JIPE Jurnal Inovasi Pendidikan Ekonomi
Available at http://:ejournal.unp.ac.id/index.php/jipe
Published by *Economics Education Study Program*
FE Universitas Negeri Padang, Indonesia
ISSN 2302-898X (Print)
ISSN 2621-5624 (Electronic)

Jurnal Inovasi Pendidikan Ekonomi, Vol. 14 No.1 hlm 01-19

Effectiveness of Creative Thinking Instruments Through Discovery Learning Models in Improving Creative Thinking Skills

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DOI: https://doi.org/10.24036/011282030

Accepted: 05-06-2024
Revision: 19-05-2024
Available Online: 06-06-2024

KEYWORD

Aiken, Creative Thinking, Economic Learning, Torrance Test Creative Thinking, Discovery Learning.

A B S T R A C T

This study aims to analyze the need, feasibility, and effectiveness of creative thinking instruments in economic learning. The study procedures were carried out using Research and Development (R&D) method, which comprised various stages, including planning, development, feasibility testing, and instrument implementation. Subsequently, a needs analysis was performed by distributing questionnaires and conducting interviews with economics subject teachers. Content validity testing was also carried out through Focus Group Discussion (FGD) with nine experts in economics learning, followed by analysis using Aiken Validity Index (Aiken V-Index). Reliability analysis was performed using KR20 through limited tests on 32 class X students at SMAN 4 Bandung City. Confirmatory Factor Analysis (CFA) was used to test the feasibility of the question items. To test the instrument's effectiveness, a quasi-experiment with the one-group pretest-posttest design was conducted on 37 students in class X at SMAN 1 Tasikmalaya City. The results showed that 70.8% of economics teachers expressed a demand for the development of creative thinking instruments. Among the 60 items developed, 47 were declared feasible based on CFA results. In addition, a total of 47 items were implemented through the discovery learning model. The results of hypothesis testing showed that the discovery learning model using the developed instrument proved effective in improving students' creative thinking skills in economics.

INTRODUCTION

Creative thinking skills are needed to support 21st-century learning (Reksaningrum & Muljani, 2022), which primarily focuses on improving students' skills in technology and communication (Etistika Yuni Wijaya et al., 2016). Students can use technology during the learning process to enhance their cognitive and academic performance (Muhajir et al., 2019). In the 21st century, creativity skills, particularly in the academic context, are considered essential for innovation in various media (Chaiyama, 2019). In addition, creativity is the interaction

of talents and processes through which individuals or groups generate detectable, original, and valuable ideas in a social framework (Fatmawati et al., 2022). Several studies have shown that creative thinking is the capacity to generate original ideas or solutions by engaging in problem-solving procedures (Guilford, 1966). This result was consistent with Guilford (Mumford, 2012) that creativity was associated with ideation as well as developing exceptional, original, and sophisticated solutions to problems (Suhonosov et al., 2021). Consequently, creative thinking is essential in school and very vital for daily life (Wanot & Wanot, 2019).

According to Anderson (2003), Bloom's taxonomy stated that creative thinking comprised assembling components into a unified or functional whole, necessitating innovative thought. Meanwhile, synthesis is considered the most challenging mental function in Bloom's taxonomy of cognitive domains. This mental function is associated with combining components or rearranging elements into a pattern, structure, or coherent whole through generation, planning, or production (Anderson, 2003). Based on these results, creativity or thinking capacity tests are essential in assessing creative development of individuals (Torrance, 2012). Fatmawati et al. (2022) stated that the tests were crucial to school evaluation, while Benedek et al. (2016) revealed their role in enhancing performance and fostering creativity in others. Creativity theories proposed that concept evaluation and selection are vital in the creative process (Silvia, 2008). Generating multiple new possibilities and determining the most suitable variant is a crucial aspect of creativity. Cognitive theory revealed that the methods of developing and assessing ideas are typically distinct (Lee et al., 2021).

Various studies have explored creativity, such as Torrance (1966)'s assessment of creative thinking. The study encountered challenges during the assessment process and tested several evaluation procedures, eliminating ineffective variants. Piffer (2012) observed that the perception of a product's innovativeness was influenced by an acknowledgment from either the expert community (such as science, visual arts, and classical music) or the general audience (such as popular art and commercial products). This indicates that tests takers and raters must analyze and assess responses using methods in line with the original language (Yarbrough, 2016). Tanjung et al (2023) reported a significant correlation between creative accomplishment and markers in TTCT (Torrance Test Creative Thinking). However, the study was limited as the evaluation team required assistance in identifying creativity from other attributes, such as IQ, knowledge, and personality factors. The achievement indicators used were also affected by factors other than creativity. Although intelligence tests were administered to participants, combining scores with creativity tests results could cause misleading conclusions. The correlation between creativity and intelligence depends on the specific assessment tool used to evaluate these concepts, as stated by Runco and Park (2020). Guilford (1966) outlined various elements of creative thinking and possible assessment methods. A theoretical multifactor intelligence model was then developed and employed to pinpoint the elements, particularly those associated with creative thinking (Cecil R. Reynolds; Robert T. Brown, 1989). However, external assessment of creative output have not confirmed these criteria. This has led to the development of different creativity assessment by several studies based on their theoretical perspective without verifying criterion validity (Cecil R. Reynolds; Robert T. Brown, 1989).

