# The Effectiveness Of Enrichment Test Instruments Design To Measure Students Creative Thinking Skills And Problem-Solving

*by* Endang Susilaningsih

**Submission date:** 23-Aug-2022 02:35PM (UTC+0700)
**Submission ID:** 1885857969
**File name:** easure_Students_Creative_Thinking_Skills_And_Problem-Solving.pdf (1.77M)
**Word count:** 4281
**Character count:** 24522

Thinking Skills and Creativity 29 (2018) 161–169

Contents lists available at ScienceDirect

Thinking Skills and Creativity

journal homepage: www.elsevier.com/locate/tsc

# The effectiveness of enrichment test instruments design to measure students' creative thinking skills and problem-solving

Taufiq Hidayat*, Endang Susilaningsih, Cepi Kurniawan

*Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang (UNNES), D6 Building 2nd Floor Main Campus at Sekaran Gunungpati Semarang, 50229, Indonesia*

ARTICLE INFO

*Keywords:*
Enrichment test instruments
Creative thinking skills
Problem-solving
Acid-base
High school

ABSTRACT

Students are to be prepared to face the challenges of 4th industrial revolution by having creative thinking skills and problem-solving. Study of preliminary show that test used in school has not been oriented to creative thinking skills and problem-solving. The purpose of this study is to develop enrichment test instruments which can be used to measure creative thinking skills and problem-solving that achieve valid and reliable criteria. The study belongs to *research and development* applying the 4D model. Stages which were developed involved preliminary studies, product design, development, and publication. The technique of data analysis used was qualitative and quantitative data analysis. Qualitative data analysis was done based on the investigate instrument validity sheet. Besides, quantitative data analysis aimed at finding out reliability level and test instruments effectiveness. The instrument validity is declared valid by experts and regarded reliable on each trial of development stage. Enrichment test instruments were effective to measure students' creative thinking skills and problem-solving based on the analysis of creative thinking and problem-solving competence, mean of learning result increases, and completeness proportion which achieved 100%. It is inferred that the enrichment test instruments developed can measure students' creative thinking skills and problem-solving.

## 1. Introduction

As humans' life has been a 4th industrial revolution, science and technology develope very rapidly. The development has been extremely supporting humans' life. This evidence demands people to possess capable skills to go with the rapid development of science and technology in balance (Siahaan, Suryani, Kaniawati, Suhendi, & Samsudin, 2017; Nur'asiah, Siahaan, & Samsudin, 2015). Four skill groups to conquer in this 4th industrial revolution are ways of thinking, ways for working, tools for working and ways for living in the world (Barak, 2017). One of those four skill groups that will deeply investigate later is the skill group of the ways of thinking. It belongs to a set of thinking skills. Among those thinking skills are: 1) creative and innovative, 2) critical thinking and problem-solving, and 3) learning how to attain metacognitive capability. Creative thinking skills and problem-solving turn into essential thinking skills to master in this revolution.

Creative thinking skills is a thinking process which creates a novel idea widely and variously. Munandar (2012) revealed that the process of creative thinking involves fluency, flexibility, originality, and elaboration. This skill is extremely affected by students' efficacy. A study by Kisti & Aini (2012) reported that there is a significant correlation between creativity and self-efficacy. Self-efficacy is defined as one's conviction to show new action done to solve a particular problem to achieve the goals.

* Corresponding author.
*E-mail address:* taufiqhidaa@gmail.com (T. Hidayat).

https://doi.org/10.1016/j.tsc.2018.02.011
Received 1 February 2018; Accepted 3 February 2018
Available online 14 February 2018
1871-1871/ 

Poyla (1985) proclaimed that competence to solve problems is an attempt to seek the way out from difficult circumstances or goals which can be achieved by using mathematical power and benefit. Chrisnawati (2007) revealed that the capability to solve problems is an important capability to possess by students since it can motivate them to create and examine their own theory, examine the theory of their friends and remove it when it is inconsistent, and try other theories. The inference that can be made is that the skill of problem-solving is an action to solve problems or a process that utilizes mathematics and science mastered to solve the problems. It can also be defined as a method to find out the solution through the steps of problem-solving.

