



Relationship between Divergent Thinking and Digital Literacy on Teacher Ability to Develop HOTS Assessment

I Wayan Widana^{1*}, I Gede Ratnaya²

¹ Universitas PGRI Mahadewa Indonesia, Denpasar, Indonesia

² Universitas Pendidikan Ganesha, Singaraja, Indonesia

ARTICLE INFO

Article history:

Received June 07, 2021

Revised June 15, 2021

Accepted August 24, 2021

Available online November 25, 2021

Kata Kunci :

Gaya Berpikir Divergen, Literasi Digital, Penilaian HOTS

Keywords:

Divergent Thinking Style, Digital Literacy, HOTS Assessment



This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.

Copyright © 2021 by Author. Published by Universitas Pendidikan Ganesha

ABSTRAK

Kemajuan teknologi informasi membawa perubahan dalam berbagai bidang kehidupan. Perubahan yang terjadi harus disikapi dengan bijak agar kemajuan teknologi informasi berdampak positif bagi kehidupan manusia. Masyarakat dunia saat ini menghadapi era baru yang lebih maju, lebih cepat, informasi yang semakin sulit disaring, dan persaingan yang semakin terbuka. Rendahnya kemampuan guru matematika SMA/SMK mengembangkan penilaian HOTS merupakan masalah serius yang harus segera dicarikan solusi untuk dapat meningkatkan daya saing siswa di abad 21. Penelitian ini bertujuan untuk menganalisis hubungan antara berpikir divergen dengan kemampuan guru dalam mengembangkan penilaian HOTS, hubungan antara literasi digital dengan kemampuan guru dalam mengembangkan penilaian HOTS, dan hubungan antara berpikir divergen dan literasi digital dengan kemampuan guru dalam mengembangkan HOTS. penelitian. Penelitian ini merupakan penelitian kuantitatif dengan metode survei non kausal. Desain penelitian menggunakan model regresi korelasional. Populasi penelitian ini adalah guru matematika SMA/SMK di Bali, NTB, dan NTT. Pemilihan sampel menggunakan teknik cluster random sampling. Data penelitian dikumpulkan dengan menggunakan kuesioner. Analisis data menggunakan regresi linier berganda berbantuan SPSS 23.0 for Windows. Hasil penelitian menunjukkan adanya hubungan positif yang signifikan antara berpikir divergen dengan kemampuan guru dalam mengembangkan penilaian HOTS. Terdapat hubungan positif yang signifikan antara literasi digital dengan kemampuan guru dalam mengembangkan penilaian HOTS. Terdapat hubungan positif yang signifikan antara berpikir divergen dan literasi digital dengan kemampuan guru mengembangkan penilaian HOTS.

ABSTRACT

Advances in information technology bring changes in various areas of life. The changes that occur should be addressed wisely so that advances in information technology positively impact human life. The world community is currently facing a new era that is more advanced, faster, information that is increasingly difficult to filter, and increasingly open competition. The low ability of high/vocational school mathematics teachers to develop HOTS assessments is a serious problem that must be immediately found a solution to be able to increase student competitiveness in the 21st century. This study aims to analyze the relationship between divergent thinking and the ability of teachers to develop HOTS assessments, the relationship between digital literacy and teachers' abilities to develop HOTS assessments, and the relationship between divergent thinking and digital literacy with teachers' abilities to develop HOTS assessments. This research is a quantitative non-causal survey method. The research design used a correlational regression model. The study population was high school/vocational high school mathematics teachers in Bali, NTB, and NTT. The sample selection used the cluster random sampling technique. Research data were collected using a questionnaire. Data were analyzed using multiple linear regression assisted by SPSS 23.0 for Windows. The results show a significant positive relationship between divergent thinking and the ability of teachers to develop HOTS assessments. There is a significant positive relationship between digital literacy and teachers' abilities to develop HOTS assessments. There is a significant positive relationship between divergent thinking and digital literacy and the teacher's ability to develop a HOTS assessment.

1. INTRODUCTION

Advances in information technology bring changes in various areas of life. The changes that occur should be addressed wisely so that advances in information technology positively impact human life. The world community is currently facing a new era that is more advanced, faster, information that is increasingly difficult to filter, and increasingly open competition (LeBlanc, 2018). This era is often referred to as the VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) era. Four important aspects are needed

*Corresponding author.

