords using the VOSViewer software is visualized in Figure 1 below.

Figure 1. Network Visualization



In the figure above there are three large clusters, namely Creativity, Creative Thinking, and Teaching Learning Strategies. There are several keywords that are close to creativity, namely innovative teaching, education, innovation, creative learning, creative teaching, e-learning and innovation. The distance between the nodes is tight indicating that the keywords are closely related and the bigger the node the more often it is researched. While the keywords that are quite far away are the keywords creative writing, psychology, intervention, creativity development Teacher Education, School Culture, Education for sustainable development, improvisation, and teaching's belief. This indicates that the keyword is still little researched compared to creativity. Then in Figure 3 about visualization overlay based on keywords, it can be explained that there are keywords that are still being discussed recently in 20202 such as associated with creativity, namely teacher's belief, creative drama, self-efficacy, divergent thinking, mobile learning, virtual reality, artificial intelligence and thinking design.

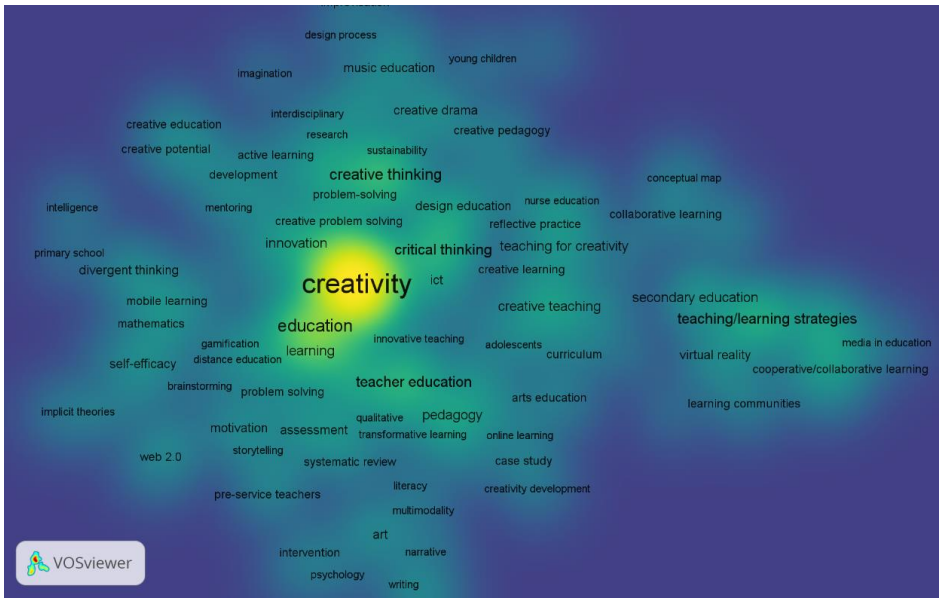
Figure 2. Overlay Visualization



In Figure 3 below, the density visualization illustrates the density or emphasis on the topic of the research group. The brighter the visualization the more research is

conducted on that topic or keyword, conversely the darker the visualization the less the themes being discussed. The keywords visualized bright are the keywords creativity, education and learning while the keywords visualized dark are collaborative learning, experiential learning, entrepreneurship, meta-analysis and blended learning.

Figure 3. Density Visualization



Discussion

Based on a literature review according to Lamb & Firestone, (2022), Virtual Reality can overcome difficulties in microteaching by eliminating audience effects. This is reinforced by the results of research from Wang et al., (2023) which states that Virtual Reality has a positive effect on the feasibility of the creative process, this is also in accordance with Chen's research, (2022).

The results of research from Conradty & Bogner, (2020) that STEAM can improve the development of students' creative thinking, Rahmawati et al., (2019) similarly expressed that STEAM integration provides opportunities for students to be involved in achieving learning goals through creative thinking. Other research that supports this is the results of research from Aguilera & Ortiz-Revilla, (2021) that the STEM and STEAM approaches have a positive influence on student creativity, as well as according to Ozkan & Umdu Topsakal, (2021) through their experiments that there are significant differences in study groups with the STEAM approach compared to study groups with a science curriculum approach and textbooks in both verbal and figural creativity. One of the STEAM approaches is the technological approach, according to Wahyuningsih & Baidi, (2021) in their research that the results of observations show that online teaching and learning activities using the Discord application can create a digital learning environment that is communicative, interesting, and enjoyable for students. These studies provide an illustration of how education cannot be separated from technology.