Young generation particularly students are to be prepared to face the challenges of 4th industrial revolution by having creative thinking skills and problem-solving. These skills are highly required to possess so that students are able to compete globally in this revolution (Dewi, Poedjiastoeti, & Prahani, 2017). The result of study done by Suriyani and Asmin (2015) revealed that the finding of their study about measuring the creative thinking skills was very disappointing. The research findings of Mustofa and Rusdiana (2017) showed that most, the students' skill to solve the problem are not that satisfying. The lack of creative thinking skills and solve the problems can be settled by training the students to enhance their skills of creative thinking and problem-solving. Besides, there are many studies about the ways to improve the students' creative thinking skills and problem-solving that have been conducted to share various innovative methods and learning models (Hung, Jonassen, & Liu, 2008; Yu, Fan, & Lin, 2014).

The result of students' creative thinking skills and solve problems need measuring to find out the effectiveness of providing innovative learning methods undertaken. These skills should also be measured to find out the students' readiness in facing the challenges of recent revolution.

Study of preliminary show that test used by teachers in some senior high schools in Semarang and SMK Raja Permaisuri Bainun almost same, which only revolves around the cognitive domain of C1-C3, which only measure memorization and understanding of a concept. Test of acid-base used for assessment is less innovative, so can not measure students' creative thinking skills and problem-solving. This study aims at developing enrichment test instruments to measure the students' creative thinking skills and the competence of solving problems.

## 2. Method

The study belongs to *research and development* adopting the development model of 4D (define, design, develop, and disseminate) (Thiagarajan, Dorothy, & Melvyn, 1974). The data collected was both qualitative and quantitative data. The qualitative data was obtained from the instruments validity result of some experts while the quantitative data was gained from the trial of test instruments on some samples of students in SMK Raja Permaisuri Bainun, Ipoh, Malaysia. The study was conducted from August up to October 2017. Stages which were developed involved preliminary studies, product design, development, and publication

### 2.1. Preliminary studies

Preliminary studies were initiated by analyze the instruments of conventional chemistry test in some senior high schools in Semarang and SMK Raja Permaisuri Bainun Malaysia, analyze students' learning result on acid-base material, and investigate school infrastructures and chemistry learning process.

### 2.2. Product design

Product design was initiated by tables of test's specification, enrichment test, answer key, and an assessment rubric. The product that has been finished was then validated by experts.

### 2.3. Development

Development step of trial for small-scale, large-scale until the implementation phase was undertaken to measure reliability, practicality and instruments effectiveness.

### 2.4. Publication

The final product of enrichment test instruments is disseminated to test the efficacy of enrichment test.

The technique of data analysis used was qualitative and quantitative data analysis. Qualitative data analysis was done based on investigating test instrument validity slips and response questionnaire sheets (for students and teachers). The items validity used was content validity in the point of view of assessment instruments, materials, and conformity between test items and indicator. Students' and teachers' response questionnaire sheets were used to measuring the practicality of test instruments. Besides, quantitative data analysis aimed at finding out reliability level and test instruments effectiveness. Instruments reliability level was calculated by using the formula of Alpha Cronbach (Arikunto, 2002). Instruments effectiveness was measured based on creative thinking and problem-solving skills analysis, mean of learning result and completeness proportion.

## 3. Results and discussions

**The first stage of study is preliminary studies,** obtained data of instruments used by chemistry teachers, school infrastructures,

**Table 1**
The weekly test questions of acid-base material used in the school.

| Question | Cognitive Domain |
|---|---|
| Write down the characteristic of acid and base, two characteristics for each! | C1 |
| Explain the definition of acid-base based on Arrhenius! | C1 |
| Write down the ionization of the following acid-base:<br>a. Nitric acid<br>b. Barium hydroxide | C2 |
| Measure the pH value of:<br>a. $H_2SO_4$ solution 0.001 M (log 2 = 0.3)<br>b. $NH_4OH$ solution 0.1 M ($K_b\ NH_3 = 10^{-5}$) | C3 |
| Measure the mixture pH value of:<br>a. 250 mL NaOH 0.2 M + 250 mL $H_2SO_4$ 0.1 M<br>b. 100 mL HCl 0.2 M + 100 mL NaOH 0.1 M<br>c. 500 mL HBr 0.1 M + 500 mL KOH 0.2 M | C2 |

and learning process. The potential that can be improved was innovative test instrument. Initial circumstance as the main focus of this recent study was chemistry instrument type in the school. The instruments only measured the aspect of memorizing and understand the concept. This evidence did not provide any advantage for students to train creative thinking skills and problem-solving. The cause is the limited scope of acid-base material. Teachers felt difficult to varying the question, because the acid-base matter in high school standard curriculum are basic, while wider coverage of acid-base material exists at higher levels of education, that is pre-university. The weekly test questions of acid-base material can be found in Table 1.