E-mail addresses: iwayan.widana.bali@gmail.com (I Wayan Widana)

to face the VUCA era, abbreviated as TRUE (Truthfulness, Resilience, Uncertainty Friendly, and Eminence) (Budiharto et al., 2019). Each aspect of TRUE contains behavioral characteristics, as presented in Table 1.

Table 1. Behavioral characteristics of TRUE

No.	Aspect	Behavioral traits
1.	Truthfulness	sincerity, honesty, integrity, equality, fairness, truth, trust, loyalty, trustworthiness, consistency, transparency, strong ethics
2.	Resilience	toughness, blessing, prosperity, quality, sustainability, long term orientation
3.	Uncertainty Friendly	openness, interdependence, learning, cooperation, reflection, flexibility, tolerance for uncertainty, adjustability
4.	Eminence	excellence, independence, caring, innovative, responsible, civilized, dignified, achievement, recognized, respected, inspire, be a reference

To prepare students to live and adapt to the VUCA era, an important competency that must be developed in education is higher order thinking skills (HOTS). As the front line in education, teachers need adequate knowledge and skills to carry out HOTS-based learning and assessment. Teachers must develop HOTS assessments to train students to solve contextual problems that are not routine. Higher order thinking skills must be trained from an early age through formal learning in schools (Sudiarta & Widana, 2019). Students should be accustomed to solving contextual problem-based problems so that learning becomes more meaningful. The phenomenon of change that occurs is very dynamic, requiring high-level thinking skills to analyze and solve problems (Victoria & Darvas, 2017). On the other hand, the ability of high school mathematics teachers to develop a very low HOTS assessment is a serious problem that must be solved to empower teachers to improve student competitiveness in the 21st century. Previous research found that mathematics teachers still use questions that only measure the level of knowledge, understanding, or the highest application level (Hamdi et al., 2018). The findings of another study stated that the low creativity of teachers in developing assessments impacted the low quality of the instruments used to measure student learning outcomes (Soenarto et al., 2020). Both studies indicate that teachers' ability to develop assessments needs to be improved to provide adequate experience to students to solve contextual problems based on reasoning and logic questions. Many factors that affect the ability of teachers to develop HOTS assessments come from internal and external factors, so it is necessary to know for sure so that a solution can be found immediately.

Divergent thinking can construct or produce various possible responses, ideas, options, or alternatives to a problem. The characteristics of divergent thinking are shown by: (a) the existence of a process of interpretation and evaluation of ideas; (b) the process of motivation to think of various possible ideas that make sense; and (c) the search for unusual (non-routine) possibilities in constructing new ideas (Ferrández et al., 2017). Divergent thinking is a thinking ability that can be used when someone is doing activities or solving problems creatively (Pratomo et al., 2019). Divergent thinking can consciously hold new ideas that produce as many solutions as possible for a particular problem (Wang, 2017). Divergent thinking is the ability to produce various solutions to problems with various procedures and the right reasons. It is one factor that affects a person's ability to think at a higher level (H. Saleh, 2019). Divergent thinking is a person's ability to create new ideas or ideas in the form of alternative solutions that are different from previous ways, to solve a particular problem (Surur et al., 2020).

Digital literacy can use technology and information from digital devices effectively and efficiently in various contexts, such as academics, careers, and everyday life (Chan et al., 2017). Digital literacy can create and share in different modes and forms to create, collaborate and communicate more effectively, and understand how and when to use good digital technology to support the process (Liu et al., 2020). Being digitally literate means being able to process various information in the form of messages and communicate effectively with others in various forms and understand when and how technology should be used to achieve goals effectively. It includes awareness and critical thinking about the various positive and negative impacts of technology in everyday life (Siriwatchana et al., 2018). Digital technology allows people to interact and communicate with family and (Sudiarta & Widana, 2019). Digital literacy is the knowledge and skills of a person using digital media, communication tools, or networks to find, evaluate, use, create information, and utilize it in a healthy, wise, intelligent, careful, precise, and law-abiding manner to foster communication and interaction in everyday life.

The HOTS assessment is an assessment that functions to measure higher-order thinking skills, the ability to think that is not just recalling, restating, or referring without processing (recite). The HOTS-based assessment measures the ability to: 1) transfer one concept to another, 2) process and apply information, 3) find connections from different kinds of information, 4) use information to solve problems, and 5)

examine ideas and information holistically. However, the HOTS assessment is a more difficult test than the recall test (Brookhart, 2010). The HOTS assessment measures ability to analyze, evaluating, and creating (Anderson, L.W. & Krathwohl, 2001). These three domains of higher order thinking skills are important in the problem-solving, transfer of learning, and creativity. From the knowledge dimension, the HOTS assessment measures the metacognitive dimension, which describes the ability to connect several different concepts, interpret, solve problems, choose problem-solving strategies, find (discover) new methods, argue (reasoning), and make the right decisions. The importance of higher order thinking skills for students as the medium of textbooks, students' HOTS can be developed by presenting topics that contain contextual cases of HOTS (Pratama & Retnawati, 2018).