Compared to previous reports, this current study was carried out to develop a new instrument that uniquely promotes creative thinking. On August 1, 2022, a bibliometric analysis of 1001 articles using SCOPUS data and the keywords "creative thinking" and "creative thinking skills" was conducted. The results showed that the terms were associated with thinking models, TTCT, thinking skills, creative personality, and education in science, mathematics, technology, and STEM fields. TTCT, created by Guilford (1966) and Torrance (1966), was a commonly utilized assessment instrument. Creativity test devised by Torrance (Alabbasi et al., 2022) was the most extensively studied evaluation method for children at the school level. In addition, cognitive skills are typically assessed using the TTCT instrument (van Laar et al., 2020). Torrance (Grajzel et al., 2022) outlined different attributes of creative thinking, including fluency, flexibility, originality, elaboration, resistance to closure, emotional expressiveness, articulateness, movement, or action, which were the foundation of TTCT.

Based on the results, there is no specific measurement of creative thinking in the discipline of social humanities, particularly in the context of economics lessons. Economics teachers have emphasized the significance of cultivating creative thinking instrument during learning and interviews. Students participating in Olympiads or comparable events are currently provided with associated objects, while non-participating students are seldom provided with assessment. Economics teachers also emphasized the importance of administering

creative thinking questions to all learners, including non-participants in the Olympics. This practice facilitates the development of problem-solving skills that are applicable not only in theoretical scenarios but also in real-life situations.

In line with previous results, the development of creative thinking instrument in this study focused on economics subjects. The questions were structured in a multiple-choice format in line with TTCT, comprising both verbal and figural items tailored for application within economics learning. The development process comprises content validity testing, including the suitability of material, construct, and language to overcome difficulties related to the use of language and the skills being measured. Validity is necessary when constructing an instrument to ensure the provision of reasonable results from the analyzed samples (An Nabil et al., 2022). According to Danardono et al. (2022), validity is the extent to which facts and theories support the interpretation of instrument scores, making it the most important part of the process. Sutseyo (2015) revealed that there were three types of validity, namely content, criterion, and construct validity. The content validity analysis carried out by expert judgment is typically dichotomous (yes-no, suitable-not suitable, agree-disagree) without paying attention to the statistical nature of the decision (Susetyo, 2015). Aiken (Susetyo, 2015) stated that deciding whether an instrument was valid was only based on the consensus of experts' judgment, rather than the results of statistical calculations. Therefore, in this study, creative thinking instrument was assessed by experts' judgment and analyzed for content validity (consistency) from the aspects of material, construct, and language using Aiken Validity Index (Aiken V-Index) value. Aiken (Susetyo, 2015) stated that the procedure for calculating content validity (consistency) and determining the statistical significance of the coefficients was explained.

Creative thinking instrument was implemented in the discovery learning model using the experimental method to determine the effectiveness in improving students' creative thinking skills in economics. The selection of the discovery learning model was based on constructivism theory, which focused on students' interaction with the natural world, prior knowledge, and beliefs (Ojugo & Yoro, 2021). Anwar (2017) reported that learning was a constructive process combining scientific discovery, problem-solving, and production through exploration, experimentation, creativity, perseverance, patience, curiosity, and cooperation. This statement was consistent with Arends (2014), that the use of the model in science and social sciences emphasized inductive reasoning and the process of inquiry typical of the scientific method and problem-solving. The selection of the discovery learning model was also based on the characteristics of economics subject matter that digressed from actual economics facts or events. Mankiw (2021) stated that economics explored how humans made decisions at work, items to be purchased, how much money was used for consumption and saving, and how humans interacted. Due to the breadth of economics and the limited time, specifically in senior high schools, the learning process is often restricted to empirical facts around students. This is to facilitate the comprehension of the facts around the environment and improve quality of life (Budiwati; Permana, 2010). Based on these results, the following study questions were proposed: (1) How is the analysis of creative thinking instruments needed in learning economics?; (2) What is the feasibility of creative thinking instruments in learning economics?; (3) How is the effectiveness of creative thinking instruments by implementing discovery learning models in economics learning improving students' creative thinking skills?

RESEARCH METHODS

Research and development (R&D) method was used to develop creative thinking instrument for economics learning. In addition, the method was used to design new products and procedures, which were then systematically tested in the field, evaluated, and refined to meet the criteria for effectiveness, quality, and specified standards.

The development of creative thinking instrument began with a needs analysis to determine whether the product was important for the progress of education and assess the estimated time needed. Previous studies showed that needs analysis could be carried out using surveys and interviews directly in the field. The results obtained could be used as a basis for consideration to develop a measurement instrument for creative thinking in economics learning. Subsequently, content standards, basic competencies, and indicators were analyzed. The analysis was conducted to identify the minimum knowledge competencies in the learning process to be

measured. The results showed that the economics learning materials that could be developed into creative thinking items were main economics problems, economics activities, balance, and market structure.

In the second stage, the materials obtained were used to develop creative thinking instrument lattice consisting of four dimensions, including fluency, flexibility, originality, and elaboration (Torrance, 1966). Creative thinking items were developed using the operational verb level C6 of Bloom's Taxonomy. This level revealed that the act of creation comprised assembling elements into a coherent or functional whole, necessitating creative thinking (Anderson, 2003). The assessment comprised dimensions 11, 14, 21, and 14 items for fluency, flexibility, originality, and elaboration, respectively.

The third stage was associated with evaluating the suitability of the items with the predetermined indicators. During the evaluation process, the creative thinking instrument was validated by nine experts, including economics teachers who were members of the Economics Subject Teacher Consultation (MGMP) and the national Olympiad question compiling team. Subsequently, the content validity was determined by matching the content of the test items with the indicators that had been determined on each learning topic. Experts were given a question review sheet to evaluate the material, construct, and grammar using a four-category rating scale, consisting of perfect (4), good (3), quite good (2), and less good (1). The validity of each item was measured using calculations based on the Aiken formula, with an index ranging from 0 to 1. Items with values close to 1 were declared to have a high level of validity (Aiken, 1985).