Lissa (2012) revealed that based on the cognitive taxonomy of Bloom C1 (memorize), C2 (understand), and C3 (apply), this kind of circumstance is definitely not good enough to train creative thinking skills and problem-solving possessed by students. Learning instruments which have great orientation on creative thinking skills and problem-solving turn into essential thing to develop due to the rapid advance of science and technology. This evidence goes in line with the statement by Richamond, (2007) in his research which declared that excellent thinking skill could be powerful provision for Asian students to live with complicated problems in this advanced modern era. The demand of this era is not a simple thing to confront without training process (Amalia & Susilaningsih, 2014). It is in accordance with Yildrim and Ozkahraman (2011) strengthened that creative thinking skills and problem-solving can be improved through conditioning and thinking.

Creative thinking skills and problem-solving that more than rote, understand and apply. The development of creative thinking skills and problem-solving are needed training and practice directly to answer the test that oriented on creative thinking skills and problem-solving continuously. Teachers can not determine the students' creative thinking skills and problem-solving only by conjecture or using cognitive test, but it takes an instrument oriented to creative thinking skills and problem-solving that are valid and reliable.

Enrichment test instruments in this study refer to acid-base material in curriculum 2013 (Indonesia's student-centered curriculum), because the scope of material is wider, also due to the needs of students who have achieved mastery in learning to carry out enrichment program. The enrichment program is intended to expand knowledge in the subject matter they have learned and honed students' creative thinking skills and problem-solving.

**The second stage is product design,** enrichment test instruments are designed based on four indicators of creative thinking developed by Munandar (2012) and four indicators of problem-solving created by Polya (1985). The type of test instruments in this study belongs to open-ended questions and trains students' capability to solve problems. The following is the design of enrichment test instruments to measure students' creative thinking skills and problem-solving on acid-base material.

Q1. Indicator of creative thinking: fluent and elaborated thinking

> A laboratory assistant does an experiment by reacting solid NaOH in aquades until the volume of solution reaches 100 mL, hence the solution pH changed from 2 to 4. From the situation:
> a. Write down the problem into a question!
> b. Write down the data you need!
> c. How much gram the solid NaOH needs to be added? Make steps to solve the problem!
> d. Write down your conclusion!
> (Ar Na = 23; Ar O = 16; Ar H =1)

Q2. Indicator of creative thinking: flexible and original thinking

The following are base solution:
(i) NaOH (Mr = 40)
(ii) KOH (Mr = 56)
(iii) $Mg(OH)_2$ (Mr = 58)
(iv) $Ca(OH)_2$ (Mr = 74)
These bases are served in similar mass and each is dissolved into aquadest until its precise volume is 100 mL. Which one is the most appropriate solution to neutralize 20 mL $H_2SO_4$ 0.2 M solution to make titrant volume made as minimal as possible?

Q3. Indicator of problem-solving: solving plan and executing plan

A group of students does an experiment to a mineral water that has concentration $[H^+] = 10^{-7}$ M in temperature 25°C and 1 atm pressure, in various container, where which:

a) Plastic glass : 240 mL
b) Big bottle : 1500 mL
c) Average bottle : 600 mL
d) Small bottle : 330 mL
e) Gallon : 19 Littre

They are using litmus paper in their experiment to measure the degree of acidity from various container allocated.

The following are the experiment data on mineral water using litmus paper:

| Container Volume | Litmus Paper | Color Alteration |
|---|---|---|
| 240 mL | Red | Red |
| 1500 mL | Blue | Blue |
| 600 mL | Red | Red |
| 330 mL | Red | Red |
| 19 Liter | Blue | Blue |

From five containers allocated:
a. What value degree of acidity from each container? Is it similar or different?
b. Explain your answer in (a) logically!

