CONSTRUCT OF CREATIVE THINKING ASSESSMENT ON DIVERGENT AND CONVERGENT ABILITY

Risky Setiawan

setiawan.risky@gmail.com, IKIP Veteran of Semarang, Central Java, Indonesia

ABSTRACT

This research and development aims (1) to develop an assesment instrument for creative thinking, and (2) to find out the characteristics of the creative thinking assessment instrument for the kindergarten teachers in the province of Central Java. The study used the Research and Development approach with ADDIE instructional model (Analyze-Design-Develop-Implementation-Evaluation) by Melinda. The subjects of the research were kindergarten teachers in Central Java selected by using purposive random sampling consisting of 281 kindergarten teachers. The product development result had been tested specifically to the respondent and then be tested generally to 281 respondent. The construct validity analysis result applied Confirmatory Factor Analysis (CFA) showed 39 valid item, and reliability coefficient Alpha Cronbach and composite score shows good categorized (>0.7). The results of the research show as the following: 1) the kindergarten teachers creative thinking constructive assessment instrument covered 3 components (teacher's professionalism, convergent thinking, and divergent thinking), 2) the characteristic development product is; a) on each instrument: (1) professionalism teacher instrument: (a) unidimensional, (b) suitable with the model GPCM (Generalized Partial Credit Model), (c) the optimal estimation TIF on theta -2.02; (2) divergent thinking instrument: (a) unidimensional, (b) suitable with the model GPCM, (c) the optimal estimation TIF on theta 0.25; (3) convergent thinking instrument: (a) unidimensional, (b) suitable with the model 2PL and 3PL, (c) the optimal estimation TIF on theta 1.5; b) the developed model was identical to the theory (Ho is rejected), c) the developed product's effectiveness is categorised as high.

Keywords: *assessment, the IRT, divergent thinking, convergent thinking, kindergarten teacher professionalism.*

1. INTRODUCTION

Early childhood intelligence potential can be maximized through effective and fun learning. The Potential of Early childhood intelligence consists of: (1) creative and emotional intelligence, (2) physiology intelligence, and (3) mathematical and language intelligence. Thus we need some effective measures to optimize the three of Early childhood intelligences. The application to increase early childhood intelligence can not be separated from the role of an educator, especially teachers. Kindergarten teacher is taking a great control over the potential to be developed for Early childhood. The role of the teacher as the closest to the children in schools should be able to create a pleasant atmosphere and become a person whose liked by the children. The role of the teacher as a friend, models, motivators and facilitators will make children enjoy coming to school and make the learning process so meaningful. Therefore it's demanded maturity that require willingnes and ability, both intellectually and in excellent condition. Professionalization like this should be viewed as a process that is continiously.

The relationship between level of education and creativity are very closely. Torrence theory says that one of the indicators that affect the development or expression of creative thinking is a person's education level [1]. The professionalism of a teacher is not impossible, despite the survey data of the political and econimic risk country (PERC), a consultancy in Singapore in 2001 ranked Indonesia 12th of 12 countries in Asia in terms of the teachers quality. While it was said by decree number 19 year 2005 declared that a kindergarten teacher should have four basic competencies (professional, pedagogical, personality, and social) and additional competence, namely: 1) creativity and the sense of art as an adjustment between learning and the child's needs, 2) understanding of development theory and its implications [2]. In addition, the kindergarten teacher also has

additional obligations include: 1) be an example for the character building, 2) develop learning plans according to the development stage, 3) managing the play activities according to the children development and interests, and 4) carry out the assessment in accordance with the children capabilities achieved [3].