The stages of development study proposed by Gall et al. (2007) are visually presented in Figure 1.

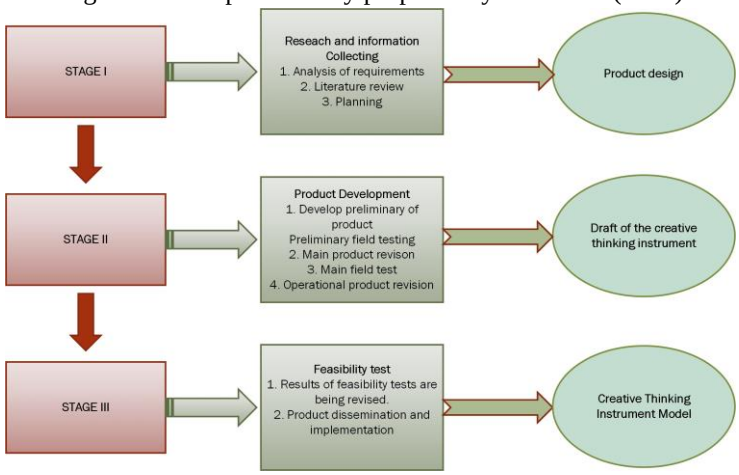

Figure 1: Stages of R&D Implementation of Creative Thinking Instrument Development

The instrument, which had been declared valid by nine experts, was tested on 32 class X students at SMA Negeri 4 Bandung City. The answers of participants were tabulated into a dichotomous form, scoring 1 and 0 for correct and incorrect answers, respectively. This limited test was conducted to analyze the reliability coefficient of creative thinking instrument. In this study, the reliability calculation was performed using Kuder Richardson (KR), which required equality in all test items in the measuring device. The equality of all test items could lead to low intercorrelation. Therefore, the Kuder-Richardson reliability coefficient was classified as a lower-limit correlation coefficient, specifically KR20 formula (Susetyo, 2015).

To test the feasibility of the instrument, the question items that had been declared valid and reliable were tested on 906 high school class X students in Bandung and Tasikmalaya. Analysis of the feasibility test was conducted using Confirmatory Factor Analysis (CFA). In addition, CFA was used when there was previous knowledge about the dimensions of the instrument being studied, either through theoretical frameworks or empirical evidence (Wang & Wang, 2020). Before testing the model, the components were conceptually determined, and the expected relationships between specific indicators or measurement items and factors were hypothesized. CFA aimed to ensure and validate that the factorial structure of the instrument scale under study was consistent with the postulated model.

Instruments that had been declared feasible from the results of CFA analysis were implemented in economics learning. At this stage, creative thinking instrument was used as an evaluation tool in economics

learning. A model used in the implementation of the instrument was discovery learning model. The implementation used an experimental method with the One-Group Pretest-Posttest Design, which was associated with measuring or observing one group before and after treatment (Fraenkel, Jack R, 2012). Visually, the design is presented in Figure 2. The experiment was conducted on 37 class X students at SMA Negeri 1 Kota Tasikmalaya.

The One-Group Pretest-Posttest Design

O	*X*	*O*
Pretest	Treatment	Posttest

Figure 2. The One Group Pretest-Posttest Design

To determine students' responses to the implementation of discovery learning model and creative thinking instrument, students were given a questionnaire using a Likert scale (strongly agree, agree, disagree, and strongly disagree)> The questionnaire consisted of 15 statements for the implementation of discovery learning model, and 9 statement items to determine the response to creative thinking instrument.

RESULTS AND DISCUSSION

Results from Needs Analysis

The needs analysis survey showed that economics teachers had made assessment instruments through tests and non-tests. However, the instruments could only assess cognitive skills at low-level thinking skills (LOTS). Economics teachers rarely developed instruments that precisely measured creative thinking skills, indicating that 58.3% still needed to conduct the development process. The survey results were confirmed through interviews with five teachers. Information was also obtained from students' point of view due to their low skills. Students were not accustomed to working on higher-order thinking skills (HOTS) based questions, leading to difficulties in providing answers. This condition led to relatively low scores or scores below the minimum completion criteria (KKM). Due to the limited time and several administrative tasks that must be completed, economics teachers needed help in developing assessment instruments from instructional analysis to making grids. Teachers were also accustomed to making items without a grid, hence, the questions were not reliable and could not be used to determine whether learning objectives had been achieved. However, item analysis of questions was sometimes carried out, such as differentiating power and difficulty level as one of the administrative tasks that must be completed.

Based on the results of interviews and observations, it was necessary to develop creative thinking instruments in learning economics. During the interviews, 70% of economics teachers emphasized the importance of developing these instruments at present, creative thinking items were given to students participating in the economics Olympiad or similar competitions. Students who were not participating in the Olympiad were rarely given items for assessment. Economics teachers revealed that questions measuring creative thinking must be given to all students to enhance their problem-solving skills in daily life.

Creative Thinking Instrument Design

After conducting a needs analysis, the next step was to analyze the content standards, essential competencies, and indicators. This analysis aimed to identify the minimum knowledge competencies to be achieved and measured in the learning process. Based on the analysis, the economics material to be used for developing question items was determined. In this study, the selected subject matter was economics problems in the economics system, economics activities, market balance, and market structure. The material selection was based on the characteristics that could enhance creative thinking skills of students. Students were given a stimulus to find various solutions, design new strategies, or find rare ways. In addition, the material could be formulated based on real-world problems (contextual) to facilitate comprehension. Table 1 shows the results of the content standard analysis of the material. The instrument lattice, based on the dimensions of creative thinking, is presented in Table 1. The development of creative thinking items was carried out in line with the

operational verb level C6 of Bloom's Taxonomy. The level revealed that creating comprised the process of composing elements into a coherent or functional whole, necessitating creative thinking skills (Anderson, 2003).