Q4. Indicator of problem-solving: understanding matter and investigating both process and result

Mr. Bani is a peat moss farmer. Chemical and physical characteristics of peat moss are important to consider while managing it. The chemical characteristic such as pH, amount of ash, amount of N, P, K, base saturation, and micro-nutrition sources are essential in fertilization of peat moss. One day, Mr. Bani took a sample of soil to measure its pH. He used litmus paper and it turned red. To make it able to be planted, he adds limestone. Different with Mr. Bani's, Mr. Suryo's soil's test turned blue. This soil's state shows similarity value degree (pH > 7), substance P (phosphor) will bound to Ca (calcium). Mr. Suryo got an advice from his neighbour to use ZA fertilizer to his soil, and he follows it.

a. Write down the problem faced by Mr. Bani and Mr. Suryo!
b. In your opinion, is the acts of Mr. Bani and Mr. Suryo to their soils correct?
c. How is your solution to solve the problem? Explain it logically!
d. Write down your conclusion!

Q1 refers to creative thinking skills, which are fluent and elaborated thinking. Indicator of fluent thinking shown in the steps used in NaOH salt mass calculation. Indicator of elaborated thinking shown in the problem-solving steps is done in detail.

Q2 refers to creative thinking skills, which are flexible and original thinking. Indicator of flexible thinking shown in the variation of an idea in predicting the base solution that used for neutralization. Indicator of original thinking is shown in steps to predicting base solution that used for neutralization coherently and varied.

Q3 refers to problem-solving skills, which are solving and executing a plan. Indicator of solving plan shown in the solving steps plan based on data obtained in matter. Indicator of executing plan shown in the calculation of acidity degree and explain the calculation that has been done.

Q4 refers to problem-solving skills, which are understanding matter and investigating both process and result. Indicator of understanding matter indicated by the guide questions, so that the students can understand and fix the problem. Indicator of investigating both process and result indicated by problems analysis and provide solutions to the problems.

Test instruments that has been finished was then validated by experts. Validator who validate instruments is Dr. Endang Susilaningsih, M. S., a creative thinking skills and problem-solving validator is Dra. Woro Sumarni, M. Si., and the content validator is Cepi Kurniawan Ph.D. Validated instruments were in the form of enrichment test and response questionnaire for students and teachers. The validation result of enrichment test instruments, students' and teachers' response questionnaire was declared valid by instruments expert, strongly valid by content expert and the expert of creative thinking skills and problem-solving. Enrichment test instruments were revised many times in order to be appropriate for trial.

**The third stage is development,** covers trial of small-scale, large-scale, and implementation. Small-scale trial aims to obtain information about enrichment test instruments that has been developed. Small-scale trial was carried out to 20 students of grade 4. The reliability result of enrichment test instruments is declared reliable with a coefficient of 0.74 and included in high-reliability criteria (Arikunto, 2007). There is a revision of incomplete questions and awkward words. The reliability result of students' response questionnaire are stated reliable with Alpha Cronbach value is 0.78. Instruments or products which declared reliable in small-scale trial will be continued on a large-scale trial. It is intended to obtain an instrument that can be used on a wider scope.

The large-scale trial was carried out to 42 students of grade 4 and 5. The reliability result of enrichment test instruments is declared reliable with a coefficient of 0.71 and included in high-reliability criteria (Arikunto, 2007). There is revision of grammar on the questions. The reliability result of students' response questionnaire are stated reliable with Alpha Cronbach value is 0.85.

Implementation phase trial was carried out to 42 students of grade 4. The reliability result of enrichment test instruments is declared reliable with a coefficient of 0.777 and included in high-reliability criteria (Arikunto, 2007). The reliability result of students' response questionnaire are stated reliable with Alpha Cronbach value is 0.99. Implementation phase trial is carried out with the aim to get more effective and efficient information than another assessment instruments. The trial is done by experiment, compare the effectiveness of learning outcomes with assessment instruments developed. Effectiveness indicator in this implementation phase had the positive effect of enrichment test on students' learning result. Practicality indicator was measured from students' and teachers' response questionnaire.

The effectiveness of enrichment test instruments was measured based on the analysis of creative thinking skills and problem solving, mean of students' learning result and completeness proportion. The data analysis of test instruments showed that students' creative thinking skills which are by 67% belonged to a very low category. The analysis graphic of creative thinking skills on implementation stage can be seen in Fig. 1.

