# DEVELOPMENT OF CLASS-BASED COGNITIVE ASSESSMENT INSTRUMENT ACCORDING TO CURRICULUM 2013 ON TECHNICAL DRAWING SUBJECTS IN VOCATIONAL SCHOOL

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## ABSTRAK

The 2013 curriculum uses a classroom-based assessment. The curriculum contains various supporters, one of which is an assessment. Assessment by teachers is used to measure the achievement of learning objectives. But in the real world, a teacher has difficulty in developing assessment planning, assessment implementation, and processing of assessment result, and teacher has not analyzed comprehensively about validity and reliability in question, and analysis of evaluation instrument conducted by the teacher is only limited to analyze difficulty level. Thus, the problem that is made to know the cognitive level of students has not known the quality. The objectives of this study were (1) to know the reliability of cognitive assessment instruments developed, (2) to know the level of difficulty, (3) to know the differentiating power, and (4) to know the effectiveness of the cultivators. The method used in this research is research and development (R & D) developed by Borg & Gall. Data analysis technique that is done is instrument validation test with construct validity through judgment expert, reliability test using ITEMAN with formula CR-20. This study resulted in (1) the reliability of the question items of 0.740, (2) the degree of difficulty there are three levels, namely difficult 23%, medium 70%, and easy 7%, (3) distinguishing power on the grain matter analysis resulted in 20%, 7% of the questions are sufficient, 60% is good, and 13% are very good, and (4) the effectiveness of the deception is 82% working and 18% not working.

**Keywords**: Curriculum 2013, Classroom-Based Assessment, Cognitive Appraisal, R&D

## INTRODUCTION

Education is an important thing for the community because in the process of education one can develop their potential. The importance of education is contained in UU SISDIKNAS No.20 of 2003 which states that education is a conscious and planned effort to realize the atmosphere and the learning process so that learners can actively develop the potential in him/her to have a good personality strength, spiritual spirituality, self-control, intelligence, morality, and skills needed by himself and society. To realize education as expected, the curriculum changes dynamically. A change of curriculum is one way to improve the quality of education.

Changes that occur are adjusted based on need. Education Unit Level Curriculum Changes (KTSP) into the 2013 curriculum aims to improve the quality and relevance of education (S. Deni Ramdani, 2016). These changes include students' thoughts directed towards scientific thinking and faculty as facilitators.

The 2013 curriculum is a continuation of the Competency-Based Curriculum that has been pioneered in 2004 that includes integrated attitude, knowledge and skills competencies. The 2013 curriculum uses a classroom-based assessment (PBK). The Principles of a Class-Based Assessment based on the 2002 Department of Education are valid, educational, competent, fair, open, sustainable, comprehensive and meaningful.

To implement the PBK, three categories of cognitive, affective and psychomotor scopes were developed using seven classroom-based assessment techniques: written assessment, performance appraisal, attitude assessment, project appraisal, product assessment, portfolio assessment, self-assessment (Natalina, Suryawati, and Rukmana 2015).

The function of class-based assessment is to help learners to change or develop their behavior in a better and advanced direction, to help learners get satisfied with what they have done, to help teachers choose the strategies, methods and teaching media that will be used is adequate and help teachers in making judgments and administrative decisions. (Arifin, 2010).

The principles in the Classroom Based Assessment based on Depdiknas in 2002 Fathurrahman (2010) and Dawn in Kholil (2008) include valid, educational, competence-oriented, fair, open, sustainable, comprehensive and meaningful.

Assessment is an activity undertaken by teachers for the achievement of learning objectives. The statement is reinforced by (Alimuddin 2014) that the assessment by educators is a process carried out through the steps of planning, the preparation of assessment tools, the collection of information through a number of evidence that demonstrates the achievement of competence learners, processing, and utilization of information about the

achievement of competence learners. In harmony with that, (Kurniasari, Sunarmi, and Nugraningsih 2014) says that assessment is the process of collecting and processing information to determine the achievement of student learning outcomes. And (Natalina et al., 2015) says that assessment is one of the activities undertaken to measure and assess the level of attainment of the curriculum.

Assessment is always experiencing a development that aims to develop each potential learners based on the times. But the reality in the field, teachers have difficulty in planning the assessment, assessment, and processing of assessment results and teachers have not been able to analyze comprehensively related to the validity and reliability in the problem, and analysis of evaluation instruments conducted by teachers only limited to analyze the level of difficulty. Thus, the problem that is made to know the cognitive level of students has not known the quality. The quality of the expected questions will be obtained if a teacher has the skills and knowledge about the selection of methods, techniques, and assessment instruments in accordance with competence and learning objectives.