According to Dweck and Leggett in Angela Anning et al [4], it is very important in the development of mastery learning in early childhood. Many facts prove that the professional and experienced teachers in the world of education will provide better response and enhance the learning effectiveness in the classroom. Learning effectiveness is still difficult optimized since the kindergarten teachers' salaries is low. The Chairman of Commission IV DPRD Purbalingga assess welfare honor given to kindergarten and Madrasah Diniyah (Madin) teachers in Purbalingga is inhumane. Currently they are only paid Rp 75.000 for kindergarten teachers and Rp 70.000 for Madin teachers [5]. The poor quality assumptions of the kindergarten teachers is justified by Syahwal Gultom, BPSDMPK Head (Human Resources Development Agency of Cultural Education (Badan Pengembangan Sumber Daya Manusia Pendidikan Kebudayaan), Kemdikbud. He said, "The competency tests results conducted over the last three years shows the quality of kindergarten teachers in Indonesia is still very low" [6].

Haryati [7] states that the assessment system used to improve the quality of education is continuous assessment. Reality assessment of children now only focus on creativity as a factor of the power amplifier child cognition. Moreover, the power of affection should be preferred because the child patterned attitude will be faster impact on the absorption of knowledge-the basic knowledge children. Glazer, 2009 [8] argues that knowledge and art is a fusion of a creative person. The creativity of teachers in kindergarten regarded as a potential environmental and capital compared to the second aspect of the professionalism of an educator. Theory of Belkhadas [9] says: "Creative teaching to Increase students' learning and achievement", a creative learning will improve learning and knowledge learners. Or assumed learning undertaken by a kindergarten teacher becomes the main factor of increasing knowledge of learners.

The importance of creativity kindergarten teachers need to be proven with a device that can measure precisely. The test is one way to measure the results and effectiveness of learning. Effectiveness and learning outcomes in the classroom will determine the quality of education in general. Teacher competency tests only give an overview of cognitive ability of teachers. According Plucker in Stenberg [10], divergent thinking test is a method often used to measure a person's creative bepikir process. A number of creative tests have been developed and implemented, such as tests of Torrence to measure creative thinking that has the form of verbal and figural forms [11]. Theory Guildford in Bloomberg, [1] confirms factor in "Structure of Intellect" classify the person's intellectual operation can be seen from the way of thinking Convergent and Divergent. From the description concluded that the measurement of the ability to think creatively a kindergarten teacher can be done by arranging two types of tests are tests of convergent and divergent test.

Implementation of measurement and assessment is important because the creativity of teachers in kindergarten element is the ability of the most influential children's creativity. Impact, a creative child can perform any activity with optimal play, especially on activities both in the classroom and outside the classroom. Therefore, experience and creativity is very important to measure. Measurement or measurement is one of the programs conducted to determine the standard of behavior or ability includes measures on a predetermined scale. From the description above explanation can be concluded measure creative thinking abilities of teachers is very important to do. Background Based on the description can be elaborated formulation of the problem, namely; 1) how to construct the assessment instrument kindergarten teachers creative thinking ?, and 2) how the assessment instrument product characteristics of creative thinking kindergarten teacher?

2. RESEARCH METHOD

The research method is a research and development by developing creative thinking abilities gauges kindergarten teacher in Indonesia . The model used in the development of ADDIE model is developed by Molenda 2003. ADDIE model is a model that adopts the IPO evaluation model (input, process, output), which consists of the step (1) Analyze, (2) design, (3) develop, (4) implementation, (5) evaluation [12]. The instrument further arranged in tested to make the contents and compiling of test and non-test proper and fit. Advanced analysis quantitatively analyzed with Item Response Theory. IRT Analysis on Remote Asisted Test Instruments, Torrance Test of Creative Thingking (CCTC) and non-testing instruments Learning Case in the learning process by the method of Generalized Partial Credit Model (GPCM).

To determine the quality of test instruments to analyze both qualitative validation expert (expert judgment) in terms of content aspect, construction and language as well as quantitatively through the testing process. Limited testing done to see quality items using Quest program. The subject of limited testing will be

done for 75 kindergarten teachers in the city of Semarang. Expanded trials conducted to prove the reliability of the instrument and the effectiveness of the instrument. By adding the subject will be able to increase the validity and reliability of the instrument. Determination of the number of samples using purposive random sampling technique that is determining the number of samples based on a certain amount. Total population of all kindergarten teachers and RA (Raudlotul Athfal) is as much as 48 987 teachers in 35 districts in Central Java (Central Java Statistical Information, 2015). According to the table Kracjie total population of 48 987, the obtained experimental data n = 281 respondents.

