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## ANALYSIS OF MULTIPLE-CHOICE QUESTIONS TO EVALUATE UNDERSTANDING OF THE CONCEPT OF ZERO WASTE PATTERN CUTTING

### Abstrak

Penelitian ini bertujuan untuk mengembangkan alat ukur evaluasi untuk mengukur pemahaman mahasiswa dan praktisi terhadap konsep pemotongan pola zero waste pada lembaga kursus dan pelatihan desain busana. Metode penelitian menggunakan pendekatan deskriptif kuantitatif dengan menggunakan analisis statistik SPSS 25.0 berupa uji validitas, reliabilitas, indeks kesukaran dan daya pembeda. Instrumen penelitian berupa soal pilihan ganda sebanyak 20 item yang didistribusikan melalui Google Form. Instrumen tersebut dibagikan kepada mahasiswa dan praktisi lembaga kursus dan pelatihan yang bergerak di bidang industri fashion dengan rentang usia 23 tahun hingga 73 tahun. Hasil penelitian menunjukkan bahwa alat ukur tersebut valid dan reliabel dengan tingkat kesukaran soal 80% pada tingkat sedang dan 20% pada tingkat mudah. Semua pertanyaan memiliki kekuatan pembeda yang unggul. Berdasarkan hasil penelitian dapat disimpulkan bahwa penelitian ini merupakan langkah penting untuk menciptakan keseimbangan antara pemahaman teori dan praktik dalam pembelajaran keterampilan di lembaga kursus dan pelatihan. Implikasi dari penelitian ini dapat membantu mengadaptasi pembelajaran berdasarkan pemahaman siswa dalam bidang fashion.

**Kata Kunci:** Analisa Soal, Google Form, Pemotongan Pola Zero Waste

### Abstract

This research aims to develop an evaluation measuring tool to measure students' and practitioners' understanding of the concept of zero waste pattern cutting in fashion design courses and training institutions. The research method uses a descriptive quantitative approach using SPSS 25.0 statistical analysis in the form of validity, reliability, difficulty index and distinguishing power tests. The research instrument is a 20-item multiple choice question which is distributed via Google Form. The instrument was distributed to students and practitioners of course and training institutions involved in the fashion industry with an age range of 23 years to 73 years. The research results show that the measuring instrument is valid and reliable with a question difficulty level of 80% at the medium level and 20% at the easy level. All questions have superior discriminating power. Based on the research results, it can be concluded that this research is an important step to create a balance between understanding theory and practice in skills learning in courses and training institutions. The implications of this research can help adapt learning based on students' understanding in the field of fashion.

**Keywords:** Question Analysis, Google Form, Zero Waste Pattern Cutting

### INTRODUCTION

Learning at courses and training institutions prioritizes hard skills and direct practice (Khalik et al., 2020), this has an impact on students' and practitioners' lack of understanding of the theory and concepts of material (Mailina et al., 2018). In its implementation, theory and concept learning only gets 30% of the total learning so it is very common to find that the abilities of students and practitioners are not comparable between understanding concepts and direct

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practice (PNF, 2021). So, to overcome this problem, it is necessary to carry out an assessment that is not only centered on practical abilities but must also be able to measure understanding of theories and concepts.

Based on the disparities that often arise in the learning process at course and training institutions, this research developed an evaluation measuring tool to measure the ability of students and practitioners to understand theories and concepts, especially material that has not been taught much at fashion design course and training institutions, namely the zero waste pattern cutting (Yusriyah & Ravena, 2022). The measuring tool developed in this research is in the form of multiple choice questions which are more commonly used to determine students' ability levels (Touissi et al., 2022). In the context of evaluating understanding of the concept of zero waste pattern cutting, the main focus is students' knowledge and understanding. Therefore, accurate measurements which include validity tests, reliability tests, difficulty level tests, and question discrimination tests are very important to ensure good quality of questions (Ulum & Anriani, 2023).

In this research, Google Form was used as a medium to facilitate distribution of questions (Wahyuni et al., 2023). In this era of increasingly rampant digitalization, conventional media in the form of sheets of paper are increasingly rarely used. This is based on the needs of students who want practicality, speed but better understanding than before (Santoso, 2019). Google forms can provide precise and fast feedback on answers sent by students, besides that students can explore further about material that is difficult or poorly understood. This facility provides extraordinary benefits for both students and educators. Students can explore more and more accurately material that was not previously understood, while educators can receive, recapitulate and distribute an unlimited amount (SUINDHIA, 2023).

