

**TWO-TIER MULTIPLE CHOICE DIAGNOSTIC TEST  
DEVELOPMENT TO IDENTIFY MISCONCEPTIONS IN ADJUSTING  
ENTRIES FOR SERVICE COMPANY LEARNING MATERIALS**

**PENGEMBANGAN TES DIAGNOSTIK TWO-TIER MULTIPLE CHOICE  
UNTUK MENGIDENTIFIKASI MISKONSEPSI MATERI JURNAL  
PENYESUAIAN PERUSAHAAN JASA**

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**Abstract: Two-Tier Multiple Choice Diagnostic Test Development to Identify Misconceptions in Adjusting Entries For Service Company Learning Materials.** This research aims: (1) develop two-tier multiple choice diagnostic test that can identify misconceptions in adjusting entries learning materials; (2) determine the quality of the diagnostic test developed in terms of validity, reliability, difficulty level, discriminating power and effectiveness of distractors; (3) determine whether the developed diagnostic test is able to identify misconceptions of SMK Abdi Negara Muntilan's students. This research is research and development (RnD) study using the 4D development model, which includes define, design, develop & disseminate. The subject of this study were material experts, evaluation experts and students of class XI AKL SMK Abdi Negara Muntilan. The data collection techniques used were validation sheet, student response questionnaires and tests. The results showed that the test was feasible, with a validity value of 0.81 (very valid category) and a reliability value of 0.85. The difficulty level was 0.49, with a differentiating power of 0.49 in the good category. The effectiveness of distractors in tier 1 and tier 2 was concluded to be functioning. Based on the result of the study, it is known that students who understand the concept are 30% and misconceptions are 70%.

**Keywords:** diagnostic test, two-tier multiple choice, misconceptions, adjusting entries

**Abstrak: Pengembangan Tes Diagnostik Two-Tier Multiple Choice untuk Mengidentifikasi Miskonsepsi Materi Jurnal Penyesuaian Perusahaan Jasa.** Penelitian ini bertujuan untuk: (1) mengembangkan tes diagnostik two-tier multiple choice yang dapat mengidentifikasi miskonsepsi pada materi jurnal penyesuaian; (2) mengetahui kualitas tes diagnostik yang dikembangkan dilihat dari validitas, reliabilitas, tingkat kesukaran, daya pembeda dan keberfungsian pengecoh; (3) mengetahui apakah tes diagnostik yang dikembangkan mampu mengidentifikasi miskonsepsi siswa SMK Abdi Negara Muntilan. Penelitian ini merupakan penelitian research and development (RnD) dengan model pengembangan 4D yang meliputi define, design, develop & disseminate. Subjek dalam penelitian ini merupakan ahli materi, ahli evaluasi dan siswa kelas XI AKL SMK Abdi Negara Muntilan. Teknik pengumpulan data menggunakan lembar validasi, angket respon siswa dan tes. Hasil penelitian menunjukkan bahwa instrument tes layak dengan nilai validitas sebesar 0,81 (sangat valid) dan nilai reliabilitas sebesar 0,85. Tingkat kesukaran sebesar 0,49 dengan daya pembeda sebesar 0,49 termasuk kategori baik. Efektivitas pengecoh pada tier 1 dan tier 2 dapat disimpulkan sudah berfungsi. Berdasarkan hasil penelitian, diketahui bahwa siswa yang paham konsep sebesar 30% dan miskonsepsi sebesar 70%.

**Kata kunci:** tes diagnostik, two-tier multiple choice, miskonsepsi, jurnal penyesuaian

## **INTRODUCTION**

Learning is as a set of human elements, materials, tools, devices, and processes that interact to achieve learning objectives (Hamalik, 2010: 57). Learning as a structured activity aims to ensure a smooth teaching and learning process in order to achieve good learning outcomes for students. To determine whether the learning carried out is well understood by students, it is necessary to conduct an evaluation.

Evaluation or assessment process in learning is important to find out how successful the achievement of learning objectives is. Tayler in Arikunto defines evaluation as the process of collecting data with the intention of determining how far and in what ways and which parts of educational objectives have been achieved (2016: 3). We must have information about students, in this case obtained through assessments/evaluations conducted by teachers to find out how well students understand the learning material. For students, learning evaluation is important as feedback to know their learning outcomes and learning process. In addition, knowledge and understanding of the learning outcomes achieved by students can help teachers to self-reflect so that they can improve learning in the future. One of the evaluation tools that can be used is a test, which is a method or a way that can be used or a process that must

be taken to make measurements and assessments in the field of education in the form of giving tasks that can consist of questions that must be answered or orders that need to be done so that measurement data can be obtained (Sudijono, 2015: 67).

Learning evaluation can be done in every subject, one of which is the practicum of accounting for service companies, which is a compulsory subject taken in class XI of vocational high school. According to Hanggara (2019: 17) accounting for service can be defined as a company whose activities focus on providing all kinds of services to consumers who need them. Accounting practicum for service company lessons are advanced lessons taken by students in class XI by means of practicum. The learning materials in the accounting practicum for service company include the accounting cycle, general journal, ledger, adjusting entries, balance sheet, financial statements, closing journal, and balance sheet after closing. From some of these learning materials, the adjusting entries learning material is more complex than the others.