This research aims to (a) determine the reliability of cognitive assessment instruments developed, (b) to know the degree of difficulty in cognitive items, (c) to know the differentiating properties of the

items, and (d) to know the effectiveness of the deception.

## RESEARCH METHODS

The research method used in this research is research and development. This research embraces 10 stages developed by Borg & Gall, but in this research only use 7 of 10 existing stages are research and information collecting, planning, preliminary form of product development, preliminary field testing, main product revision, testing, and operational product revision.

The technique of data collecting is done by written test and questionnaire. The written test is done to the learners by giving a sheet about the equipment and the completeness of engineering drawings, technical drawing lines, letters, numbers, and technical drawing etiquette, while the questionnaire is given to the validator.

The data obtained then analyzed by using ITEMAN program. Analysis of data generated in the form of the reliability of the item, the difficulty of the item, the differentiator, and the effectiveness of the outsourcer. ITEMAN is used to know the quality of items that have been through the stage of Main Field testing.

The subject of this research is the odd semester class X students at SMK Negeri Pertanian Serang City who follow the subjects of Technical Drawing. Basic competencies developed are KD 3.1., 3.2.,

And 3.3. The number of respondents involved as many as 40 students.

## Results and Discussion
### Research and information collecting

The first stage in this research is to observe the assessment of cognitive aspects in the subjects of Technical Drawing. A multiple choice is an assessment done during the Mid Exams (UTS) and the final examination (UAS) so that in the preparation of multiple choice questions must consider the aspect to be achieved.

The literature review is a step taken after the observation. The measure aims to strengthen the data and discussion that will be done. The literature review is conducted using several journals that have relevance to the development of the cognitive assessment.

### Planning

The second stage is to do the planning (Planning) in the form of determination of basic competencies that will be developed in the cognitive assessment. The basic competence is 3.1. understand the equipment and the completeness of the engineering drawing, 3.2. understand the lines of engineering drawings according to their shape and function, and 3.3. understand the letters, numbers, and image etiquette. After determining the basic competence is done then choose the level of cognitive to be achieved.

The cognitive level to be achieved in developing the item is to remember, to understand, to evaluate, to analyze, to evaluate, and to create. The six cognitive levels used include the Higher Order Thinking Skills level (HOTS).

### Develop preliminary form of product

The third stage is to develop a dual choice instrument in accordance with Higher Order Thinking Skills (HOTS). At this stage mapping the cognitive level on the developed problem. The amount of distribution at each cognitive level varies. But every question has 1 correct answer and 4 wrong answers.

### Preliminary field testing

Validation of item is the stages of fourth in research that aims to know the quality of the item. The validation of the items in this research is constructed validity through the experts' judgment. There are 13 indicators in the validation conducted, among others are (1) In accordance with the indicators in the grid compilation of questions, (2) Indicator tested has been selected in accordance with the urgency, continuity, relevance and discharging, (3) Pengecoh function (there is an option (4) There is only one correct answer, (5) The subject matter is formulated clearly and firmly, (6) The subject matter does not lead to the correct answer, (7) The subject matter does not contain a double-negative statement, (8) ) Option does not contain the stetmen "all correct / false answers", (11) The number-shaped option has been sorted from smallest to largest or vice versa, ( 12)

Using the Indonesian language well and correctly, (13) The basic formula does not contain phrases that are meaninglessly uncertain (example: preferably, in general, sometimes).

### Main product revision

The next stage is the fifth stage. At this stage the improvement of the validation results. Items that do not match the cognitive level to be achieved and problems that do not meet the 13 indicators will be improved. Repair it by replacing the editorial problem or change the choice of existing answers.

### Main field testing

Main field testing is the sixth stage. At this stage, the spreading of the item has been fixed to 40 responses. Respondents only chose 1 correct answer from 5 answers provided on each item.