Table 1. Instruction Grid Based on Creative Thinking Dimensions

	Creative Thinking Dimensions	Item number	Total
1.	Fluency: Producing many relevant ideas and answers is characterized by the skills to find various kinds of problem-solving and choose one of them.	1, 2, 3, 4, 6, 9, 12, 13, 24, 33, 42.	11
2	Flexibility: Generating uniform ideas is characterized by the skills to change different ways or approaches to thinking.	7, 15, 25, 26, 31, 35, 38, 45, 48, 50, 51, 57, 58, 59.	14
3	Originality: Providing unusual, out-of-the-box answers that most people rarely give is characterized by the skills to resolve.	10, 11, 16, 17, 18, 19, 20, 21, 29, 30, 32, 34, 36, 37, 40, 41, 44, 46, 54, 56, 60.	21
4	Elaboration: Expanding an idea is characterized by the skills to elaborate in solving a problem.	5, 8, 14, 22, 23, 27, 28, 39, 43, 47, 49, 52, 53, 55.	14
	TOTAL		60

Content Validity and Reliability Analysis Results

Instrument creation started with analyzing content requirements, creative thinking competencies, and indicators. This analysis aimed to determine the essential knowledge competencies required to assess the learning process. The results suggested that economics learning could be used to foster creative thinking by focusing on challenges in the economics system, economics activity, market equilibrium, and market structure. A framework of elements had been modified from the generated content to align with the parameters of creative thought, comprising fluency, flexibility, originality, and elaboration (Torrance, 1966). Creative thinking items were created as 60 multiple-choice questions using C6-level operational verbs from Bloom's Revised Taxonomy. These included 11 items focusing on fluency, 14 on flexibility, 21 on originality, and 14 on elaboration.

The developed question items were validated by nine experts, including economics teachers in Subject Teacher Consultation (MGMP) and practitioners who created national Olympiad questions. The items' suitability was assessed based on predetermined indicators. Experts were provided with a review sheet to evaluate substance, construct, and grammar based on four rating categories, namely excellent (4), good (3), satisfactory (2), and poor (1). Aiken formula calculated each item's validity rating (V statistics) as judged by the experts. Aiken V-Index ranged from 0 to 1, with a value closer to 1 indicating higher levels (Susetyo, 2015). With a significance threshold of 0.05 and nine assessors, Aiken V-Index had a magnitude of 0.74. An item was considered valid when V-statistic exceeded Aiken V-Index value (Retnawati, 2016). All items on creative thinking instrument were considered legitimate based on the content validity coefficient (V-statistic > 0.74) calculation, as shown in Appendix 1.

Table 1 showed that 60 creative thinking items had been approved as authentic and could be used in the next step of testing, namely limited testing. An exclusive investigation was conducted on 32 students at SMAN 4 in Bandung City. Participants' responses were transformed into a dichotomy structure, where a value of 1 denoted a correct answer and 0 indicated an incorrect answer. The limited test results showed a reliability coefficient of 0.96, suggesting that the created creative thinking instrument was in the high category (Susetyo, 2015). In addition, the reliability coefficient was determined using KR20 formula. Following validity and reliability assessments, the instrument was considered appropriate for thoroughly examining creative thinking.

Creative Thinking Instrument Feasibility Test Results

This study comprised dichotomous true and false categorical data tabulated as true = 1 and false = 0. In addition, the estimation of categorical data was based on the WLS estimator. WLSM and WLSMV estimators

were WLS-based robust estimators that were more common and available in MPLUS application. These estimators could be applied to binary, ordered categorical, and continuous indicators. Typically, WLSMV was recommended and was the default estimator in MPLUS for modeling categorical outcomes (Wang & Wang, 2020). Based on this explanation, CFA for dichotomous data was estimated using WLSMV in MPLUS application. Factor analysis was conducted for each dimension of creative thinking, where the variable was built by four dimensions, namely fluency, flexibility, originality, and elaboration.

Based on the results of data estimation using MPLUS, information on the suitability of creative thinking instrument measurement model is presented in Appendix 1 In the chi-square test statistic, the model was stated to fit the data when the chi-square test statistic could provide a probability (p-value) greater than 0,05. However, the chi-square test statistic was sensitive to sample size. The number of samples in this study was 906 respondents, which influenced the value of the chi-square test statistic and tended to reject the model test results. To overcome this limitation, CFA measurement model suitability test was often complemented (Kusnendi & Ciptagustia, 2023). This study's chi-square test statistical value was complemented by the Root Mean Square Error of Approximation (RMSEA) value of 0,034, which was smaller than the critical value of 0.08. The results showed that the creative thinking measurement model was fit. Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) values had test values of 0,931 and 0,929, respectively, which was more significant than the critical value of 0.90. The results also showed that creative thinking measurement model was fit, as presented in Appendix 2. The standardized factor weight coefficient could be seen to evaluate the feasibility of each item in measuring the construct being measured. Based on the statistical results of the creative thinking instrument measurement model test, the standardized validity value information is presented in Appendix 3.