The characteristics of the HOTS-based assessment can be detailed and explained as follows: (a) measuring higher-order thinking skills, including the ability to solve problems, critical thinking skills, creative thinking, argument skills (reasoning), and decision making; (b) based on contextual and interesting topics, related to the environment, health, earth and space, social life, cultural penetration, and the use of science and technology in various aspects of life; and (c) not routine and carrying novelty, aiming to build students' creativity in solving various contextual problems (Widana, 2018). A creative attitude is closely related to innovative concepts that present novelty. The HOTS assessment cannot be tested repeatedly on the same test taker. HOTS learning and assessment can improve student learning outcomes. Thus, it is very important to improve the ability of teachers to develop HOTS assessments (Anggrieny et al., 2017).

Many factors affect a teacher's ability to develop a HOTS assessment. In this study, the internal factor used as the focus of research is divergent thinking, a natural trait from birth. In his research, Lin et al. (2016) stated that thinking could be trained to be developed optimally. It means that if it is proven that divergent thinking contributes to the teacher's ability to develop the HOTS assessment, the teacher's divergent thinking must be optimized. Likewise, one of the external factors studied in this study is digital literacy. Research stated that digital literacy could provide experience for developing skills in utilizing information technology, fostering a critical and creative attitude (Caldevilla-Domínguez et al., 2021). Therefore, teacher digital literacy is one of the focuses in this study related to the ability of teachers to develop HOTS assessments. Following the description above, this study aims to describe and analyze the relationship between divergent thinking and digital literacy with the ability of mathematics teachers to develop HOTS assessments.

2. METHODS

This research is a quantitative non-causal survey method. The research design uses a correlational regression model (Creswell, 2014). The population of this study was high school/vocational high school mathematics teachers in the provinces of Bali, NTB, and NTT. The sample amounted to 400 people who were determined using the cluster random sampling technique. The sample data used in this study are presented in Table 2.

Table 2. Number of Samples

No.	Province	Regency/city	Total
1.	Bali	9	96
2.	West Nusa Tenggara (NTB)	10	139
3.	East Nusa Tenggara (NTT)	22	165
Total		41	400

The independent variables in this study are divergent thinking (X1) and digital literacy (X2). At the same time, the dependent variable is the teacher's ability to develop a HOTS assessment (Y). Data on divergent thinking, digital literacy, and the ability of teachers to develop the HOTS assessment were collected using a questionnaire. The instrument for collecting data on divergent thinking, digital literacy, and the ability of teachers to develop the HOTS assessment was developed from the dimensions and indicators of each variable as described in Table 3, Table 4, and Table 5.

Table 3. Dimensions and indicators of divergent thinking

Dimension	Indicator
Fluency	1. Fluency in expressing many ideas 2. Generate many ideas that are relevant to the problem
Flexibility	3. The ability to see an object, situation, or problem from various points of view

Dimension	Indicator
Originality	4. Ability to use various ways to solve problems
	5. Unusual thinking skills
Elaboration	6. Ability to come up with new and unique ideas
	7. The ability to break down the main idea into smaller ideas to solve problems
	8. Ability to develop ideas
	9. Ability to make implications from available information

(Ferrándiz et al., 2017; Pratomo et al., 2019; S. Saleh, 2019; Surur et al., 2020; Wang, 2017);

Table 4. Dimensions and Indicators of Digital Literacy

Dimension	Indicator
Class-Based Digital Literacy	1. Frequency of digital literacy training that teachers have participated.
	2. The intensity of the application and use of digital literacy in learning and assessment activities.
	3. The level of understanding of teachers using digital and internet-based learning and assessment media.
School Culture-Based Digital Literacy	1. Number and variety of reading materials and digital-based teaching aids accessed by teachers.
	2. The ability of teachers to present school information using digital media or websites.
	3. The ability of teachers to carry out activities in schools that utilize technology and information
	4. The ability of teachers to implement school policies related to the use and utilization of information and communication technology