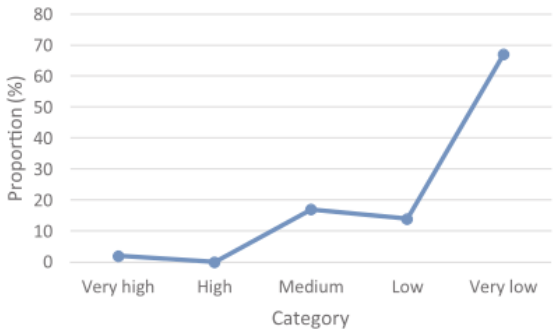


**Fig. 1.** The analysis graphic of creative thinking skills on implementation stage.

Based on analysis result showed that students achieved the indicator of fluent and elaborated thinking, but yet did not already achieve the indicator of flexible and original thinking. Students' creative thinking skills on indicator of fluent thinking was reported by the competence of producing many ideas made to respond to an order. Accomplishing the indicator of elaborated thinking was showed by evidence that students could examine and provide rational reasons for solution steps of problem solving. The answers of fluent and elaborated indicator can be seen in Fig. 2, showed that students could provide a relevant answer to sequential solving stages. Students were proficient at identifying problems in detail to determine NaOH solid needed to turn solution pH from 2 into 4.

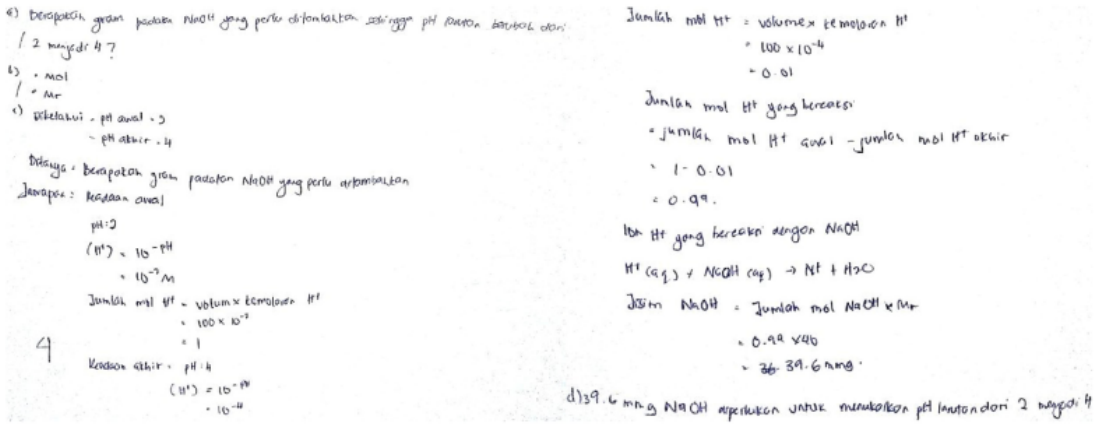

**Fig. 2.** The answers of fluent and elaborated thinking indicator.

The unsuccessful accomplishment of flexible thinking appeared on the lack of students competence in producing various ideas to solve problems. The unsuccessful accomplishment of original thinking could be seen on the poor competence possessed by students in responding to problems with extra-ordinary answers. Those extra-ordinary ideas involve thinking about things having never been thought by other people or those which are unequal with common thoughts. The answers of flexible and original thinking indicator can be seen in Fig. 3, showed that students only focused on one step of solving the problem yet it was not always appropriate to solve other problems. Students were not capable enough to draw a complete and rational conclusion for the stage of solving a problem they did.