The results of the creative thinking instrument's feasibility test comprised items with a standardized factor loading coefficient value of less than 0.5. This indicated that the item was considered invalid or not feasible for measuring the construct of creative thinking dimension. Among the 60 creative thinking instrument items, 13 had a loading factor coefficient of less than 0,5, spread across the four dimensions. In the fluency dimension, four items were not feasible, namely items 2, 4, 6, and 13. For the flexibility dimension, only one item was declared unfit, namely item 48. In the originality dimension, four items were declared unfit, including 11, 16, 18, and 32. A total of four items were declared unfit in the collaboration dimension, namely 5, 8, 47, and 52. Although 13 question items were declared inappropriate and excluded from the measurement model, the construct for each dimension could be declared reliable in measuring creative thinking dimension. The results were supported by CR value for each dimension, which was greater than 0.7. This indicated that the data set collected through creative thinking instrument measurement model was declared valid and reliable for further analysis. Therefore, 47 items could be used to implement economic learning.

Implementing Creative Thinking Instrument Using Discovery Learning Principle in Economic Learning

The experiment was conducted over five meetings, where students were given pretests and posttests using 47 items of creative thinking test instrument questions declared feasible in the first and fifth meetings. Subsequently, the second to fourth meetings were treated using discovery learning model. The syntax of discovery learning model was 1) providing stimuli, 2) problem statement/identification, 3) data collection, 4) data processing, 5) proof, and 6) concluding/generalization (Direktorat Jenderal Guru dan Tenaga Kependidikan, 2018).

Based on the results of the analysis carried out for implementing the discovery learning model, the average value of the pretest and posttest in the experimental class was obtained. The average pretest score was 28.97, while the average posttest score was 47.26. The magnitude of the increase in pretest to posttest scores was 18.29, as shown in Table 2.

Table 2. Pretest and Posttest Results of Experimental Class Using Discovery Learning Model

Number of Students	Average Score		N-Gain
	Pretest	Posttest	
37	28,97	47,26	18,29

Source: Output SPSS, 2024

Hypothesis testing was carried out using the paired sample t-test, and the results of implementing the discovery learning model using test instruments could effectively improve students' creative thinking skills in learning economics. The results of the hypothesis test are presented in Table 3.

Table 3. Hypothesis Test Results of Discovery Learning Model Implementation Using Creative Thinking Test Instrument

	Number of Student	Average Score	t	P-value
Pretest	37	28,97	34,546	0,000
Posttest	37	47,26	98,249	0,000

Source: Output SPSS, 2024

Discussion

Based on the results of the data analysis, a total of 47 questions were declared feasible. These results could be used to measure creative thinking skills to learn economics. The instrument developed could contribute to measuring students' creative thinking skills. In CFA, each of the dimensions used for building variables had a dominant contributing question item indicated by the magnitude of the loading factor of each question item. In the fluency dimension, students were asked to provide many relevant ideas/answers characterized by the skills to find various kinds of problem-solving, followed by the selection of one. Among the 11 question items, item 9 on the economics system material had the highest contribution to the dimension, with a loading factor value of 0,719. In the flexibility dimension, students were asked to produce uniform ideas characterized by the skills to change the way or approach the direction of thought. Among the 14 items, item 51, with market-type material, had the highest contribution with a loading factor of 0.70.

The originality dimension was built using 21 items, where students were asked to provide unusual and different answers, which were rarely given by most people and characterized by the skills to solve. Among the 21 items, item 44, with the supply function material, had the highest contribution, with a loading factor value of 0.803. In the elaboration dimension, students were asked to expand an idea, which was marked by the skills to provide detail in solving a problem. In this dimension, a question item made a dominant contribution, namely item 22 with the material concept of production costs, revenue, and profit as well as a loading factor value of 0.739.

In the learning process, the test instrument was an evaluation tool that teachers often used to measure students' skills. Creative thinking test instrument could be implemented through constructivism learning models. Pritchard and Woollard (2013) stated that constructivism was a philosophical perspective showing the skills of individuals to create knowledge. Constructivism theory focused on students' interactions with the natural world, prior knowledge, and beliefs (Ojugo & Yoro, 2021). Discovery learning model implemented creative thinking instrument in constructivist learning theory. Discovery learning was one of the models that could improve creative thinking skills. According to previous studies, creative thinking was the skills to develop innovative ideas or solutions through problem-solving (Guilford, 1966). An instrument had been developed to evaluate the results of implementing a discovery learning model.

The evaluation of the implementation of thediscovery learning model using creative thinking instrument was conducted for five meetings. The results showed that there was an increase in students' creative thinking skills in learning economics before and after treatment. This was evidenced by the average pretest score of 28.97, which increased to 47.26 on the posttest. The magnitude of the increase could be seen from the N-gain score of 18.29. Based on paired sample t-tests, the p-value was 0.000, indicating that the implementation of the discovery learning model using creative thinking instruments was significantly effective. The results were in line with Salam et al. (2023), that the discovery learning model significantly influenced students' creative thinking skills. Similarly, Yerimadesi et al. (2022) stated that a guided discovery learning model had a significant impact.

Based on the results of the questionnaire responses given to students, the discovery learning model was not saturating. This was evidenced by student percentages, which were 69.4% agreeing and 30.6% strongly agreeing

with the statement, "Teachers teach economics using a model that is not boring." In group discussions, the teacher provided problems that could explore curiosity about economics problems. Teacher provided problems related to real life every day to facilitate interest in being able to solve problems.

The way of learning provided by teachers through the discovery learning model also made students more motivated to understand economics lessons better. This was evidenced by the percentage of responses of 83.3% agreeing and 16.7% strongly agreeing with the statement "the way of learning provided makes students more motivated to understand economics lessons better." The study results were based on Jerome Bruner's statement (Arends, 2014), that discovery learning focused on students understanding the basic concepts of a subject, encouraged active participation in learning, and asserted that real learning occurred through personal exploration.