(Chan et al., 2017; Siritwatchana et al., 2018; Sudiarta & Widana, 2019)

Table 5. Dimensions and Indicators of Teacher Ability to Develop HOTS assessment

Dimension	Indicator
Understanding the concept of HOTS assessment	1. The teacher's ability to explain the basic concepts of the HOTS assessment
	2. Understanding the cognitive level of Bloom's taxonomy
Characteristics of HOTS-based assessment	3. Describe the characteristics of an assessment based on the level of reasoning and logic
	4. Distinguish between HOTS assessment and non-HOTS assessment
HOTS Assessment Writing Techniques	5. Teacher mastery of HOTS assessment writing rules
	6. Mastery of the steps for the preparation of the HOTS assessment
	7. The ability of teachers to carry out HOTS assessment analysis
	8. Skills in using computer/laptop for HOTS assessment development
	9. Ability to access various information from the internet to prepare HOTS assessment

(Brookhart, 2010; Widana, 2018)

The validity test of the research instrument used the Pearson Product Moment correlation test formula, while the instrument reliability test used the Cronbach Alpha formula. The research data were analyzed using multiple linear regression using the SPSS 23.0 for Windows.

3. RESULT AND DISCUSSION

Results

Following the research objectives, to analyze the relationship between divergent thinking and the ability of teachers to develop HOTS assessments, the relationship between digital literacy and the ability of teachers to develop HOTS assessments, and the relationship between divergent thinking and digital literacy together with the teacher's ability to develop HOTS assessments. There are three types of research data, data on divergent thinking (X1), digital literacy (X2), and the ability of teachers to develop HOTS assessments (Y). Data were analyzed using multiple linear regression assisted by SPSS 23.0 for Windows. The results of the study are presented in Table 5.

Table 5. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1	(Constant)	-3.148	1.254	-2.510	0.012
	Divergent thinking	0.648	0.023	0.653	28.384
	Digital literacy	0.416	0.023	0.415	18.047

In Table 5. Coefficientsa above, in column B (Unstandardized Coefficients), describes the score of Constant, X_1 , and X_2 , respectively as coefficients β_0 , β_1 , and β_2 in the regression equation: $\beta_0 + \beta_1 X_1 + \beta_2 X_2$. Thus, the regression line equation that describes the relationship between the independent and dependent variables can be formulated as follows: $y = -3.148 + 0.648X_1 + 0.416X_2$. The significance of each independent variable X_1 and X_2 can be seen in the t-test column, each of which is sig. = 0.000 < 0.05 (significant), meaning that the two independent variables of divergent thinking style (X_1) and digital literacy (X_2) are significantly significant in estimating the dependent variable is the ability of teachers to develop HOTS-based assessments (Y).

Furthermore, it is shown that the partial relationship between each independent variable and the dependent variable is shown. Look at Table 6. Correlations below, in the Pearson Correlation line, it can be seen that the close relationship between divergent thinking variables and the teacher's ability to develop HOTS-based assessments is 0.827 with a score of sig. = 0.000 < 0.05 (significant), which means that there is a significant relationship between divergent thinking and the ability of teachers to develop HOTS-based assessments. Thus, the partially divergent thinking variable (X_1) has an effect of 82.7% on the ability of teachers to develop HOTS-based assessments (Y). At the same time, the partial closeness of the relationship between digital literacy variables and the ability of teachers to develop HOTS-based assessments can be seen in the Pearson Correlation line of 0.688 with a score of sig. = 0.000 < 0.05 (significant), which means that there is a significant relationship between digital literacy and the ability of teachers to develop HOTS-based assessment. Partially, the digital literacy variable (X_2) has an effect of 68.8% on the teacher's ability to develop HOTS-based assessments (Y).

Table 6. Correlations

		Ability to develop HOTS-based assessments	to Divergent HOTS-thinking	Digital literacy
Pearson Correlation	Ability to develop HOTS-based assessments	1.000	0.827	0.688
	Divergent thinking	0.827	1.000	0.418
	Digital literacy	0.688	0.418	1.000
Sig. (1-tailed)	Ability to develop HOTS-based assessments	.	0.000	0.000
	Divergent thinking	0.000	.	0.000
	Digital literacy	0.000	0.000	.
N	Ability to develop HOTS-based assessments	400	400	400
	Divergent thinking	400	400	400
	Digital literacy	400	400	400

The joint relationship between the independent and dependent variables is presented in Table 7. ANOVAa. It can be seen that the score of $F = 944.299$ with a score of Sig. = 0.000 < 0.05 (significant). Thus, it can be concluded that there is a jointly significant relationship between divergent thinking (X_1) and digital literacy (X_2) and the ability of teachers to develop HOTS-based assessments (Y). In other words, the ability of teachers to develop HOTS-based assessments can be estimated based on linear regression equations using predictors of divergent thinking and digital literacy.