### Operational product revision

The last step in this research is Operational product revision. This stage is a test of expenditure data generated by the dispersion of questions. Test data is as follows:

## Reliability of the assessment instruments

Reliability of item in the result of analysis using ITEMAN is 0.74. items that have been developed can be said to be reliable because the item has a reliability value of at least 0.70.
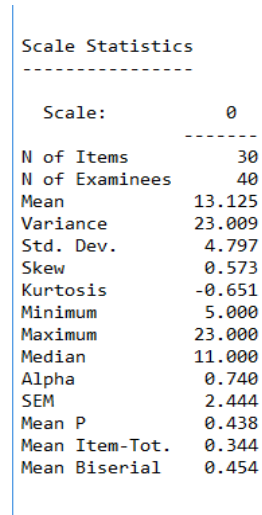
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Scale Statistics
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  Scale:              0
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N of Items            30
N of Examinees        40
Mean              13.125
Variance          23.009
Std. Dev.          4.797
Skew               0.573
Kurtosis          -0.651
Minimum            5.000
Maximum           23.000
Median            11.000
Alpha              0.740
SEM                2.444
Mean P             0.438
Mean Item-Tot.     0.344
Mean Biserial      0.454
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Fig 1. Scale Statistics ITEMAN

## The difficult level item

Table 1. Level of difficulty Problem Multiple Choice

| No. Item | Answer | Difficult level (Prop. Correct) | |
|---|---|---|---|
| 1. | C | 0.600 | Medium |
| 2. | E | 0.900 | Easy |
| 3. | C | 0.525 | Medium |
| 4. | B | 0.400 | Medium |
| 5. | D | 0.300 | Hard |
| 6. | B | 0.275 | Hard |
| 7. | C | 0.100 | Hard |
| 8. | A | 0.525 | Medium |
| 9. | E | 0.475 | Medium |
| 10. | A | 0.825 | Easy |
| 11. | E | 0.450 | Medium |
| 12. | E | 0.250 | Hard |
| 13. | A | 0.375 | Medium |
| 14. | D | 0.275 | Hard |
| 15. | E | 0.275 | Hard |
| 16. | A | 0.500 | Medium |
| 17. | D | 0.325 | Medium |
| 18. | A | 0.325 | Medium |
| 19. | C | 0.400 | Medium |
| 20. | A | 0.275 | Hard |
| 21. | C | 0.375 | Medium |
| 22. | B | 0.350 | Medium |
| 23. | D | 0.550 | Medium |
| 24. | B | 0.575 | Medium |
| 25. | A | 0.625 | Medium |
| 26. | D | 0.475 | Medium |
| 27. | D | 0.375 | Medium |
| 28. | B | 0.500 | Medium |
| 29. | E | 0.325 | Medium |
| 30. | A | 0.600 | Medium |

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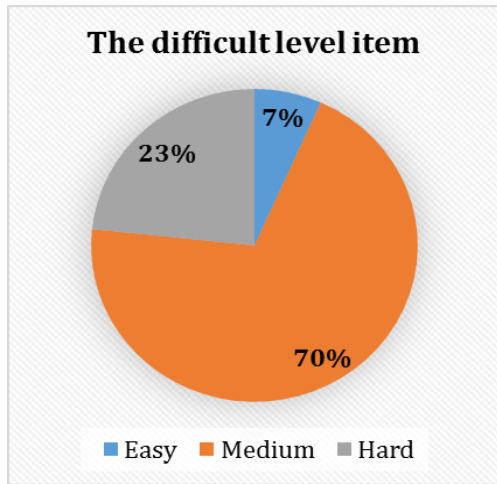
## The difficult level item



Fig 2. Percentage of difficult level

Table 1. Explain that multiple choice questions developed consist of three levels of difficulty. These levels are difficult, medium and easy. The difficult problem consists of 7 questions contained in questions 5, 6, 7, 12, 14, 15, and 20. And about 21 questions on the number 1, 3, 4, 8, 9, 11, 13, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, and 30. Whereas the easy question is 2 questions in question 2 and 10.

Figure 2. explains that the percentage of the difficulty level of the items developed has different percentages. The highest percentage of 70% is the level of moderate difficulty. The difficulty level is difficult to have a 23% percentage. Meanwhile, the level of difficulty that has the smallest percentage is the level of difficult difficulty with a percentage of 7%.