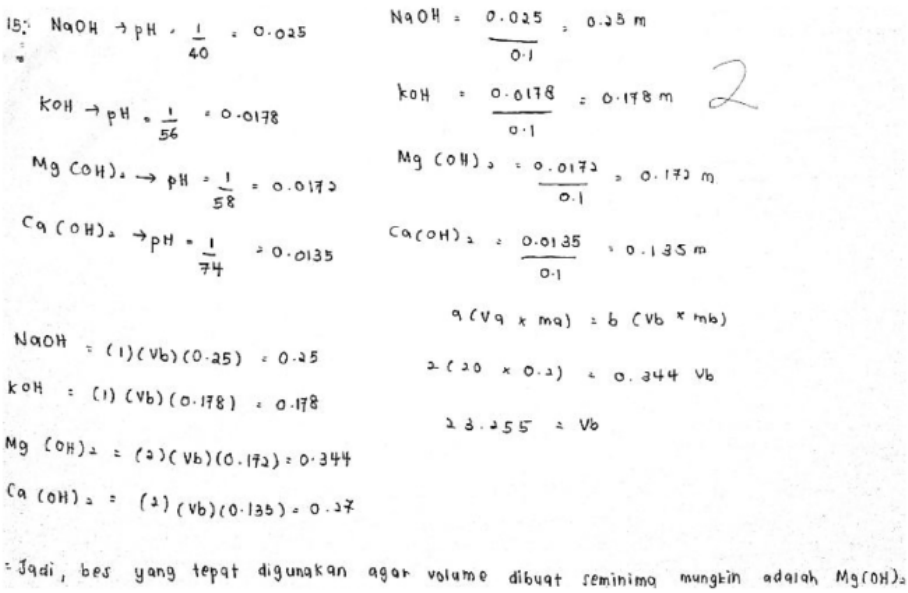


**Fig. 3.** The answers of flexible and original thinking indicator.

The data analysis of test instruments showed that students' competence of problem solving achieved 29% which belonged to a very low category. That percentage score was not quite different with the percentage of students' skill to solve a problem in the medium category, i.e. by 26%. The analysis graphic of problem solving competence on implementation stage can be seen in Fig. 4.

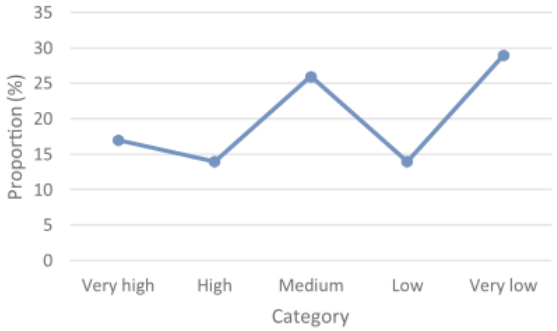


**Fig. 4.** The analysis graphic of problem solving competence on implementation stage.

Based on analysis result showed that students achieved indicator solving and executing a plan, yet some of them had not already achieved indicator of understanding matter and investigating both process and result. The competence to solve problems based on an indicator of solving plan was shown by the evidence that students could create a plan and determine the strategy of problem solving to answer questions. The accomplishment of executing plan indicator appeared on the fact that most students were able to explain how to answer questions on the problem sheets. The answers of solving and executing plan indicator can be seen in Fig. 5, showed that students were able to explain the inference about acidity on the circumstance of pure water.

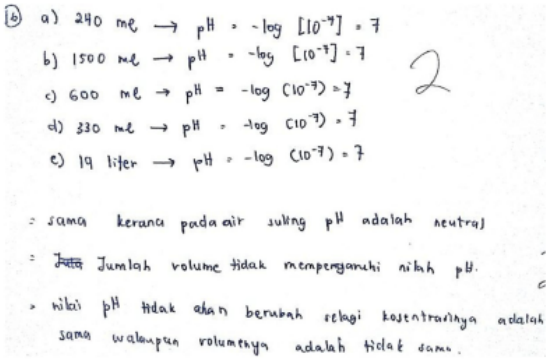


**Fig. 5.** The answers of solving and executing plan indicator.

The indicator of understanding matter had not been achieved well since students had not been able to comprehend and determine problem on the test. The fact that indicator of investigating both process and result had not been accomplished successfully appeared on some students who were not able to write down the appropriate and incomplete conclusion. The answers of understanding matter and investigating both process and result indicator can be seen in Fig. 6, showed that students were not already able to understand the problem and still wrote the information gained in the question incompletely. They were not also able to interpret the solving result gained through writing inappropriate and incomplete inference.

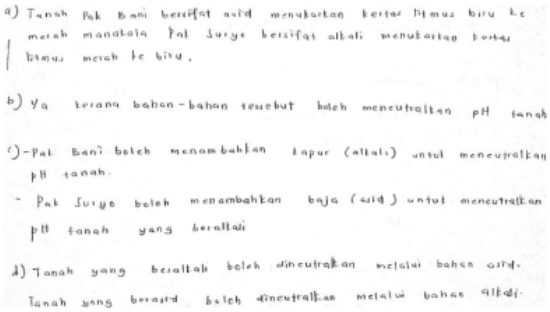


**Fig. 6.** The answers of understanding matter and investigating both process and result indicator.

Students' creative thinking skills and problem solving were not already optimum since they were inadequately trained in conducting problem solving and seeking other solutions. The suggested attempt is to help students in carrying out their thinking process to solve problems through various ways and steps in the learning process.