The method used to identify the problems and needs is a test, observation, distribution of questionnaires, documentation of research results, and discussion. In addition, data obtained through expert advice snapping-measurement, all TKan and prospective users, both in oral form (input in meetings) and a questionnaire (written input). The method further discussions are recorded and implemented in the assessment of creativity of teachers that have been refined to being transformed into a form of creative thinking assessment instrument is a kindergarten teacher.

The research instrument based on objective assessment of Developing Creative Thinking Kindergarten Teacher as follows.

Table - 1. The Instrument of Creative Thinking

No	Variable	Categorical	Indicator
1	Personal Test	Pedagogic, Professionalsm, Social and Personal	Learning Instructional
2	Divergent Test	♦ Use and different ♦ Founded and combine ♦ Complete and conclude	♦ Figural test ♦ Choose and pick theme
3	Convergent Test	♦ Ask and guess ♦ Couse and consequences ♦ Unusual and suppose to problem solving	♦ Verbal Test

3. RESULTS AND DISCUSSIONS

3.1 Assessment of Initial Product

The details of the output lisrel results are as follows: 1) Value P-Value = 0.067 (> 0.05), 2) Value RMSEA = 0.052 (<0.08). 3) The value of GFI was 0.46, (a value between 0 and 1). It can be concluded instrument being tested is fit and match the model. Significant votes whether the parameters or relationships between variables can be seen from the t-value. The significance of the parameters to see the relationship between variables can be seen in the regression equation in LISREL output with the following calculation formula.

$$t - value = \frac{Regression\ Estimate}{Standar\ Error} \quad \ldots\ldots [13]$$

The estimation results of the T value is calculated through a formula by dividing the standard error of regression estimation of measurement if the value is greater than 1.2, the correlation between variables is good or significant. Whereas if the value is less than 1.2, the correlation between variables is less well or not significant. From the whole instrument contained 22 items that have a strong relationship between the variables that 37% had a t-value indicators are very good.The next step is to test the construct validity. Test the construct validity can be seen through convergent validity value (the value of the loading factor). Determination fit model aims to see whether or not fit items. Rated loading factor at the beginning of the study (research and development) is ≥ 0.50 (Gozali), while according to Fernandes, 1984, p.28, when the value of λ (Lamda) or loading factor greater than 0.3, the point of such instruments considered valid.

Fig- 1. Construct of Instrument

Figure 2 shows the relationship between the latent variables with an observed variable measured is the loading factor of each component . There is a loading factor is negative . This means that the components of the divergent tests have probably not included in the component parts measure the ability to think creatively kindergarten teacher . Here are the results of loading factor in the assessment of the structural model of creative thinking kindergarten teacher described in Table 2.

Table - 2. The Decission for Construct Measurement.

Part of instrument	Decission	Item
Convergent Figural	Accepted	2,4,8,10,11,12,13,16,17
	Rejected	1,3,5,6,7,9,14,15,18,19,20
Convergent Verbal	Accepted	1,2,3,4,5,7,8,11,12,14,18
	Rejected	6,9,10,13,15,16,17,19,20
Divergent	Accepted	1,2,3,4,5,6,7,8,9,10,11
	Rejected	12,13
Teacher Professionalism	Accepted	1,2,3,4,5,6,7,8
	Rejected	-

3.2 Instrument Reability

Calculation of the coefficient of reliability of the instrument basically using Cronbach Alpha formula . The level of reliability of the instrument is determined based on the coefficient owned. The higher the reliability coefficient , the higher the reliability of the instrument. The criteria used as the minimum limit of the coefficient of reliability in this evaluation was 0.65 . According Mehrens & Lehmann [14] , the level of reliability equal to or more than 0.65 , the instrument is quite good . Djemari Mardapi [15] , states that if the instrument has been assessed then repaired and subsequently assembled to be tested .