Table 7. ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33220.640	2	16610.320	944.299	0.000
	Residual	6983.270	397	17.590		
	Total	40203.910	399			

Discussion

Relationship between divergent thinking and teacher's ability to develop HOTS assessment.

The results showed that the divergent thinking positively and significantly affected the teacher's ability to develop the HOTS assessment. It means that teachers who have higher divergent thinking can develop the HOTS assessment. Teachers who have divergent thinking have higher creativity when compared to teachers who have convergent thinking (H. Saleh, 2019). Teachers with divergent thinking have many ways, solutions, and unusual models to arrange questions that are not routine and bring novelty. Therefore, it is very appropriate and logical that divergent thinking positively affects the teacher's ability to develop the HOTS assessment. The research found that individuals with divergent thinking were more creative than individuals with convergent thinking. This study also supports the findings in this study that a teacher's divergent thinking can make the teacher more creative in developing the HOTS assessment. Divergent thinking can develop a person's creativity related to his ability to modify, combine ways, models, or techniques of doing things so that they become new ways that are different from previous ways (Gunawan et al., 2020; Rini et al., 2020). This finding has implications for the teacher's ability to make modifications and incorporate new ways of developing assessments, including creativity in developing HOTS assessments. Logically, the higher the teacher's creativity, the better the teacher's ability to develop HOTS assessments. Conversely, the lower the teacher's creativity, the lower his ability to develop a HOTS assessment. Divergent thinking needs to be developed by motivating teachers to be better. They want to do exercises regularly because divergent thinking is internal factors that must be grown from within a person (Riadil et al., 2020). Thus, divergent thinking significantly affect the ability of teachers to develop HOTS assessments.

Based on the analysis of the findings in this study and previous research, there are similarities in the meaning of divergent thinking. However, the focus of the study on divergent thinking is different for each researcher. In principle, divergent thinking can increase a person's creativity so that his productivity increases according to his field. Concerning the teacher's task, divergent thinking can increase teachers' creativity in carrying out their duties in developing the HOTS assessment. Thinking can be trained by solving non-routine problems and bringing up one's original ideas or ideas. Therefore, the teacher's thinking needs to be appropriately honed to produce creativity optimally.

Relationship between Digital Literacy and Teacher Ability to Develop HOTS Assessment

The HOTS assessment contains contextual and interesting stimuli. Constructing a contextual and interesting stimulus can be done using the help of social media, the internet, or other browsers. Teachers will have difficulty when they cannot browse information through the internet or use information technology. Thus, good digital literacy skills are an important supporting factor so that teachers can develop a good HOTS assessment. Through good digital literacy, the teacher's ability to choose contextual and interesting stimuli and follow the assessment's objectives can be carried out. Student learning outcomes are better when using digital media based on information technology in their learning (Imelda et al., 2019). It shows that digital literacy can motivate students to learn. The implication is that teachers should have adequate digital literacy to teach well. Teachers with good digital literacy skills can develop better learning media so that learning is felt to be more interesting and meaningful. These findings are in line with the results of previous study (Syawaludin et al., 2019). Teachers who have good digital literacy can improve students' critical thinking skills because digital-based assessments can motivate students to solve problems better. Research is done in different places with different focuses (Imelda et al., 2019; Syawaludin et al., 2019). However, from the two studies, it can be concluded that digital literacy plays an important role in education. By mastering good digital literacy, teachers can provide better learning and assessment as well.

Digital literacy can encourage someone to be more creative in doing things. Digital literacy makes it easier for someone to get the information they need to work creatively. Digital literacy can make it easier for someone to carry out various activities. Teachers who have high digital literacy skills will have better abilities in carrying out activities, especially in developing HOTS assessments. On the other hand, if a teacher's digital literacy skills are low, developing a HOTS assessment will also be lower. Thus, for teachers to develop better HOTS assessments, their digital literacy skills must also be improved. A digital media-based storytelling approach can improve higher-order thinking skills (Chan et al., 2017). It means that indirectly digital literacy can motivate someone to improve higher-order thinking skills because good digital literacy can increase a person's activities according to their needs and explore more widely using various social media and the internet. This research implies that digital literacy can improve student learning outcomes because they are motivated to learn better. Thus students' higher-order thinking skills are easier to build if students have a higher interest in learning.