In the learning process, giving questions to students that contained problems related to daily life raised curiosity to ensure motivation in finding alternatives to solving problems by constructing their solutions to the problems given. As stated by Ojugo & Yoro (2021), the theory of constructivism focused on interaction with the natural world, prior knowledge, and beliefs. Students acquired knowledge by combining new information with existing knowledge (Do et al., 2023).

Learning was a constructive process incorporating scientific discovery, problem-solving, and production through exploration, experimentation, creativity, perseverance, patience, curiosity, and cooperation (Anwar, 2017). This was supported by the questionnaire responses from students related to creative thinking instrument. A total of 66.7% agreed, and 33.3% strongly agreed that the problems in the questions were very familiar in everyday life. Other results showed that 80.6% agreed and 19.4% strongly agreed that each problem explained the economics lesson material. Any reading text, data/figures/graphics related to the questions were also presented. Students preferred and understood creative thinking questions compared to the usual variants (86.1% agreed and 13.9% strongly agreed). This was because students were accustomed to working on problems at a cognitive level with relatively low thinking complexity. Consequently, when given creative thinking test questions with a high level of cognitive level and thinking complexity, students were motivated to explore information to find alternative solutions to the problem.

CONCLUSIONS

In conclusion, economics education today must focus on HOTS to achieve learning objectives in line with 21st-century competencies. These developments required graduates to improve the skills needed to complete their jobs (Taar & Palojoki, 2022). To excel in an increasingly competitive economics sector, students needed to develop effective communication, critical thinking, and problem-solving skills. Proficiency in working with complex data, making decisions based on large amounts of information, collaborating in different teams, and being self-motivated were also required (Wu & Wu, 2020). Sofya (2018) stated that increasing students' higher-order thinking could be done through the learning process in a classroom that incorporated discussion. Therefore, implementing a discovery learning model could contribute to science development in economics learning. Creative thinking instrument was practically used as an assessment tool to develop the skills to think at a high level according to the demands of 21st-century competencies.

Based on the results of this study, a total of 60 question items from creative thinking instrument had been declared valid. This was evidenced by the magnitude of V-statistic value of each item, both from the material, construct, and language elements, which had a higher value than the value of Aiken V-Index. In addition, the instrument could also be declared reliable, as evidenced by the KR20 reliability calculation of 0.96. Among the 60 question items declared valid and reliable, 47 were declared feasible based on CFA. Each dimension that was used to develop creative thinking variables had items with dominant contributions to improving creative thinking skills. The instrument developed could be implemented in a discovery learning model. The results showed that the discovery learning model using creative thinking instrument evaluation instrument proved effective. This was indicated by an increase from pretest to posttest score of 18.29. Despite the advantages, the discovery learning model had limitations, as the implementation used the one-group pretest-posttest design. This experimental design had several drawbacks from the point of view of internal validity. Fraenkel, Jack R. (2012) stated that studies could not determine whether the difference between pretest and posttest results was due to the treatment or other potential factors caused by threats to internal validity. In addition, the economics material

developed into creative thinking items was still relatively small. The material also needed to be expanded to prevent its sole focus on the economics system, economics activities, market balance, and market structure.

Creating an instrument for fostering creative thinking within a discovery learning approach aimed to inspire future studies to develop similar tools for economics learning using a more comprehensive array of resources. Using diverse experimental designs could also help address issues related to threats to internal validity.

ACKNOWLEDGEMENTS

The authors are grateful to the Institute for Research and Community Service (LPPM) of Universitas Siliwangi for supporting and funding this research.

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APPENDIX

Appendix 1. Aiken Index Value for Creative Thinking Instrument in Economics Learning

No item	Dimension	Item Indicator	V- statistic		
			Content	Construct	Language
Item 1	**Fluency**: Producing many relevant ideas/answers is characterized by the skills to find various kinds of problem-solving and select one of them.	Presented with illustrations of the main economic problems, students can construct the main problems of modern economics.	0,886	0,827	0,900
Item 2		Presented with illustrations of the main economic problems, students can construct the main problems of modern economics.	0,829	0,787	0,850
Item 3		Given a picture illustration of producer behavior in a market, students can construct producer behavior.	0,857	0,853	0,900
Item 4		Presented with an illustration of the preparation of a production process plan, students can categorize the main problems of classical and modern economics.	0,895	0,880	0,867
Item 6		Presented with statements related to economic systems, students can categorize the characteristics of each economic system.	0,819	0,85	0,850
Item 9		Presented with a picture illustration of currency exchange rates, students can construct the basic values of the Indonesian economic system.	0,933	0,880	0,933
Item 12		Presented with a picture illustration of the output of economic activities, students can formulate the meaning of one of the economic activities.	0,933	0,893	0,933
Item 13		Presented with a picture illustration of labor production factors, students can categorize the factors of production.	0,886	0,853	0,917
Item 24		Presented with story illustrations and pictures of bad weather conditions, students can construct the concept of production cost.	0,905	0,920	0,883
Item 33		Presented with a diagram of the economic activity cycle, students can generalize the economic cycle diagram of the four economic sectors.	0,905	0,920	0,933
Item 42		Given an illustration of an increase in the price of a factor of production, students can formulate the definition of	0,886	0,920	0,917