In the implementation of the learning process, several problems related to the adjusting entries learning material are often found. Wati in her research revealed that the adjustment entries requires understanding, thoroughness, and accuracy in the learning process (2017: 2). Muhlis, Kantun &

Hartanto (2020: 308) revealed that students tend to experience learning difficulties in adjusting entries learning material which is identical to analysing and calculating procedures. In their research, Anis and Adeng (2019: 101) revealed that adjusting entries learning material is considered difficult by students so that teachers need to explain it repeatedly. So, it can be concluded that adjusting entries learning material is often considered difficult by students.

Based on research conducted by Wulandari Pratiwi (2019) entitled "Analisis Kesulitan Peserta Didik dalam Mengerjakan Soal-Soal Ayat Jurnal Penyesuaian di Kelas X SMK YWKA Medan Studi Akuntansi Tahun Ajaran 2019/2020" states that in working on adjusting entries questions, students' thinking or logic skills are still lacking which causes them to experience learning difficulties. Students are also less careful in calculating transactions and are still confused in terms of grouping accounts from journalized transactions. In working on adjusting journal problems, a mature concept is needed so that students can work on problems or exercises smoothly.

When following the learning process students are directed to be able to understand the concept of the material taught, there are still many students who have difficulty in understanding learning materials. The reason for this may be due to the confusion of

students who are dealing with adjusting entries learning material whose transaction recording procedures are more complex or the lack of teacher activeness in providing varied problem exercises. As a result, it is not uncommon for students to experience misconceptions. Misconceptions can be interpreted as student inability caused by student knowledge that is not in accordance with the actual concept, so that it can hinder the student in learning new concepts. Misconceptions can also arise from the mistakes of the students themselves, mistakes made by the teacher in explaining the material, errors from the textbook used, context errors, and errors in the teaching methods used by the teacher during learning. According to Suryawirawati (2018: 94-95), misconceptions include: 1) Inappropriate understanding of concepts, 2) Inappropriate use of concepts, 3) Classification of examples of incorrect application of concepts, 4) Different concept meanings, 5) Chaos of different concepts, and 6) Hierarchical relationships of wrong concepts. The result of not understanding the learning material from the beginning has an impact on subsequent learning activities because learning accounting practicum is a continuous procedural series.

Based on the description above, it is very important for teachers to know in which parts of the students experience misconceptions. In

addition, it is also important to know who the students in the class who experience misconceptions are. One form of test that can be used to evaluate and determine what causes misconceptions is a diagnostic test (Wuryanti, 2017: 111). Diagnostic tests are tests designed to identify student weaknesses so that based on these weaknesses appropriate action can be given (Arikunto, 2016: 48). Diagnostic test results are information about which concepts have been understood and which concepts have not been understood.

One form of diagnostic test that can be developed to identify students' concept understanding is a two-tier multiple choice diagnostic test. A two-tier multiple choice diagnostic test is a test which provides reasons for choosing answers. According to Suwanto, compared to other forms, the two-tier multiple choice test has the advantage of being easier to implement because it is easier for teachers to provide assessments. This form of diagnostic test allows students to answer questions in multiple choice form, but accompanied by the reasons why they chose the answer, so that the information obtained from students is more complete (2017: 136).

Based on the field study in SMK Abdi Negara Muntilan, it is known that there are still many students who do not understand the service company's adjustment entries learning material, this is indicated by the

daily test scores of the service company's adjustment entries learning material which are still many below the KKM.

Table 1. Accounting Practicum Daily Test Score

Score	Total Students	
	X AKL 1	X AKL 2
< 75	11	12
> 75	7	8
Total	18	20

Source: subject teacher

This means that there is a possibility that students experience misconceptions. Thus, this research is very important to be carried out with the aim of being able to assist teachers in identifying students' misconceptions in adjusting entries learning material so that teachers in measuring students' abilities do not only see the score that is used as a benchmark without seeing the possible location of errors made by students. In addition, the author also has the view that the adjusting entries learning material has an important role in learning accounting on further subjects. It is hoped that with a better understanding of the concept, students will find it easier to learn and accept the next accounting lesson.

## LITERATURE REVIEW

### Learning Evaluation

Mehrens and Lehmann in Purwanto (2013: 3) define evaluation as a series of planning processes, obtaining and providing information needed to make alternative

decisions. Meanwhile, according to Arikunto and Jabar (2010: 1-2), evaluation is an activity to collect information about how something works, which is then used to determine the right alternative in making decisions. Arifin (2017: 2) explains that evaluation is an important component and is a stage that teachers need to take to find out whether learning is running effectively or not.

From some of the above definitions, it can be concluded that learning evaluation is the process of collecting information about the performance of teachers and students involved in the learning process so that the shortcomings and strengths can be known for further improvement, for the benefit of decision making or consideration in the preparation of the next program. Evaluation can be done by means of non-test and test. Based on its function, tests is divided into 3 types, namely summative test, formative test and diagnostic test (Arikunto, 2016: 48-53).

### **Diagnostic Test**

According to Arikunto (2016: 48), a diagnostic test is a test designed to identify student weaknesses so that these weaknesses can be overcome with appropriate action. Diagnostic tests are used to find out the areas of student weaknesses so that the results can be the basis for providing follow-up in the form of treatment in accordance with the weaknesses that students have (Depdiknas,

2007: 1). Suwanto (2017: 127) also states that diagnostic tests have a function to determine learning difficulties experienced by students, including errors in understanding concepts. Based on the description above, it can be concluded that a diagnostic test is a tool used to measure the extent of a student's understanding of a lesson and test the concepts that the student knows whether they are in accordance with what is taught or not.