Research conducted by Kang, (2020) turns out that the creative disposition of kindergarten teachers in pre-eminent kindergartens is higher than the creative disposition of teachers in kindergartens in general, as well as the creative disposition of their students, the creative disposition of children is influenced by the type of

kindergarten and teachers' perceptions of the creative climate of the organization. This study corroborates the research results of Yeh-Yun Lin & Liu, (2012) that variations in innovation in an organization result from the climate of organizational creativity that is built. The same thing was expressed by Da'as et al., (2020) who revealed that the organizational creative learning climate mediated the innovative behavior of school principals and teachers.

Research conducted by Liu et al., (2020) shows that teaching groups with a TCM (teaching for creativity module) improve creative teaching behavior and creative self-efficacy for teaching, as well as participation in creative workshops can increase the quality of creative learning. In line with Liu's research, the STEAM creative module can support the creation of components of the educational environment and encourage students to imagine, explore, experiment, test, manipulate, and speculate creatively (Conradty et al., 2020).

Research by Beaulieu, (2022) states that there is a correlation between the three perceptual components of creativity, namely perception of creativity, perception of self-creativity, and creativity in college. The results of this study corroborate the results of research from Ambrose, (2006) where academic discipline is a significant predictor of creativity perception where the arts have a higher creativity perception score than engineering and science. Whereas research by Uchenna & Nwagbo, (2021) stated that students' learning interest increases more when taught by teachers with high creativity than by teachers with medium or low creativity, this research is in line with Azizah et al., (2022) that teachers teaching creativity has a positive relationship on students' learning interest.

Research conducted by Huang et al., (2019b) states that teachers' creative self-efficacy mediates the relationship between creative role identity and teachers' positive implementation attitudes, and process-focused self-efficacy was found to be significantly related to teachers' positive implementation attitudes, while self-efficacy which focuses on the product is not significantly related to the teacher's positive implementation attitude. this research is in line with the results of research from Parhamnia et al., (2022) which states that creativity is a mediator of knowledge sharing and self-efficacy in the context of learning English.

Moreover, research conducted by Ayyildiz & Yilmaz, (2021) concluded that a creative learning environment and teacher coaching behavior has a positive mediating effect, besides that the results of his research stated that creative personality traits positively predict the disposition of creativity through the learning environment and teacher coaching behavior. This research is supported by the research of Avcı & Yildiz Durak, (2023) that creative and innovative thinking will explain the learning process from various aspects such as creativity, innovation, commitment, performance, product development, achievement, and motivation.

According to Demirtaş & Batdal Karaduman, (2021), there is a significant relationship between the teacher's sensitivity to creativity and the level of mathematical thinking. On the other hand, according to Chen & Lo, (2019), students are motivated to think creatively and there is a positive change in creative attitude towards originality, flexibility, fluency, and elaboration through STEAM.

CONCLUSION

Creativity is a very important ability for teachers to have in the VUCA era, to create effective learning experiences for students. The STEAM approach that integrates

concepts from various fields of study, a technology used effectively, student motivation, self-efficacy, student interest in learning, and creative thinking are very important factors for increasing teacher creativity and enriching student learning experiences. Teachers must be able to motivate students to learn and design learning experiences fulfilling students' needs. In this case, students' self-efficacy and students' interest in learning also need to be improved.

Creative thinking is also important in enhancing teacher creativity. Teachers must be able to design challenging learning experiences and encourage students to think creatively in dealing with complex problems and challenges. Through creative thinking, students can develop their ability to find creative solutions to complex problems.

In conclusion, enhancing teacher creativity, STEAM, student motivation, self-efficacy, student learning interest, and creative thinking are important factors in creating effective learning experiences for students in the VUCA era. Therefore, teachers must continue to develop their creativity and make effective use of technology to create challenging and innovative learning experiences for students.

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