No item	Dimension	Item Indicator	V- statistic		
			Content	Construct	Language
		supply.			
Item 7	**Flexibility:** Generating uniform ideas is characterized by the skills to change different ways or approaches to thinking.	Presented with a statement of the strengths of the economic system, students can categorize the strengths and weaknesses of each economic system.	0,848	0,827	0,917
Item 15		Presented with illustrations of examples of producer and consumer activities, students can generalize the theory of producer behavior.	0,829	0,787	0,850
Item 25		Presented with an illustration of iso-quant curve, students can generalize the meaning of iso-cost and iso-quant curves.	0,800	0,773	0,917
Item 26		Given a picture of an indifference curve, students can generalize the characteristics of the indifference curve and the cost line.	0,838	0,867	0,917
Item 31		Presented with a picture illustration of export and import activities, students can show the role of economic activity actors.	0,924	0,907	0,900
Item 35		Presented with illustrations that influence the factors that influence demand, students can determine the factors that influence demand.	0,886	0,893	0,950
Item 38		Presented with an illustration of a demand curve, students can formulate the law of demand.	0,895	0,920	0,917
Item 45		Presented with an image of a supply curve, students can conclude the law of supply.	0,895	0,920	0,933
Item 48		Presented with a picture of market price equilibrium, students can construct the definition of market price.	0,933	0,920	0,917
Item 50		Presented with illustrations of supply and demand price data tables, students can categorize excess demand and excess supply.	0,924	0,893	0,933
Item 51		Presented with illustrations of supply and demand price data tables, students can categorize excess demand and excess supply.	0,781	0,787	0,883
Item 57		Given an illustration of an oligopoly market example, students can analyze the characteristics of an oligopoly	0,924	0,880	0,933

No item	Dimension	Item Indicator	V- statistic		
			Content	Construct	Language
		market.			
Item 58		Given an illustration of the characteristics of a monopolistic competitive market, students can determine the form of a monopolistic market.	0,886	0,867	0,867
Item 59		Given pictures of demand curves for various market structures, students can determine the shape of the demand curve in a perfectly competitive market.	0,810	0,867	0,883
Item 10	**Originality**: Providing unusual, out-of-the-box answers that most people rarely give is characterized by the skills to resolve.	Presented with a picture illustration of the economic crisis case of 1998, students can construct the fundamental values of the Indonesian economy.	0,829	0,920	0,933
Item 11		Presented with illustrations of macroeconomic policy targets, students can relate economic problems to the economic system.	0,924	0,907	0,933
Item 16		Given an example of the law of diminishing returns, students can develop the concept of production cost, revenue, and profit.	0,886	0,880	0,900
Item 17		Presented with a picture illustration of the increase in fuel prices, students can develop the concept of production costs, revenue, and profit.	0,867	0,880	0,917
Item 18		Given a picture of the relationship of cost curves, students can show the relationship of the cost curves.	0,838	0,827	0,917
Item 19		Presented with a picture illustration and data of a company, students can determine the amount of goods in the home position.	0,857	0,827	0,933
Item 20		Presented with a picture illustration and data of a company, students can determine the amount of goods in the home position.	0,838	0,787	0,917
Item 21		Students can derive a marginal cost equation from a given picture and data of an average cost equation.	0,924	0,907	0,933
Item 29		Students can generalize the consumer behavior theory by illustrating a marginal utility curve.	0,886	0,920	0,933
Item 30		Given a picture of a consumer	0,895	0,893	0,917

No item	Dimension	Item Indicator	V- statistic		
			Content	Construct	Language
		behavior curve, students can generalize the cardinal and ordinal approaches to measuring customer satisfaction.			
Item 32		Presented with a picture illustration of the activities of economic actors, students can show the role of the actors in economic activities.	0,933	0,907	0,883
Item 34		Presented with an illustration of an article on the rising prices of goods, students can formulate the definition of demand.	0,867	0,920	0,933
Item 36		Given an illustration of a demand curve, students can construct the demand function.	0,943	0,907	0,917
Item 37		Given a table of price levels and quantity of goods demanded, students can construct a demand curve.	0,848	0,907	0,883
Item 40		Given an illustration of the phenomenon of a chili price increase, students can determine the price elasticity of demand.	0,933	0,907	0,933
Item 41		Given a table of variations in price and quantity of goods demanded, students can construct the type of elasticity.	0,905	0,907	0,917
Item 44		Given a table of data on the price and quantity of goods offered, students can create an offer function.	0,924	0,880	0,933
Item 46		Presented with a table of data on the price and quantity of goods offered, students are asked to create a supply curve.	0,924	0,907	0,917
Item 54		Given an illustration of the shifting price equilibrium curve, students can generalize the shifting market equilibrium curve.	0,914	0,933	0,917
Item 56		Given an illustration of the phenomenon of online transport companies, students can show the role of government in the formation of market prices.	0,924	0,920	0,933
Item 60		Given a picture of profit formation in a perfectly competitive market, students can generalize the characteristics of a perfectly competitive market.	0,933	0,867	0,950
Item 5	**Elaboration:**	Presented with illustrations of	0,895	0,853	0,917

No item	Dimension	Item Indicator	V- statistic		
			Content	Construct	Language
	Expanding an idea is characterized by the skills to elaborate in solving a problem.	problems in the economic system, students can conclude the policies in the economic system.			
Item 8		Presented with illustrations of articles on the characteristics of the Pancasila economic system, students can construct the good and bad of the economic system.	0,924	0,867	0,900
Item 14		Given a picture of the curve relationship in production theory, students can generalize the production cost curve relationship.	0,829	0,813	0,900
Item 22		Given a picture and data of the price equation and total cost of company, students can determine the price, quantity of goods, and profit of the company.	0,914	0,893	0,933
Item 23		Presented with a graph of the law of diminishing return curve, students can develop the concept of production cost.	0,933	0,893	0,950
Item 27		Given a case illustration of Gosen's Law 1, students can generalize the characteristics of the indifferent curve and the coastline.	0,781	0,880	0,933
Item 28		Given an illustration of a total utility curve, students can generalize the theory of consumer behavior.	0,867	0,853	0,933
Item 39		Given an illustration of a demand curve shift figure, students can show the ceteris paribus assumption.	0,857	0,853	0,883
Item 43		Presented with an illustration of an increase in the price of a factor of production, students can formulate factors that affect supply.	0,924	0,920	0,933
Item 47		Presented with an illustration of the movement/shift of the supply curve, students can show the ceteris paribus assumption in the supply law.	0,914	0,907	0,917
Item 49		Given data on the price and quantity of goods demanded and offered and the demand function equation, students can determine the market equilibrium price point.	0,895	0,893	0,883
Item 52		Given data on demand and supply functions, students can determine the price and output at market equilibrium.	0,889	0,907	0,900