One form of diagnostic test is a two-tier multiple choice. It is a diagnostic test where the question form has two levels. The first tier contain questions with several answer choices and the second tier contains choice of reasons based on the first tier. This two-tier multiple choice diagnostic test is used to detect misconceptions experienced by students on certain concepts (Suwanto, 2017: 137). In line with this, Cullinane (2011: 9-10) also stated that two-tier multiple choice is an effective method as an assessment instrument and easy to identify students' misconceptions in learning.

### **Misconceptions**

Students' understanding of a concept is called conception, where each student has a different conception of a concept. Misconception can be interpreted as a difference in students' understanding of the actual concept so that the concept that students ultimately have is wrong, which if left unchecked will have an impact on the

process and learning outcomes of students. Suparno (in Suwanto, 2017: 76) states that misconceptions are improper understanding of concepts, incorrect use of concepts, errors in the classification of examples, confusion of different concepts and incorrect hierarchical relationships of concepts. Thus, it can be concluded that misconceptions are errors or interpretations of concepts that are not in accordance with scientific understanding. Misconceptions can be caused by various sources, including students, teachers, textbooks, context, and teaching methods (Suparno, 2013: 29). There are various ways that can be used to diagnose student misconceptions including multiple choice diagnostic tests, multiple choice diagnostic tests accompanied by reasons, multiple choice diagnostic tests accompanied by a choice of reasons, multiple choice diagnostic tests and descriptions, and description diagnostic tests (Suwanto, 2017: 134-144).

### **Adjustment Entries Learning Materials**

Sujarweni (2016: 44) reveals that the adjustment entries is a journal to correct certain accounts in the trial balance to reflect the actual state of assets, liabilities, income, costs and capital which is usually made at the end of the period. The adjustment entries is prepared because it describes the actual situation or amount. There are two types of accounting recording systems known in the

adjustment of income and expenses, namely recording based on time (accrual basis) and based on cash (cash basis). The circumstances that require an adjustment entries, namely adjustment for supplies, prepaid expenses, unearned revenues, accrued revenues, accrued expenses, estimated of bad debts, depreciation, bank reconciliation and error correction.

### **Research Questions**

The research questions in this study is as follows:

1. How is the product development of a two-tier multiple choice diagnostic test instrument to identify misconceptions in adjusting entries learning material for service company for students of SMK Abdi Negara Muntilan?
2. Does the developed two-tier multiple choice diagnostic test fulfil the test eligibility criteria in terms of validity?
3. Does the developed two-tier multiple choice diagnostic test fulfil the test eligibility criteria in terms of reliability?
4. Does the developed two-tier multiple choice diagnostic test fulfil the test eligibility criteria in terms of difficulty level?
5. Does the developed two-tier multiple choice diagnostic test fulfil the test eligibility criteria in terms of differentiation?

6. Does the developed two-tier multiple-choice diagnostic test fulfil the test eligibility criteria in terms of the effectiveness of the distractors?
7. Is the two-tier multiple choice diagnostic test developed able to identify misconceptions in the adjusting entries material of service companies for students of SMK Abdi Negara Muntilan?

## RESEARCH METHODS

This research is a type of development study (RnD) oriented to the development of a product. Borg and Gall (1985) stated in Sugiyono (2016: 4) that development research (RnD) is a research method used in developing or validating products / devices used in education and the teaching and learning process. In this study, the product produced is a two-tier multiple choice diagnostic test instrument for adjustment entries for service company learning material for grade XI vocational students which is tested for feasibility by material experts and evaluation experts. The development model used in this research is the 4D development model by Sivasailam Thiagarajan includes four stages, namely define, design, develop, and disseminate. In this study, the disseminate stage was not carried out, it was only carried out until the develop stage because at the develop stage the research objectives had been achieved where the

diagnostic test instrument developed was known to what extent it was feasible to use in identifying student misconceptions (Trianto, 2010: 189).

The development procedure in this study is a series of stages carried out until the final prototype of the test instrument is obtained in accordance with the research objectives. In summary, the development procedure can be seen in the following figure.

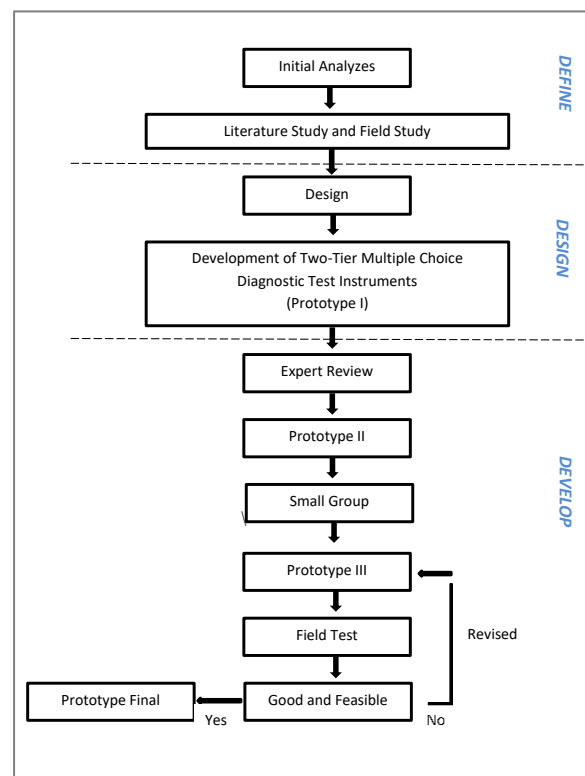


Figure 1. Flowchart of 4D Model Test Instruments Development

This research was conducted at SMK Abdi Negara Muntilan, which is located at Jalan Pemuda Barat, Ngadiretno, Tamanagung, Muntilan, Magelang. This research was carried out in December 2022 - January 2023. The subject of this research are