The appropriate teaching method is the key and the requirement for students to study well. One of the criteria that students are able to learn what to learn is that the result learning indicator intended can be achieved by students (Trianto, 2009). An attempt to optimize students' creative thinking skills and problem solving is that teachers are to design learning process that engages students actively. They can use a particular approach to engage students' activities during the learning process and design learning materials that have divergent (opened) questions.

Based on the analysis of students' learning result mean measured by comparing two groups' means using t or t' formula (Sudjana, 2005), shows that the mean of enrichment test instruments score of students is higher than the mean of weekly test score, for it has value $t'_{count} > t_{table.}$ It can be inferred that enrichment test instruments are effective to use.

The completeness proportion of learning result from enrichment test instruments was compared with completeness proportion of students' weekly test. The sample taken for this research was students with a complete category, i.e. those who gained minimum completeness criteria. It can be inferred that completeness proportion of students' weekly test was 100%. Learning completeness proportion gained after being examined by enrichment test instruments also achieved 100%. This means all students have achieved minimum completeness criteria.

The practicality of enrichment test instruments was measured by students' and teachers' response questionnaire. The students' response result stated that their response by agreeing a lot was by 55%. That result declared that enrichment test instruments were practical to use during the learning process. Some students even recommended their chemistry teachers to use test type including creative thinking skills and problem solving for other chemistry materials. The teachers' response was agreeing with developed instruments and proclaimed practical to use. Some teachers have great intention to design those instruments to be applied in their classroom.

**The last stage is a publication,** the enrichment test instrument's product is used and developed by teachers of SMK Raja Permaisuri Bainun as an alternative test instrument. The objective is to test the efficacy of the enrichment test made.

## 4. Conclusion

The test instruments validity (enrichment test, students' and teachers' response questionnaire) is declared valid by instruments expert and very valid by content expert and the experts of creative thinking and problem-solving skills. Enrichment test instruments and students' response questionnaire are regarded reliable on each trial of the development stage. Enrichment test instruments are stated effective to measure creative thinking and problem-solving skills of students' viewed by analysis of creative thinking and problem-solving skills, mean of learning result increases and completeness proportion which achieved 100%.

## Acknowledgements

Authors would like to thank the Head of SMK Raja Permaisuri Bainun for giving permission of the research, the students of SMK Raja Permaisuri Bainun who have helped and participated in the research process, as well as all people who help the proofreading process so that this article can be better arranged.