Table 3. Cronbach Alpha Coefficient

No.	Subtest	Reliabilitas (*Chronbach Alpha*)	Decision
1	Konvergen Figural	0,614	Good
2	Konvergen Verbal	0,560	Not Good
3	Divergen	0,898	Very Good
4	Teacher Profesionalism	0,755	Very Good

Composite reliability values or Average Variance Extracted (AVE) can be used to determine the reliability of each latent variable using the formula :

$$pc = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum_i var\ (\varepsilon_i)} \qquad \ldots\ldots\ldots\ldots\ [16]$$

Where λ_i is the component loading into indicators and var $(\varepsilon_i) = 1 - \lambda_i^2$. The nature of the composite reliability is a closer approximation assuming the parameter estimates are accurate. Here are the results of calculation of composite reliability for each component.

Table - 4. Reliability Coeficient

No.	Instruments	Composit Reliability	Decission
1	Convergent Figural	0,673	Good
2	Convergent Verbal	0,871	Good
3	Divergent	0,870	Good
4	Profesionalism	0,798	Good

Recapitulation result of composite reliability in Table 5 shows all the components have a good internal consistence that is above 0.65. It can be concluded that the composite reliability assessment instrument of kindergarten teacher creative thinking is good.

3.3 Study of Final Product

Unidimensional test was conducted by factor analysis using SPSS 23. Before conducting factor analysis, it was conducted feasibility testing by using test analysis KMO - MSA and Barlett 's test on each instrument. According to Anderson (1998, p.88) requirements for factor analysis is Kaiser - Meyer Olkin (KMO) - MSAU > 0.5 and significant barletnidimensi test means that every item tests only measure one 's ability. The results of the empirical analysis KMO - MSA value is equal to 0.826 or more than 0.5 and sig Barlett.s test is 0,000. Having in mind the total variance of 32.94 % in the first component can be interpreted this instrument to measure one aspect of the dominant eigen value is 3.624 means that the instrument developed to measure only one dimension of ability alone.

GPCM model test with the data is an analysis to see the characteristics of each question by looking at the parameter effect on each question. The criteria in the analysis are: 1) The value of Chi Square and probability in answering questions> 0.05, 2) Power difference (0-2), 3) The level of difficulty, and 4) Pseudoguessing (estimate).

Compatibility of this model can be seen by comparing the chi-squared (estimated at a table with a degree of autonomy and independence. The decision was taken when the item fits with the model GPCM is <table, whereas the item does not fit the model GPCM if> table. The estimation results on the value of Chi Square it can be concluded that whole grains are incompatible with the model GPCM ie 11 items. the items that match the model concluded GPCM means Ha rejected or empirical data in accordance with the model used. it can be concluded for teacher professionalism questionnaire instruments better suited wearing GPCM models.

The first analysis is to look at the characteristics of items using GPCM. GPCM method is the development of Rasch models using two parameters, namely grains of different power and item difficulty were analyzed using Parscale software for Windows. Fit analysis assuming the probability of answering the questions is if the value of P (θ) <0.05 then the item is significant. Conversely, if the value of P (θ)> 0.05 then the item is not significant. Recapitulation of the value of the probability of answering correctly. The analysis shows there are 2 items that do not fit with the model that is the number 1 and number 8. Based on the analysis performed GPCM models is analyzed by two parameters, namely the level of difficulty and different power.

There are several criteria a good question based on the analysis IRT, namely:

1) Power difference (a): 0 s / d 2
2) The level of difficulty (b): -2 s / d 2
Based on analysis of 3 PL and criteria, there are several issues which are not in accordance with the following criteria:
a) Power depending matter: all the questions that were analyzed have different power in the range of 0 s / d 2. depending Southwestern lowest for the question number 7 (0237) and different power is highest at about number 10 (1005).
b) The level of difficulty of questions: about the difficulty level ranges from -2010 (No. 3) s / d -0.489 (No. 1). The whole matter has a difficulty level (-), it means that the instruments do not have the questionnaire in level of difficulty at all. Or it can be concluded all the items can be said to be easy to do.