In carrying out the duties of teachers in schools, digital literacy relates to the four main competencies of teachers as follows: (1) operating Microsoft Office software, an office application package

developed by a company called Microsoft, the applications that must be mastered are: (a) Ms. Word, which is a word processing application that teachers often use to compose learning and assessment tools, (b) Ms. Excel, which is a data processing application generally in the form of numbers and graphs, contains formulas to process data in the form of numbers (numeric); (c) Ms. Powerpoint), which is a presentation processing application needed by teachers to present lessons in class, interactive learning media, or deliver other important materials. (2) using internet services/applications such as (a) creating an e-mail address for the type of internet-based service used to transmit data digitally, in the form of text, images, video, and sound; (b) sending an e-mail with document file attachments; (c) replying to incoming e-mails at e-mail addresses, (3) conducting searches on the internet, about teacher assignments, finding learning resources using the internet is the activity most often done by teachers; (4) choosing digital learning media and resources, learning resources that require technology to access them and are paperless. Research focuses more on digital literacy needs to fulfill 21st-century life skills (Eryansyah et al., 2019). This study also equally recommends that digital literacy is one of the important competencies to improve one's competence.

Digital literacy is necessary for educational research, especially searching the literature and analyzing research data (Spante et al., 2018). The research focuses on examining the contribution of digital literacy to educational research. In this study, the focus of the study is to analyze the effect of digital literacy on the ability of teachers to develop HOTS assessments. Previous research and current research show that digital literacy is needed to develop teachers, researchers, or other professions according to their work.

The Relationship of Divergent Thinking and Digital Literacy Together with Teacher Ability to Develop HOTS Assessment

Divergent thinking is a person's ability to construct or produce various possible responses, ideas, choices, or alternatives to a problem. A person's creativity is largely determined by his thinking (Darhim et al., 2020). Teachers who have a radical way of thinking will be more creative. In general, divergent thinking people have higher creativity than people who have convergent thinking. Thus, divergent thinking has a direct positive effect on creativity. A teacher's creativity will affect the teacher's ability to develop a HOTS assessment. Previous studies also give the same meaning that divergent thinking can increase a person's productivity according to their field of work.

Another factor that affects a person's creativity is digital literacy skills. A teacher who has good digital literacy skills will be more creative in developing HOTS assessments. Teachers can obtain various information needed to develop HOTS assessments through high digital literacy skills, such as materials for developing stimuli based on contextual problems that carry novelty. Pictures, graphs, tables, or other data can be easily obtained via the internet if the teacher can use the internet well. Improving one's digital literacy skills is necessary to practice regularly and seriously (Dewi et al., 2020). The higher the frequency of practice, the more skilled the impact. One's skills can be improved by increasing the frequency of practice. The development of the HOTS assessment requires high teacher creativity. Teacher creativity can be developed through divergent thinking and high literacy skills. Thus, the two variables of divergent thinking and digital literacy cannot be separated because these two variables together can increase teachers' creativity to develop HOTS-based assessments.

In addition to developing divergent thinking that grows internally within a person, it is very important to train teachers to improve their competence in preparing the HOTS assessment. Coaching can be done in the form of workshops, IHT, or other forms of assistance. However, the guidance of teachers through technical guidance or mass workshops during the Covid-19 pandemic was less effective considering many teachers throughout Indonesia. Therefore, coaching teachers to compile HOTS-based assessments through webinars or virtual classes is a very appropriate and rational choice at this time. For teachers to take part in webinars or virtual classes, teachers should have adequate digital literacy. Every individual needs to understand that digital literacy is an important thing needed to participate in today's modern world. Digital literacy is as important as reading, writing, arithmetic, and other disciplines. The generation that grew up with unlimited access to digital technology has a different mindset from the previous generation. Everyone should be responsible for how to use technology to interact with the surrounding environment.