**Differentiating**

Table 2. Differentiating

| No. Item | Answer | Differentiating (Biser) | |
|---|---|---|---|
| 1. | C | 0.540 | Good |
| 2. | E | 0.579 | Good |
| 3. | C | -0.047 | Bad |
| 4. | B | 0.486 | Good |
| 5. | D | 0.607 | Good |
| 6. | B | 0.650 | Good |
| 7. | C | 0.520 | Good |
| 8. | A | 0.738 | Very good |
| 9. | E | 0.466 | Good |
| 10. | A | 0.422 | Good |
| 11. | E | 0.747 | Very good |
| 12. | E | 0.488 | Good |
| 13. | A | 0.675 | Good |
| 14. | D | 0.103 | Bad |
| 15. | E | 0.541 | Good |
| 16. | A | 0.346 | Enough |
| 17. | D | 0.483 | Good |
| 18. | A | -0.081 | Bad |
| 19. | C | 0.661 | Good |
| 20. | A | 0.869 | Very good |
| 21. | C | 0.497 | Good |
| 22. | B | 0.580 | Good |
| 23. | D | -0.142 | Bad |
| 24. | B | 0.480 | Good |
| 25. | A | 0.424 | Good |
| 26. | D | 0.349 | Enough |
| 27. | D | 0.263 | Bad |
| 28. | B | 0.777 | Very good |
| 29. | E | 0.556 | Good |
| 30. | A | 0.067 | Bad |
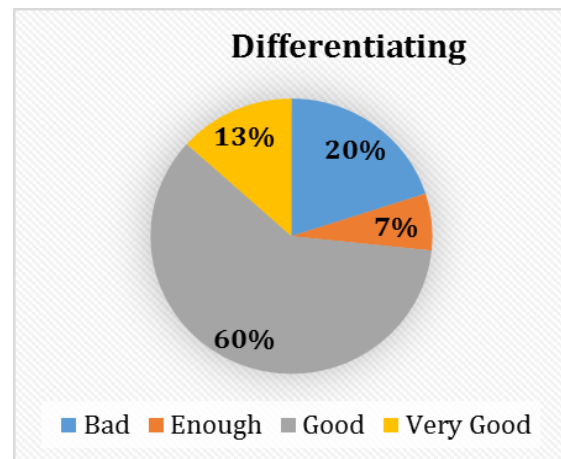


Fig 3. Percentage of Differentiating

The result of the research on the development of multiple-choice items based on differentiating power is as follows:

a. The question with the index of 0.00 - 0.20 is a question with the bad category with percentage 20% and 6 question. The six questions consist of questions of numbers 3, 14, 18, 23, 27, and 30.

b. The question with index 0.20 - 0.40 has the percentage of 7% with enough category. The question that has the category enough amounted to 2 questions consisting of questions number 16 and 26.

c. The largest percentage in the question index is 0.41 - 0.70 at 60%. The index is in the category of either the number of 18. the questions contained in items 1, 2, 4, 5, 6, 7, 9, 10, 12, 13, 15, 17, 19, 21, 22, 24, 25, 29.

d. The question with index 0.71-1.00 is a matter with a very good category. The category has a percentage of 13% which consists of 4 questions. The question is in item number 8, 11, 20, 28.

**Effectivity of deception**

Arikunto (2012: 234) explained that a deception is said to work properly if it is chosen by at least 5% of test takers.

Table 3. Effectivity of Deception Result

| No. Butir | A | B | C | D | E |
|---|---|---|---|---|---|
| 1. | × | × | ○ | ✓ | × |
| 2. | × | × | ✓ | × | ○ |
| 3. | × | ✓ | ○ | ✓ | × |
| 4. | ✓ | ○ | ✓ | ✓ | ✓ |
| 5. | ✓ | ✓ | ✓ | ○ | ✓ |
| 6. | ✓ | ○ | ✓ | ✓ | ✓ |
| 7. | ✓ | ✓ | ○ | ✓ | × |
| 8. | ○ | ✓ | ✓ | ✓ | × |
| 9. | ✓ | ✓ | ✓ | × | ○ |
| 10. | ○ | ✓ | ✓ | × | × |
| 11. | ✓ | × | ✓ | × | ○ |
| 12. | ✓ | ✓ | ✓ | ✓ | ○ |
| 13. | ○ | ✓ | ✓ | ✓ | ✓ |
| 14. | ✓ | ✓ | ✓ | ○ | × |
| 15. | ✓ | ✓ | ✓ | ✓ | ○ |
| 16. | ○ | ✓ | ✓ | × | ✓ |
| 17. | ✓ | ✓ | ✓ | ○ | ✓ |
| 18. | ○ | ✓ | ✓ | ✓ | ✓ |
| 19. | ✓ | ✓ | ○ | ✓ | ✓ |
| 20. | ○ | ✓ | ✓ | ✓ | ✓ |
| 21. | ✓ | ✓ | ○ | ✓ | ✓ |
| 22. | ✓ | ○ | ✓ | ✓ | ✓ |
| 23. | ✓ | × | ✓ | ○ | ✓ |
| 24. | ✓ | ○ | ✓ | ✓ | ✓ |
| 25. | ○ | ✓ | ✓ | ✓ | × |
| 26. | ✓ | ✓ | ✓ | ○ | ✓ |
| 27. | ✓ | ✓ | ✓ | ○ | ✓ |
| 28. | ✓ | ○ | ✓ | ✓ | × |
| 29. | ✓ | ✓ | ✓ | ✓ | ○ |
| 30. | ○ | × | ○ | ✓ | × |