3.11 Convergent Thinking IRT Instruments Test assumptions

Unidimensional test conducted by factor analysis using SPSS 23 for windows. Before conducting factor analysis testing the feasibility of using test analysis KMO - MSA and Barlett 's test on each instrument . According to Anderson et al . (1998, p.88) requirements for factor analysis is Kaiser - Meyer Olkin (KMO) - MSAU > 0.5 and significant barletnidimensi test means that every item tests only measure one 's ability. To test unidimesi by factor analysis. The results of the analysis KMO and Barlett, s less than 0.05. The results of the empirical analysis KMO - MSA value is equal to 0.672 or more than 0.5 and sig Barlett.s test is 0,000.

After a chi-square analysis it can be arranged recapitulation chi-square analysis suitability model as shown in Table 26 below. The results of the analysis in Table 26 below can be concluded that the model fits to 2PL and 3PL which has Chi Square smaller than χ^2 critical. And it can be seen that the model does not fit to the single parameter model (1PL) which has five items that do not fit with the model. After the probability analysis it can be arranged recapitulation model fit Chi-square analysis results of the analysis on the value of probability it can be concluded that the model matches the 3 PL model.

Kindergarten teacher convergent thinking instruments will provide information on the maximum test 0 at θ value of -0125 and the test is suitable for capability scale approximately -3.5 up to -0.025. The error measurement in model 1 PL is 0.4 to 0.5. In 2PL model indicates maximum information about the function of -2.02 on θ 0.25 and the test is suitable for θ between -2.8 and 2.5. The error measurement is 2.1388. In the 3PL model, maximum test information is 0.4234 at θ is 1.5 and it is suitable for θ value between -0.8 to 3.9. The error measurement is 1.5368. Base on the three models above, the maximum information value verbal tests are on model 3 PL so that the error measurement of 3 PL model is smaller than in the other two models.

3.12 Divergent Thingking assumptions Test Instruments

The empirical analysis results which KMO - MSA value is equal to 0.917 or more than 0.5 and sig Barlett.s test is 0,000. It can be concluded that all analysis results have been significant, which means the insrument are feasible to do factor analysis. The variance total in Table 35 is 59.1 % in the first component, it can be interpreted this instrument measures an aspect of the dominant eigen value of 4.72,it means that the instrument can be developed only to measure a capability dimension.

The Steep Sreeplot shows that there is a dominant component, which means that the teachers professionalism instrument measures only one factor or one dimension. In divergent capabilities instrument subtest there are several things to be measured,they are the original ideas ability (originality), elaboration and imagine imagination (abstractness).

The χ^2 values estimation describes,it shows that there are four items that χ^2 have a greater value than χ^2 critical, which means four items are match to GPCM models. While 4 point (2, 4, 5, and 6) has a < χ^2 critical chi -square value, which means 4 grains are incompatible with the GPCM model.

Based on the analysis GPCM models which have been done, it was analyzed by two parameters, namely the difficulty level and different power. The Recapitulation shows that there are three items that do not fit the GPCM model are the number 1, 3 and 7.

3.13 Effectiveness Developed Products

The effectiveness of creative thinking Assessment are views from three aspects: 1) the accuracy or reliability of kindergarten teacher creative thinking abilities measurement results; 2) the ease of the product use; and 3) the use of product in the kindergarten program implementation. In the field, the empirical criteria developed by the reference or consideration of the promoter and expert (expert/specialist).

The criteria will be compared with the field data so that it shows the product effectiveness. In order to know the products effectiveness that have been developed, it was conducted by distributing questionnaires to the user in this case the head of the kindergarten.