4. CONCLUSION

Based on the description above, it can be concluded that divergent thinking positively affects teachers' ability to develop HOTS assessments. Digital literacy positively affects teachers' abilities to develop HOTS assessments, and divergent thinking and digital literacy positively affect teachers' abilities to develop HOTS assessments. Thus, teachers' divergent thinking and digital literacy need to be optimized so that the ability of teachers to develop HOTS assessments increases. It is necessary to guide teachers to

improve digital literacy through various steps such as workshops, IHT, or other forms. Meanwhile, divergent thinking can be honed through practice to develop creativity and innovation. Internal and external motivation is also very important for school principals and heads of education offices to improve teacher skills in developing HOTS assessments. Many factors affect the ability of mathematics teachers to develop HOTS assessments. In this study, the variables studied were limited to divergent thinking and digital literacy. Other researchers can develop their research on other variables to enrich findings related to the ability of mathematics teachers to develop HOTS assessments.

5. REFERENCES

- Anderson, L.W. & Krathwohl, D. . (2001). *Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*.
- Anggrieny, T., Sari, N. P., & Agustina, F. (2017). Pengaruh Metode Pembelajaran Kooperatif Tipe Wawancara Tiga Tahap Terhadap Hasil Belajar Biologi Siswa Kelas X Man Batam Pada Pokok Bahasan Bakteri the Effect of Cooperative Learning Method Interview With Thype Technique Step on Biology Learning Result St. *Cahaya Pendidikan*, 3(1), 9–16. <https://doi.org/10.33373/chypend.v3i1.865>.
- Brookhart, S. M. (2010). *How to assess higher-order thinking skills in your classroom*. ASD Publisher.
- Budiharto, S., Himam, F., Riyono, B., & Fahmi, A. (2019). Membangun Konsep Organisasi Autentik. Kajian Metaetnografi. *Buletin Psikologi*, 27(2), 159. <https://doi.org/10.22146/buletinpsikologi.43267>.
- Caldevilla-Domínguez, D., Martínez-Sala, A. M., & Barrientos-Báez, A. (2021). Tourism and ICT. Bibliometric study on digital literacy in higher education. *Education Sciences*, 11(4). <https://doi.org/10.3390/educsci11040172>.
- Chan, B. S. K., Churchill, D., & Chiu, T. K. F. (2017). Digital Literacy Learning In Higher Education Through Digital Storytelling Approach. *Journal of International Education Research (JIER)*, 13(1), 1–16. <https://doi.org/10.19030/jier.v13i1.9907>.
- Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). Sage.
- Darhim, Prabawanto, S., & Susilo, B. E. (2020). The effect of problem-based learning and mathematical problem posing in improving student's critical thinking skills. *International Journal of Instruction*, 13(4), 103–116. <https://doi.org/10.29333/iji.2020.1347a>.
- Dewi, R. M., Sholikhah, N., & Fitrayati, D. (2020). High order thinking skills instrument on microeconomics course: A development research. *International Journal of Instruction*, 13(4), 283–294. <https://doi.org/10.29333/iji.2020.13418a>.
- Eryansyah, Erlina, Fiftinova, & Nurweni, A. (2019). EFL Students' Needs of Digital Literacy to Meet the Demands of 21 st Century Skills. *Indonesian Research Journal in Education*, 3(2), 442–460.
- Ferrándiz, C., Ferrando, M., Soto, G., Sáinz, M., & Prieto, M. D. (2017). Divergent thinking and its dimensions: What we talk about and what we evaluate? *An. Psicol*, 33(1), 40–47. <https://doi.org/10.6018/analesps.32.3.224371>.
- Gunawan, G., Harjono, A., Nisyah, M., Kusdiastuti, M., & Herayanti, L. (2020). Improving students' problem-solving skills using inquiry learning model combined with advance organizer. *International Journal of Instruction*, 13(4), 427–442. <https://doi.org/10.29333/iji.2020.13427a>.
- Hamdi, S., Suganda, I. A., & Hayati, N. (2018). Developing higher-order thinking skill (HOTS) test instrument using Lombok local cultures as contexts for junior secondary school mathematics. *Research and Evaluation in Education*, 4(2), 126–135. <https://doi.org/10.21831/reid.v4i2.22089>.
- Imelda, Cahyono, B. Y., & Astuti, U. P. (2019). Effect of process writing approach combined with video-based mobile learning on Indonesian EFL learners' writing skill across creativity levels. *International Journal of Instruction*, 12(3), 325–340. <https://doi.org/10.29333/iji.2019.12320a>.
- LeBlanc, P. J. (2018). Higher Education in a VUCA World. *Change: The Magazine of Higher Learning*, 50(3–4), 23–26. <https://doi.org/10.1080/00091383.2018.1507370>.
- Liu, Z. J., Tretyakova, N., Fedorov, V., & Kharakhordina, M. (2020). Digital literacy and digital didactics as the basis for new learning models development. *International Journal of Emerging Technologies in Learning*, 15(14), 4–18. <https://doi.org/10.3991/ijet.v15i14.14669>.
- Pratama, G. S., & Retnawati, H. (2018). Urgency of Higher Order Thinking Skills (HOTS) Content Analysis in Mathematics Textbook Recent citations Urgency of Higher Order Thinking Skills (HOTS) Content Analysis in Mathematics Textbook. *Journal of Physics: Conference Series*, 12147. <https://doi.org/10.1088/1742-6596/1097/1/012147>.
- Pratomo, S., Hendawati, Y., Putri, S. U., Sumiati, T., & Widodo, S. (2019). Divergent thinking of students teachers' through problem-based learning in environmental science. *Journal of Physics: Conference Series*, 1318(1). <https://doi.org/10.1088/1742-6596/1318/1/012116>.