material expert & evaluation expert as validator, 6 students of class XI AKL 1 as the small group trial and 20 students of class XI AKL 2 as the field test.

Data collection techniques in this study were tests, questionnaires and documentation. The research instruments used for data collection are tests, validation sheets & students response questionnaire. The test in this study was used to determine the location of misconceptions experienced by students as well as to assess the effectiveness of the use of the developed product. The use of questionnaires in this study aims to measure the feasibility of diagnostic test instruments. Product feasibility questionnaires are used to obtain data regarding the feasibility of test instruments from evaluation experts, material experts, and students. The documentation data collection technique is a data collection technique obtained from secondary sources. This data is based on the results of students' daily tests on the adjusting entries learning materials obtained from the teacher teaching the accounting practicum class XI SMK Abdi Negara Muntilan.

The data analysis techniques used to assess the feasibility of the two-tier multiple choice diagnostic test are as follows: (1) validity test of two-tier multiple choice test with Aiken' V Index; (2) reliability test of two-tier multiple choice test using KR-20

formula; (3) analysis of difficulty level; (4) differentiating power analysis; (5) analysis of distractors functioning; and (6) analysis of students' misconceptions. In identifying students' conceptions with the two-tier multiple choice diagnostic test, students are divided into 2 categories, namely students who understand the concept and students with misconceptions. To find out this, we can see from the answers and reasons chosen by students. A score of 1 is given for each correct answer or reason, while for each wrong answer or reason a score of 0 is given. Based on the test results, analysis was carried out by grouping students' level of understanding into categories as follows.

Table 2. Interpretation of two-tier Multiple Choice Diagnostic Test Results

Answer Combination	Category
Correct answer - Correct reason	Understand the concept
Wrong answer - Correct reason	Misconceptions
Correct answer - Wrong reason	Misconceptions
Wrong answer - Wrong reason	Misconceptions

(Suwanto, 2010: 213)

## **RESEARCH RESULT AND DISCUSSION**

In this development research, the product produced is a two-tier multiple choice diagnostic test in accounting practicum subjects. This diagnostic test product is a learning evaluation tool used to determine



student misconceptions on the material of the adjustment entries for Service Company. Each of the research and development stages can be described as follows.

### **Define Stage**

At this stage, we started collecting research data by conducting literature studies and field studies. The literature study was conducted to find several references and information related to this research, namely regarding the two-tier multiple choice diagnostic test, misconceptions, and service company adjustment entries material. Information from the results of literature studies related to research was obtained from various sources through books, journals, theses and articles used by researchers as a reference in conducting research. In addition, at this stage an analysis of the concepts of the material that will be developed into diagnostic test instruments is also carried out. Based on the results of the analysis, the material chosen was the service company adjustment entries.

After conducting a literature study, the next step was to conduct a field study. The field study began with determining the place and subject of the research trial. The first step in determining the research location is to contact the school that will be used as a research site to ask for approval. After obtaining approval, then meet with the Head of the Accounting Department to ask for

recommendations for accounting teachers who can be used as sources in the research process. The next step is to discuss with the teacher concerned regarding the research to be carried out and ask for an agreement regarding the time and class that will be used as a trial of research subjects. The test site in this study was SMK Abdi Negara Muntilan. While the test subjects in this study were students of class XI AKL 2.

### **Design Stage**

This stage is the stage of designing a two-tier multiple choice diagnostic test instrument to identify student misconceptions based on the previous stage (define stage). The diagnostic test instrument designed consists of a test grid, instructions, diagnostic test questions, test answer keys, answer sheets, scoring guidelines, and diagnostic test interpretation guidelines. The activities carried out at this stage are as follows.

The question grid is a reference used in compiling two-tier multiple choice diagnostic test questions. The question grid in this study contains basic competencies, main material/concepts, sub-concepts of adjusting entries material, question indicators, question levels on cognitive aspects, item numbers and number of items. The cognitive aspects to be achieved are from the C2, C3, and C4 levels. The questions total 15 items along with the reasons consisting of

2 questions at C2 level, 7 questions at C3 level and 6 questions at C4 level.

Instructions for working on questions are procedures for answering questions. The instructions in this study consist of 7 points (4 points of general instructions and 3 points of specific instructions) which include what to do when going to work on the problem, namely starting with prayer, filling in personal identity, procedures for filling out the answer sheet, must be careful when reading questions and checking the answers again before submitting them to the supervisor. In this study, the working instructions were not written as a separate section but were included in the question paper.