Explanation:

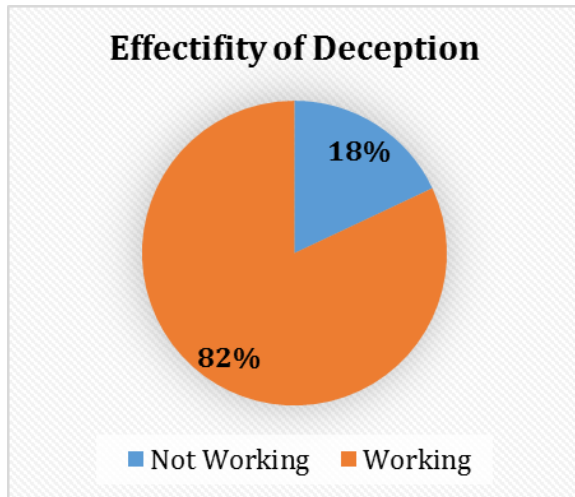○ : Answer

✓ : Working

× : Not Working

Fig 4. Effectivity of Deception Percentage

The effectiveness of deception will influence the assessment instruments developed. A deceiver is said to work if each sparer has 5% or more of all respondents. The effectiveness of a well-functioning Dingler of 82% and non-functioning dandruff has a percentage of 18%.

## CONCLUSION

Based on the results of data analysis and discussion, then obtained the following conclusions:

1. The reliability of the item is 0.740
2. The level of difficulty there are three levels, each consisting of 23% hard level with 7 items, the medium level has a percentage of 70% with 21 questions, and easy level has 7% percentage with 2 items.
3. Differentiating on item analysis of 20% item is bad with the amount of problem as much as 6 item, the percentage of the matter is enough to equal to 7% with item of 2 item, 60% item have good character of 18, and 4 item with

very good category have percentage equal to 13 %.

4. The effectiveness of deception is well suspended by 82%, and the percentage of fraud does not work properly by 18%.

There are some items that need to be fixed so that the item can be used with maximum results.

## REFERENCES

Alimuddin. (2014). Penilaian dalam kurikulum 2013. *Seminar NAsional Pendidikan Karakter*, *1*, 23–33.

Atih, Wiwi, dan Nahadi. (2011). Penilaian Instrumen Penilaian Berbasis Kelas Pada Mata Pelajaran Hidrokarbon. Bandung:UPI

Firman, H. (2000). *Penilaian Hasil Belajar dalam Pengajaran Kimia.* Bandung: FPMIPA UP

Kurniasari, I. R., Sunarmi, & Nugraningsih. (2014). Pengembangan Instrumen Penilaian Kognitif Materi Gerak Tubuh dan Hama Penyakit Tumbuhan Kelas VIII Semester Genap Tahun Ajaran 2013-2014, (4), 1–8.

Natalina, M., Suryawati, E., & Rukmana, S. (2015). Pengembangan Perangkat Penilaian Berbasis Kelas pada Mata Pelajaran Biologi SMA Kelas XI. *Jurnal Biogenesis Vol*, *11*(2), 111–118. Retrieved from http://ejournal.unri.ac.id/index.php/JPSB/article/view/2583

S, Deni Ramdani. (2016). Pengembangan Student Self-Assessment Berdasarkan Kurikulum 2013 Di Smk Developing Student Self-Assessment Based on Curicculum 2013 in Vocational High School. Jurnal VANOS Journal Of Mechanical Engineering Education Vol, 1(1), 2528-2700

Savitri, L. (2014). Analisis Butir Soal Ulangan Akhir Semester Gasal Mata Pelajaran Teori Kejuruan Teknik Kendaraan Ringan Kelas Xii Smk N 2 Pengasih Tahun Ajaran 2013 / 2014.