- Riadil, I. G., Nuraeni, M., Prakoso, Y. M., & Yosintha, R. (2020). Persepsi Guru Paud Terhadap Sistem Pembelajaran Daring Melalui Whatsapp Di Masa Pandemi Covid-19. *PAUDIA : Jurnal Penelitian Dalam Bidang Pendidikan Anak Usia Dini*, 9(2), 89–110. <https://doi.org/10.26877/paudia.v9i2.6574>.
- Rini, N. K. R. K., N.L.P, D. K. T., & Dewi, E. S. (2020). A Comparative Study of The Students' Critical Reading Competency on High Order Thinking Items in A Junior High School. *Journal of Education Research and Evaluation*, 4(4), 380. <https://doi.org/10.23887/jere.v4i4.28011>.
- Saleh, H. (2019). Convergent and Divergent Ways of Thinking in Problem Solving: a Case Study on Junior High School Students. *International Journal of Insights for Mathematics Teaching*, 02(1), 11–21.
- Saleh, S. (2019). Analisis Kemampuan Berpikir Kritis Siswa dalam Pembelajaran Biologi. *Florea*, 6(1), 45–53. <https://doi.org/http://doi.org/10.25273/florea.v6i1.4369>.
- Siriwatchana, K., Na-Songkhla, J., & Nilsook, P. (2018). How to Enhance Digital Literacy Skills among Information Sciences Students. *International Journal of Information and Education Technology*, 8(4), 292–297. <https://doi.org/10.18178/ijiet.2018.8.4.1050>.
- Soenarto, S., Sugito, Suyanta, Siswantoyo, & Marwanti. (2020). Vocational and senior high school professional teachers in industry 4.0. *Cakrawala Pendidikan*, 39(3), 655–665. <https://doi.org/10.21831/cp.v39i3.32926>.
- Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education*, 5(1), 1–21. <https://doi.org/10.1080/2331186X.2018.1519143>.
- Sudiarta, I. G. P., & Widana, I. W. (2019). Increasing mathematical proficiency and students character: Lesson from the implementation of blended learning in junior high school in Bali. *Journal of Physics: Conference Series*, 1317(1). <https://doi.org/10.1088/1742-6596/1317/1/012118>.
- Surur, M., Degeng, I. N. S., Setyosari, P., & Kuswandi, D. (2020). The Effect of Problem-Based Learning Strategies and Cognitive Styles on. *International Journal of Instruction*, 13(4), 35–48. <https://doi.org/10.29333/iji.2020.1343a>.
- Syawaludin, A., Gunarhadi, & Rintayati, P. (2019). Enhancing elementary school students' abstract reasoning in science learning through augmented reality-based interactive multimedia. *Jurnal Pendidikan IPA Indonesia*, 8(2), 288–297. <https://doi.org/10.15294/jpii.v8i2.19249>.
- Victoria, D. S., & Darvas, J. W. (2017). Encouraging Student Autonomy Through Higher Order Thinking Skills. *Journal of Instructional Research*, 6(1), 29–34. <https://doi.org/10.9743/jir.2017.5>.
- Wang, Y. (2017). Cultivate Students' Divergent Thinking in Total Differential Teaching. *International Conference on Humanities Science, Management and Education Technology*, 96(Hsmet), 1244–1248. <https://doi.org/10.2991/hsmet-17.2017.230>.
- Widana, I. W. (2018). Higher Order Thinking Skills Assessment towards Critical Thinking on Mathematics Lesson. *International Journal of Social Sciences and Humanities (IJSSH)*, 2(1), 24–32. <https://doi.org/10.29332/ijssh.v2n1.74>.