This two-tier multiple choice question has a multiple choice format with 5 answer options at the first tier and at the second tier there are 5 answer options as reasons for the answer to the first level question. So, to work on one problem, students must choose the answer that is considered correct, then choose the reason that is considered appropriate to the answer that has been chosen. The material whose concept understanding level is measured is the service company's adjustment entries. The purpose of developing two-tier multiple choice diagnostic questions in this study is to detect students' misconceptions on the service company's adjusting entries material. The

diagnostic test questions developed were 15 items.

The answer key is the correct answer that has been provided which is used as a guide in correcting the answers chosen by students. The answer key consists of three components, namely question numbers 1 to 15, answers to questions 1 to 15, answers to the reasons for question numbers 1 to 15. The answer sheet is a sheet that serves as a place for students to write the answers chosen and considered correct. The answer sheet contains student identity which includes name, attendance number, class and two tables containing question numbers 1 to 15 along with answer choices A-E (A,B,C,D,E) and a table containing A-E (A,B,C,D,E) reason choices.

Scoring guidelines are a reference used to determine the value or score that will be given to students according to the answers chosen by students on each item. Students who answer the questions correctly will be given a score of 1, as well as students who answer the reasons correctly will be given a score of 1, on the other hand, if the student chooses the wrong answer or reason, it will be given a score of 0. So, the maximum score in each item is 2 points, while the minimum score is 0.

The diagnostic test result interpretation guideline is a tool used to identify the answers given by students. The result

interpretation guideline contains a result interpretation table to classify the answers students have given.

## **Develop Stage**

### **1. Expert validation**

Products produced at the design stage must be validated by two validators, namely material experts and evaluation experts. Both validators are Accounting Education lecturers at the Faculty of Economics and Business, Yogyakarta State University, namely Dian Normalita Purnama, M.Pd as an expert on adjusting entries material and Eka Ary Wibawa, M. Pd as an evaluation expert. Instrument validation is carried out by providing instrument validation sheets, test grids, test questions, answer keys, scoring guidelines, and test interpretation guidelines to validators. The validation results were then analyzed using Aiken's V method to calculate the content validity coefficient.

Table 3. Validity Aiken V

Assessment Aspect	$\Sigma S$	V	Criteria
1	5	0,83	Very valid
2	5	0,83	Very valid
3	5	0,83	Very valid
4	4	0,67	Medium
5	5	0,83	Very valid
6	5	0,83	Very valid
7	5	0,83	Very valid
8	5	0,83	Very valid
9	5	0,83	Very valid
Average		0,81	Very valid

Source: primary data processed

From the results of Aiken's V index, 8 of the 9 items are in the highly valid category and 1 item is in the medium category. The average value of the Aiken's V index of all items is 0.81 with very valid criteria, so the diagnostic test instrument is suitable for use. The correction results from these validators were then used as a reference in improving the instrument that had been made.

### **2. Small group**

At this stage, the revised prototype II from the expert review was tested on a small groups to assess the readability of the diagnostic test developed which was held on Monday, 2 January 2023 on several students of class XI AKL 1 non research subjects consisting of 6 students (2 low ability students, 2 medium ability students and 2 high ability students). The selection of the six students was based on recommendations from the accounting practicum teacher. Students were asked to fill out the response questionnaire that had been provided after first work on two-tier multiple choice diagnostic test questions. This student response questionnaire contains 6 statement items that must be filled in by students by giving a tick ( $\surd$ ) in the available column according to the criteria that students think meet the statement. Then count the number of students who gave a positive response to each aspect, namely criteria 1 and 2 including the "negative" category and criteria 3 and 4

including the "positive" category. If the results of the analysis show that student responses are not yet positive, then the diagnostic test instrument needs to be revised. The results of the analysis of student responses to the two-tier multiple choice diagnostic test instrument in the small-scale trial are described as follows.

Table 4. Results of Student Response Analysis

Item No.	Positive		Negative	
	F	%	F	%
1	6	100%	0	0%
2	5	83%	1	17%
3	6	100%	0	0%
4	6	100%	0	0%
5	6	100%	0	0%
6	4	67%	2	33%
<b>Average</b>		92%		8%

Source: primary data processed

Based on the student response questionnaire, the average positive response of students was 92% and the average negative response of student responses was 8%. Thus, the two-tier multiple choice diagnostic test questions can proceed to the field test.

### 3. Field test

The revised prototype from the expert review and small group stages was tested on the research test subjects, namely class XI AKL 2 students of SMK Abdi Negara Muntilan, totaling 20 students. The field test was conducted on Tuesday, 3 January 2023.

The test activity lasted for 45 minutes. Students were asked to work on a 15-item two-tier multiple choice diagnostic test. The results of the field test were then analyzed to determine the reliability, difficulty level, differentiating power, and functioning of the distractors as well as to determine student misconceptions.

### Diagnostic Test Reliability Analysis

Reliability analysis using the KR-20 formula. Based on the analysis of data calculations on Microsoft Excel software, the reliability correlation coefficient value ( $r_{11}$ ) is 0.85 with a very high reliability interpretation. Based on this analysis, it can be concluded that the two-tier multiple choice diagnostic test instrument is reliable or can be trusted to identify student misconceptions, which means that if this test is tested repeatedly the results obtained will be steady.

### Analysis of Difficulty Level

The results of the diagnostic test difficulty level analysis are as follow.