Chart-2. Effectiveness developed products

4. CONCLUSION AND SUGGESTIONS

4.1 Conclusions

The kindergarten teachers'creative thinking constructive assessment instrument covered 3 components (teacher's professionalism, convergent thinking, and divergent thinking). The characteristic development product is; a) on each instrument: (1) professionalism teacher instrument: (a) unidimensional, (b) suitable with the model GPCM (Generalized Partial Credit Model), (c) the optimal estimation TIF on theta -2.02; (2) divergent thinking instrument: (a) unidimensional, (b) suitable with the model GPCM, (c) the optimal estimation TIF on theta 0.25; (3) convergent thinking instrument: (a) unidimensional, (b) suitable with the model 2PL and 3PL, (c) the optimal estimation TIF on theta 1.5; b) the developed model was identical to the theory (Ho is rejected), c) the developed product's effectiveness is categorised as high.

4.2 Suggestions

The Kindergarten teachers creative thinking skills assessment instrument can be used to measure the kindergarten teacher creative thinking ability by the Principal, Supervisor or City/Regency Education Department and selectors team of educator resources in kindergarten. This product can be enhanced by developing test according to the relevant themes to early childhood education so that the instrument is more suitable for kindergarten teachers. This product can be used as an early model of the kindergarten teachers creative thinking ability measurement by adding factors that are not included in the development of this research study.

5. REFERENCES

[1] Bloomberg, M. (1973). Creativity. theory and research. Manufactured in the United States of America: United Printing Service.Inc.

[2] Modul PLPG (Pendidikan dan Pelatihan Profesi Guru) Pendidikan Anak Usia Dini. (2013). Universitas Negeri Jakarta.

[3] Petunjuk teknis penyelenggaraan taman kanak-kanak. (2011). Direktorat pembinaan PAUD. Dirjen PAUD, nonformal dan informal.

[4] Angela, A. (2009). Early childhood education. society and culture. California: Sage Publitions.

[5] Suara Merdeka. (2013). *Gaji guru honorer di bawah buruh*. Ditulis oleh K3-60. Koran Suara Merdeka 9 September 2013.

[6] Jimmy, A. (2013). *Kemdigbud akui kualitas guru masih rendah*. Koran ANTARA. 27 September 2013.

[7] Haryati, M. 2004. Model dan teknik penilaian pada tingkat satuan pendidikan. Jakarta: GP Press.

[8] Glazer, E. (2009). Rephrasing the madness and creativity debate: What is the nature? Elsevier-Personality and Individual Differences. Ed 46.

[9] Belkhadas. (2010). A Dessertation of Doctoral: Creative teaching to increase students' learning and achievement the case of english teachers - University of Constantine. Published

[10] Sternberg, R.J. (1999). Handbook of creativity. Australia: Cambridge University Press.

[11] Torrance, E.P. Future careers for gifted and talented students gifted child, Quarterly 20: 142-156. 1976.

[12] Branch Robert M. (2009). Instructional Design: The ADDIE Approach. Athens. USA: Spinger Publisher.

[13] Ghozali, I. (2014). Structural equation modelling: Teori, konsep, aplikasi dengan Program Lisrel 9.10. Semarang: Badan Penerbit Universitas Diponegoro.

[14] Mehrens, W.A. & Lehmann, L.J. (1973). Meassurement and evaluation in educational and psychology. New York: Hold, Rinehart and Winstons Company.

[15] Djemari Mardapi. (2008). *Teknik penyusunan instrumen tes dan nontes*. Yogyakarta: Mitra Cendikia Jogjakarta.

[16] Anderson, R.E. (1998). Multivariate data analysis. USA. Prentice-Hall. International.Inc.

BIOGRAPHIES

	Name : Risky Setiawan, Dr. Birt of Place : Kudus,Java, Indonesia 1987, July 25th Institution : IKIP Veteran of Semarang Indonesia Expertise Program : Educational Measurement and Assesment Phone Number : +6282135114970 Book Writes : So Easy Action Research, Applied Statistic for Research