## References

Amalia, F. N., & Susilaningsih, E. (2014). Pengembangan instrumen penilaian keterampilan berpikir kritis siswa sma pada materi asam basa. *Jurnal Inovasi Pendidikan Kimia, 8*(2), 1380–1389.
Arikunto, S. (2002). *Prosedur penelitian: Suatu pendekatan praktek*. Jakarta: PT. Rineka Cipta.
Arikunto, S. (2007). *Dasar-dasar Evaluasi Pendidikan (Edisi Revisi)*. Jakarta: Bumi Aksara.
Barak, M. (2017). Science teacher education in the twenty-first century: A pedagogical framework for technology-integrated social constructivism. *Research in Science Education, 47*(2), 283—303.
Chrisnawati, H. E. (2007). Pengaruh metode pembelajaran kooperatif tipe stad terhadap kemampuan problem-solving siswa smk (teknik) swasta di surakarta ditinjau dari motivasi belajar siswa. *Journal MIPA*, 17.
Dewi, I. N., Poedjiastoeti, S., & Prahani, B. K. (2017). Elsii learning model based local wisdom to improve students problem-solving skills and scientific communication. *International Journal of Education and Research, 5*(1), 107–118.
Hung, W., Jonassen, D., & Liu, R. (2008). *Problem-based learning. Handbook of research on educational communications and technology, 3*, 485–506.
Lissa (2012). Pengembangan instrumen penilaian keterampilan berpikir tingkat tinggi materi sistem respirasi dan ekskresi. *Jurnal Unnes LIK, 41*(1), 27–32.
Munandar (2012). *Pengembangan Kreativitas Anak Berbakat*. Jakarta: Rineka Cipta.
Mustofa, M. H., & Rusdiana, D. (2017). Profil kemampuan pemecahan masalah siswa pada pembelajaran gerak lurus. *Jurnal Penelitian & Pengembangan Pendidikan Fisika, 2*(2), 15–22.
Nur'asiah, R., Siahaan, P., & Samsudin, A. (2015). Deskripsi instrumen tes keterampilan berpikir kritis materi alat optik. *Prosiding Simposium Nasional Inovasi dan Pembelajaran Sains 2015*.
Polya, G. (1985). *How to solve it. A new aspect of mathematical method* (2nd ed.). Princeton, New Jersey: Princeton University Press.
Richamond, J. E. D. (2007). Bringing critical thinking to the education of developing country professionals. *International Education Journal, 8*(1), 1–29.
Siahaan, P., Suryani, A., Kaniawati, I., Suhendi, E., & Samsudin, A. (2017). Improving students' science process skills through simple computer simulations on linear motion conceptions. *Journal of Physics Conference Series*, 1–5.
Sudjana (2005). *Metoda Statistika* (edisi 6). Bandung: Tarsito.
Suriyani, H., & Asmin (2015). Peningkatan kemampuan berpikir kreatif dan kemandirian belajar siswa mts negeri 2 medan melalui pembelajaran matematika dengan pendekatan open-ended. *Jurnal Tabularasa PPS Unimed, 12*(33), 224–234.
Thiagarajan, S., Dorothy, S. S., & Melvyn, I. S. (1974). *Model Pengembangan dan Pembelajaran*. Available at https://ayahalby.files.wordpress.com/2012/10/konsep-pengembangan-dan-pembelajaran-modul.pdf [accessed 28-4-2017].
Trianto (2009). *Mendesain Model Pembelajaran Inovatif Progressif*. Jakarta: Kencana Prenada Media Group.
Yildrim, B., & Ozkahraman, S. (2011). Critical thinking in nursing process and education. *International Journal of Humanities and Social Science, 1*(13), 257–262.
Yu, K. C., Fan, S. C., & Lin, K. Y. (2014). Enhancing students problem-solving skills through context-based learning. *International Journal of Science and Mathematics Education, 13*(6), 1377–1401.

# The Effectiveness Of Enrichment Test Instruments Design To Measure Students Creative Thinking Skills And Problem-Solving

ORIGINALITY REPORT

| 7% | 6% | 3% | 2% |
|---|---|---|---|
| SIMILARITY INDEX | INTERNET SOURCES | PUBLICATIONS | STUDENT PAPERS |

PRIMARY SOURCES

| | | |
|---|---|---|
| 1 | msceis.conference.upi.edu<br>Internet Source | 1% |
| 2 | John Feldhusen, Jan Hansen. "Teachers of the Gifted: Preparation and Supervision", Gifted Education International, 2016<br>Publication | 1% |
| 3 | pt.scribd.com<br>Internet Source | 1% |
| 4 | Submitted to Brigham Young University<br>Student Paper | 1% |
| 5 | Staffnew.Uny.Ac.Id<br>Internet Source | <1% |
| 6 | askinglot.com<br>Internet Source | <1% |
| 7 | www.coursehero.com<br>Internet Source | <1% |
| 8 | ojs.serambimekkah.ac.id<br>Internet Source | <1% |
| 9 | Submitted to Universiti Putra Malaysia | |

| | | |
|---|---|---|
| | Student Paper | <1 % |
| 10 | sipeg.unj.ac.id<br>Internet Source | <1 % |
| 11 | journal.unj.ac.id<br>Internet Source | <1 % |
| 12 | A F Syadzili, Soetjipto, Tukiran. "Guided Inquiry with Cognitive Conflict Strategy: Drilling Indonesian High School Students' Creative Thinking Skills", Journal of Physics: Conference Series, 2018<br>Publication | <1 % |
| 13 | www.irphouse.com<br>Internet Source | <1 % |
| 14 | pure.uva.nl<br>Internet Source | <1 % |
| 15 | mdpi.com<br>Internet Source | <1 % |

| | | | |
|---|---|---|---|
| Exclude quotes | On | Exclude matches | < 10 words |
| Exclude bibliography | On | | |

# The Effectiveness Of Enrichment Test Instruments Design To Measure Students Creative Thinking Skills And Problem-Solving

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

**Instructor**

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9