Table 5. Results of the Analysis of the Difficulty Level of the two-tier Multiple Choice Diagnostic Test

Difficulty Level	Question Item	Total	Percentage
Difficult	6,8,9	3	20%
Medium	2,3,4,5,7,10, 11,12,13,14, 15	11	73%
Easy	1	1	7%

Source: primary data processed

The results shows that of the 15 items, most of the questions, namely 73% of the questions (11 items) are included in the medium category. Questions in the difficult category 3 items and the easy category was 1 item. The average value of the difficulty level of the question is 0.49 with a medium category. So it can be concluded that the overall level of difficulty of the two-tier multiple choice diagnostic test instrument is good.

**Differentiating Power Analysis**

The results of the diagnostic test differentiator analysis are as follows.

Table 6. Results of Differentiability Analysis of Two-Tier Multiple Choice Diagnostic Tests

Differentiability	Question Item	Total	Percentage
Excellent	12	1	7%
Good	1,2,5,6,7,9,10,13,14	9	60%
Satisfactory	3,4,8,11	4	27%
Poor	15	1	7%
Very poor	0	0	0%

Source: primary data processed

The table shows that of the 15 items, 1 item (7%) has excellent differentiating power, 9 items (60%) have good differentiating power, 4 items (27%) have satisfactory differentiating power and 1 item (7%) has poor differentiating power. The results of the analysis show 94% of the questions are in accordance with the criteria for

differentiating power. Based on these results, it can be interpreted that the diagnostic test instrument developed is able to distinguish high ability students (upper group) and low ability students (lower group).

**Analysis of Distractors Functioning**

The analysis of the functioning of distractors was carried out twice, namely the distractors in the answer options and the distractors in the reason options.

Table 7. Results of the Analysis of the Distractors Functioning of two-tier Multiple Choice Diagnostic Test (Answer Options)

Item No	Distractors work	Distractors does not work	Item No	Distractors work	Distractors does not work
1	4	0	9	4	0
2	3	1	10	4	0
3	4	0	11	4	0
4	4	0	12	4	0
5	3	1	13	4	0
6	4	0	14	3	1
7	4	0	15	4	0
8	4	0			

Source: primary data processed

The table shows that in 12 items, all of the distractors were functioning and in 3 items, 1 distractor was not functioning because it was not selected by the testees. Overall, all distractors were functional because they were selected by at least 5% of the testees.

Table 8. Results of the Analysis of the Distractors Functioning of two-tier Multiple Choice Diagnostic Test (Reason Options)

Item No	Distractors work	Distractors does not work	Item No	Distractors work	Distractors does not work
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		not work			not work
1	2	2	9	4	0
2	3	1	10	4	0
3	4	0	11	3	1
4	4	0	12	4	0
5	3	1	13	3	1
6	4	0	14	4	0
7	4	0	15	4	0
8	4	0			

Source: primary data processed

The results of the analysis for the reason options show that 10 items had all functioning distractors, 4 items had 1 non-functioning distractor and 1 item had 2 non-functioning distractors. Overall, all distractors were functional because they were selected by at least 5% of the testees.

The determination of the feasibility of the two-tier multiple choice diagnostic test uses the following criteria:

- 1) The validation criteria are considered good if the Aiken's V index has a V value  $\geq 0.4$ .
- 2) Reliability criteria are considered good if the diagnostic test instrument has a  $r_{11}$  value  $\geq 0.70$  (high reliability level).
- 3) The criteria for the level of difficulty is considered good if the test instrument has a P value of 0.31 - 0.70 (medium difficulty level).
- 4) The criteria for differentiating power is considered good if the test instrument has a DP value  $> 0.2$  (satisfactory differentiating power).

- 5) A distractor is declared to be functioning properly if it is selected by at least 5% of all testees.

Based on the results of the analysis and description above, it can be concluded that the two-tier multiple choice diagnostic test developed is feasible. Referring to various previous researches regarding two-tier multiple choice diagnostic test, namely Merry Dayanti' research (2021) shows that overall two-tier multiple choice diagnostic tests are effective for identifying misconceptions. Then, Meilan Lengkong et al's research (2020) shows that the two-tier multiple choice diagnostic test developed can be used to analyze student misconceptions. In line with Khusnah's research (2019), it shows that the two-tier multiple choice diagnostic test developed is declared feasible by validator and has a reliability value with a high category.

### **Analysis of Students Misconceptions**

In identifying students' conceptions with the two-tier multiple choice diagnostic test, students are divided into 2 categories, namely students who understand the concept and students with misconceptions. To find out this, we can see from the answers and reasons chosen by students. A score of 1 is given for each correct answer or reason, while for each wrong answer or reason a score of 0 is given. The results of the diagnostic test analysis are as follows.

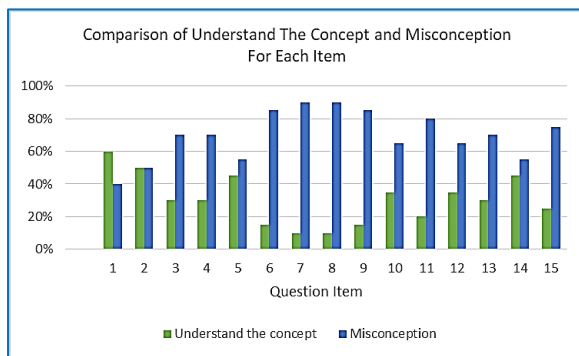


Figure 2. Comparison Chart of the Percentage of Understand the Concept and Misconception of Each Question Item

From the figure it is shows the percentage of each category on each question item. The highest misconceptions were in question number 7 and 8, while the lowest was in question number 1. As for the calculation of the percentage of overall concept understanding can be seen in the following graph.