No item	Dimension	Item Indicator	V- statistic		
			Content	Construct	Language
Item 53		Given a table of prices and the quantity of goods offered and asked, students can construct an equilibrium price graph.	0,924	0,880	0,933
Item 55		Given an illustration of the shifting price equilibrium curve, students can generalize the shifting market equilibrium curve.	0,914	0,880	0,950

Source: Primary data processed (2023)

Appendix 2. Test the suitability of Creative Thinking Instrument Measurement Model

Test Statistics	Critical Values	Result	Descriptions
Chi-Square	-	3422,217	-
Degree of Freedom	-	1704	-
p-value	-	0,0000	-
Root Mean Square Error of Approximation (RMSEA)	< 0,08	0,034	Model Fit
Comparative Fit Index (CFI)	≥ 0,90	0,931	Model Fit
Tucker Lewis Index (TLI)	≥ 0,90	0,929	Model Fit

Source: MPLUS Data Estimation Output, 2024

Appendix 3. Creative Thinking Instrument Feasibility Test Results

No item	Estimate (λ)	p-value	$\lambda^2 = R^2$	$e = 1 - \lambda^2$
Fluency Dimension				
Item 1	0,551	0,000	0,303601	0,696399
Item 2	0,315	0,000	0,099225	0,900775
Item 3	0,667	0,000	0,444889	0,555111
Item 4	0,489	0,000	0,239121	0,760879
Item 6	0,393	0,000	0,154449	0,845551
Item 9	0,516	0,000	0,266256	0,733744
Item 12	0,587	0,000	0,344569	0,655431
Item 13	0,447	0,000	0,199809	0,800191
Item 24	0,719	0,000	0,516961	0,483039
Item 33	0,718	0,000	0,515524	0,484476
Item 42	0,358	0,000	0,128164	0,871836
CR = 0,838				
Flexibility Dimension				
Item 7	0,604	0,000	0,364816	0,635184
Item 15	0,543	0,000	0,294849	0,705151
Item 25	0,671	0,000	0,450241	0,549759
Item 26	0,550	0,000	0,302500	0,697500
Item 31	0,547	0,000	0,299209	0,700791
Item 35	0,573	0,000	0,328329	0,671671
Item 38	0,515	0,000	0,265225	0,734775
Item 45	0,545	0,000	0,297025	0,702975
Item 48	0,478	0,000	0,228484	0,771516
Item 50	0,704	0,000	0,495616	0,504384
Item 51	0,700	0,000	0,490000	0,510000
Item 57	0,520	0,000	0,270400	0,729600
Item 58	0,545	0,000	0,297025	0,702975
Item 59	0,543	0,000	0,294849	0,705151
CR = 0,877				
Originality Dimension				

No item	Estimate (λ)	p-value	$\lambda^2 = R^2$	$e = 1 - \lambda^2$
Item 10	0,656	0,000	0,430336	0,569664
Item 11	0,464	0,000	0,215296	0,784704
Item 16	0,447	0,000	0,199809	0,800191
Item 17	0,529	0,000	0,279841	0,720159
Item 18	0,447	0,000	0,199809	0,800191
Item 19	0,588	0,000	0,345744	0,654256
Item 20	0,615	0,000	0,378225	0,621775
Item 21	0,596	0,000	0,355216	0,644784
Item 29	0,626	0,000	0,391876	0,608124
Item 30	0,646	0,000	0,417316	0,582684
Item 32	0,445	0,000	0,198025	0,801975
Item 34	0,671	0,000	0,450241	0,549759
Item 36	0,790	0,000	0,624100	0,375900
Item 37	0,565	0,000	0,319225	0,680775
Item 40	0,516	0,000	0,266256	0,733744
Item 41	0,652	0,000	0,425104	0,574896
Item 44	0,803	0,000	0,644809	0,355191
Item 46	0,650	0,000	0,422500	0,577500
Item 54	0,591	0,000	0,349281	0,650719
Item 56	0,666	0,000	0,443556	0,556444
Item 60	0,614	0,000	0,376996	0,623004
		CR = 0,926		
		Elaboration Dimension		
Item 5	0,498	0,000	0,248004	0,751996
Item 8	0,453	0,000	0,205209	0,794791
Item 14	0,621	0,000	0,385641	0,614359
Item 22	0,739	0,000	0,546121	0,453879
Item 23	0,675	0,000	0,455625	0,544375
Item 27	0,554	0,000	0,306916	0,693084
Item 28	0,713	0,000	0,508369	0,491631
Item 39	0,635	0,000	0,403225	0,596775
Item 43	0,506	0,000	0,256036	0,743964
Item 47	-0,088	0,000	0,007744	0,992256
Item 49	0,585	0,000	0,342225	0,657775
Item 52	0,483	0,000	0,233289	0,766711
Item 53	0,683	0,000	0,466489	0,533511
Item 55	0,641	0,000	0,410881	0,589119

Source: MPLUS Test Statistics Output, 2024