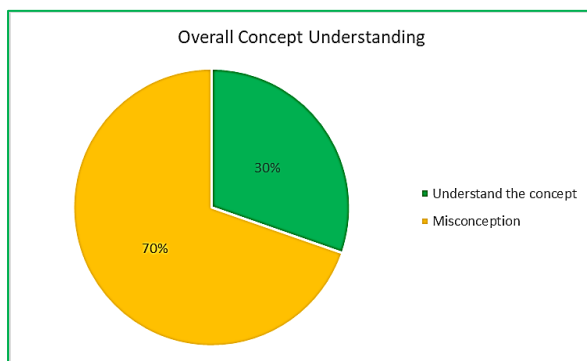


Figure 3. Percentage Chart of Overall Concept Understanding

Based on this graph, it can be seen that students' ability to understand the concept of service company adjustment entries is still lacking. This is indicated by the higher percentage of students who have misconceptions compared to those who understand the concept. From the test results, it can be said that the two-tier multiple choice

diagnostic test developed can be used to identify student misconceptions. This is in line with the opinion of Mehrens & Lehmann (in Suwanto, 2017: 114) which states that a good diagnostic test is a diagnostic test that can provide an accurate picture of student misconceptions based on information on errors made by students.

The two-tier multiple choice diagnostic test instrument developed in this study consists of 10 subconcepts. Further misconceptions on each subconcept can be seen in the following graph.

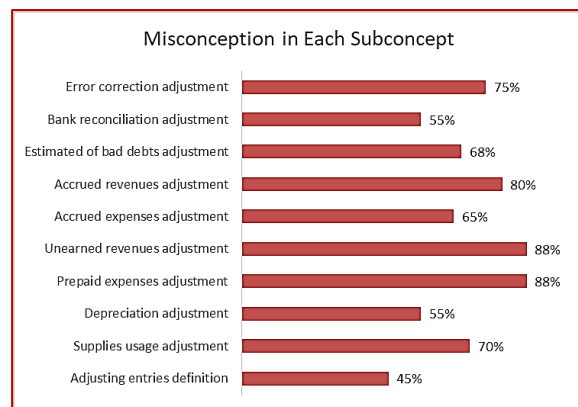


Figure 4. Percentage Chart of Misconceptions for Each Subconcept

The results of the analysis show that the most misconceptions were found in the subconcept of prepaid expenses adjustment (question items number 6 & 7) and the subconcept of unearned revenues adjustment (question items number 8 & 9). While the lowest misconception is in the subconcept of adjustment entries definition, namely question items number 1 and 2.

In the first subconcept, namely about the definition of adjustment entries, misconception in question number 1 was experienced by 8 students, while number 2 was 10 students. Students still do not understand the basis for preparing the adjustment entries, the purpose and function of the adjustment entries.

In the second subconcept, namely questions number 3 and 4 regarding supplies used adjustments, students who experienced misconceptions were 70%. Supplies usage adjustments have two recording approaches. Students misunderstand the concept, it can be seen that they are still confused about the difference between the balance sheet approach and the profit and loss approach. Students' conceptions are still lacking in understanding the relationship between the concepts of supplies adjustments and the numbers recorded whether they have been used or what is left. In addition, student errors in working on problems are also caused by students' lack of understanding of the concept of adding and subtracting ALEER (Assets, Liabilities, Equity, Expenses and Revenue). This is in line with Bagus's opinion in his research which states that students are still confused in understanding the problem and determining the number of expenses.

In the third subconcept (question number 5), namely about depreciation of fixed assets, misconceptions were experienced by 11

students or 55%. Students' conceptions are still wrong in determining the debited and credited accounts. Student errors also occur in determining the depreciation value. In calculating the depreciation value using the straight-line method, the value of fixed assets should be reduced by the residual value first before being divided by the economic life number. However, students made a calculation error in not reducing the value of the vehicle by the residual value and immediately dividing it by the economic life. Students are less careful in understanding the problem and operating numbers (Rohman, 2018: 8).

Misconceptions were also found in question numbers 6 and 7 regarding the adjustment of prepaid expenses. Students' conceptions are wrong in determining the approach used, whether the balance sheet approach or the profit and loss approach. Students misunderstand the concept in determining whether the costs recorded have been used or are still remaining. Student errors were also found in associating the effect of transactions with account debits and credits. Lenny (2019) in his/her research also revealed that the errors experienced by students were in distinguishing between two approaches, namely the balance sheet and profit/loss approaches.

The misconceptions found in the fifth subconcept of unearned revenue adjustment



(questions number 8 and 9) amounted to 88%. Students' conceptions are wrong in analyzing the recording approach used. Students misunderstood the question in determining whether the revenue that has become the right of the company is journalized or vice versa. In addition, student errors also occur in determining the affected account and its position, whether debited or credited. According to Putri (2018: 105) students' errors in analyzing unearned revenue adjustment entries transactions are still high.

In the sixth subconcept, namely question number 10 regarding accrued expenses, misconceptions were experienced by 13 students (65%). Students do not understand that accrued expenses are debt for the company. Students' conceptions are still wrong in understanding the relationship between the concepts of cost payable adjustments and the addition and subtraction of ALEER (Assets, Liabilities, Equity, Expenses and Revenue). This is in accordance with Putri's opinion which reveals that when adjusting accrued expenses, students are wrong in recording the debited and credited accounts (2018: 105).

The seventh subconcept misconception, question number 11, regarding accrued revenue was 80% (16 students). Students do not understand that accrued revenue is revenue receivable. Students' conceptions in

understanding the relationship between the concepts of adjusting revenue receivables and adding and subtracting ALEER (Assets, Liabilities, Equity, Expenses and Revenue) are still wrong. In the accrued revenue adjustment entries material, students' basic understanding of accounts is lacking, causing students to journalize debits and credits incorrectly (Putri, 2018: 105).

The misconceptions found in question numbers 12 and 13 (subconcept of bad debts) were 68%. Students' conceptions are wrong in distinguishing between the use of the direct method and the indirect method. Students are wrong in determining the accounts used and determining the accounts debited and credited. In addition, student errors in working on problems are also caused by students' lack of understanding of the concept of adding and subtracting ALEER (Assets, Liabilities, Equity, Expenses and Revenue). Research conducted by Rohman (2018: 7) revealed that students could not connect accounting concepts so that students were confused about which accounts should be journalized.

Misconceptions about question number 14 of the bank reconciliation subconcept were experienced by 11 students or 55%. Students lack understanding of the question and have difficulty analyzing transactions. Students' conceptions are lacking in determining account debits and credits and

associating them with the concepts of adding and subtracting assets, liabilities, equity, expenses and revenues. Students have difficulty understanding the information in the problem, so they have difficulty determining which accounts should be journalized (Pratiwi, 2019: 64).

Misconception is also found in question number 15 about recording errors adjustment. Students do not understand the debit and credit position of accounts, as a result students make journaling errors. This student error also occurs because students are not careful in reading the questions. According to Muhlis, Kantun and Hartanto (2020: 311) students are less careful in completing the adjustment entries. Often students do not double-check their work, so when corrected by the teacher, errors are often found.

In general, students' misconceptions are caused by students' lack of understanding and analysis of questions. Students have difficulty distinguishing between the balance sheet approach and the profit/loss approach in working on the adjustment entries. In addition, students are also mistaken in associating transactions and their effects on the concept of ALEER (Assets, Liabilities, Equity, Expenses and Revenue) so that students are often confused about which account to journalize. Student errors are also caused by students' lack of accuracy both in

reading the questions and performing arithmetic operations. This is also revealed by Wahyuni (2020: 9) that in working on the adjustment entries, students' thinking skills are still lacking, students still do not fully understand the basic concepts of accounting. Students are also less careful in performing calculations and determining account items that need to be journalized.

Student misconceptions can be caused by various things. It is possible that students experience misconceptions due to internal factors such as not paying attention during learning so that they do not understand the material. In addition, misconceptions can occur due to external factors such as unclear explanations from teachers, lack of providing a variety of practice questions and others. Misconceptions can also occur due to misconceptions that students have brought in the previous learning and became protracted until the next learning. In this research, the study results are still limited to knowing the location of students' weakness or misconceptions. To find out more about the causes of students' misconceptions and their patterns, other diagnostic techniques such as interviews or more complex diagnostic test instruments are still needed.

## **CONCLUSIONS AND SUGGESTIONS**

### **Conclusions**

Based on the results of the study, the following conclusions can be drawn.

1. The diagnostic test instrument was developed by following the development stages of the 4D model (define, design, develop & disseminate) in the form of two-tier multiple choice with 2 levels, the first tier is a question that reveals the concept that students will choose the answer and the second tier is the student's reason for choosing the answer at the first tier.
2. The diagnostic test developed as a whole is feasible, with a validity value obtained of 0.81 (very valid category). While the reliability value obtained was 0.85, including in the very high category. The instrument readability questionnaire obtained more than 50% gave a positive response. Analysis of the level of difficulty obtained is 0.49 (medium category), with a differentiating power of 0.49 in the good category. The effectiveness of distractors in tier 1 and tier 2 was concluded to be functioning.
3. The diagnostic test developed can identify misconceptions of service company adjusting entries material for students of SMK Abdi Negara Muntilan. Based on the result of the study, it is known that students who understand the

concept are 30% and misconceptions are 70%.

### **Research Limitations**

The limitations of this study are as follows.

1. In the implementation of the field test, supervision during the test was still lacking because it was only carried out by the researcher.
2. Students are still unfamiliar with the two-tier multiple choice test.
3. At the dissemination stage, it has not been carried out widely, it is still only limited to the use of products in field trials.
4. Identifying misconceptions has not been accompanied by interviews to find out more about the learning difficulties experienced by students.

### **Suggestions**

Based on the results of the study, the following suggestions can be made.

1. For teachers, to develop a two-tier multiple choice diagnostic test on other accounting subject matter so that student misconceptions are more easily identified.
2. In learning activities, teachers need to emphasize understanding of the subconcepts of unearned revenues adjustment and prepaid expenses adjustment because these misconceptions occur the most. In addition, it is also necessary to increase the number of

practice questions and variations of questions.

3. For the next researchers, it is necessary to conduct interviews to find out more about the causes of students' misconceptions and what difficulties they experience and a follow-up design is needed to deal with students' misconceptions.

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