Designing multiple choice questions that are effective and appropriate to the context is very important in order to provide an accurate picture of students' understanding (Ramadhan et al., 2023). So, to find out the quality of the questions being designed, assessment instruments are needed in the form of validity, reliability, level of difficulty and distinguishing power of the questions (Suhandi & Maemonah, 2022). Validity is important to use as a reference to measure the level of accuracy of questions (Janna & Herianto, 2021). Reliability functions as a basis for consistency when questions are used repeatedly (Dewi, 2018). The level of difficulty is useful for knowing the level of difficulty between one question and another (Mukhadis, 2016), and the distinguishing power for knowing the quality of the questions is seen from the difference in students' right and wrong answers (Ida & Musyarofah, 2021).

The ability to evaluate understanding of concepts in skills material in course and training institutions is not widely possessed by educators (Sabani et al., n.d.), therefore it is important to develop appropriate measuring tools to support a balanced learning process so that students are not only able to solve questions direct practice with accuracy but also have a strong basic understanding of theories and concepts. In the zero waste pattern cutting material, the learning process focuses more on practical learning to create designs, design patterns, and realize designs in real form (Novitasari et al., n.d.), therefore measuring tools are needed in the form of evaluating theoretical and conceptual understanding to balance skills possessed by students (Azizah & Tohani, 2020).

This research aims to analyze evaluation questions regarding understanding of the concept of zero waste pattern cutting which has not been widely developed by educators in course and training institutions by utilizing Google Form as a distribution tool to facilitate use and recording of results. The questions used as an assessment must have an objective quality that can be accounted for, so the questions are analyzed statistically which includes (1) validity analysis, (2) reliability analysis, (3) difficulty level analysis, and (4) analysis of the differentiating power of the questions.

**METHOD**

This research uses a descriptive quantitative approach that focuses on ocus tic analysis with the aim of providing an objective description of the research subject (Syahrizal & Jailani, 2023). The main focus is to test the level of validity, reliability, difficulty index and differentiating power of the questions. The research stages include (1) preparing instruments in the form of questions to be tested, (2) distributing the questions via Google Form, (3) collecting and processing data or answers from respondents, (4) data analysis using SPSS, and (5) withdrawal conclusions from the analysis results (Zikriadi et al., 2023).

This research was conducted in October 2023 online using Google Form as a distribution tool. The use of online media as an evaluation tool allows for a wider and more diverse range of respondents and more accurate results. This allows flexibility in data collection and efficient analysis (Santoso, 2019).

The data in this study are multiple choice questions designed to determine students' understanding of the concept of zero waste pattern cutting in the textile industry and fashion design which are arranged based on the indicators in table 1. 20 questions were distributed and tested on 30 respondents with a range of ages. 23 years to 73 years. All respondents involved were students and practitioners involved in the textile and fashion design industries.

Table 1 Indicators of Understanding the Zero Waste Pattern Cutting Concept

No.	Indikator
1	Memahami latar belakang dan falsafah dasar <i>zero waste pattern cutting</i>
2	Menganalisis tujuan dan manfaat <i>zero waste pattern cutting</i>
3	Memahami istilah dalam <i>zero waste pattern cutting</i>

Statistical tests to determine the quality of the questions are carried out based on four instruments, namely (1) validity, (2) reliability, (3) difficulty index, and (4) distinguishing power of the questions (Sukendra & Atmaja, 2020). The first stage of testing is a validity test to determine the validity of the questions used as research objects, then a reliability test to ensure the consistency of the questions when used repeatedly. In the next stage, a test of the item difficulty index and a test of the differentiating power of the item were carried out (Darma, 2020).

Validity tests are carried out to determine the suitability of the test items. These results can be obtained from the distribution of scores when the questions are tested on respondents (Dinata & Rosyana, 2021). To determine whether the question can be declared valid, the Pearson product moment test is carried out by paying attention to rcount. If the rcount value is greater than rtable and is supported by a significance value of less than 0.05 then the question item is declared valid.

Reliability tests are carried out to determine the consistency of question items when used repeatedly (Ida & Musyarofah, 2021). To determine the reliability value of a question item, the Cronbach alpha test is used to draw the conclusion that if the resulting value is greater than 0.06 then the question item is declared reliable or consistent.

The measurement of the level of difficulty of a question item is produced based on a comparison of the number of incorrect and correct responses (Baskoro, 2020) and then the results are compared with the difficulty index criteria in table 2.

Table 2 Categories of item difficulty index

Nilai Indeks Kesukaran	Interpretasi
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$\leq 0,30$	Sulit
0,30 - 0,70	Sedang
$\geq 0,70$	Mudah

Source: (Nurhalimah et al., 2022)

The discriminating power index of question items is classified based on the quality of the questions which can be referred to from the final score obtained by each respondent (Nurhalimah et al., 2022). This value is used as a reference in the Pearson product moment test to classify the calculated r value for each question item to obtain a distinguishing power index. There are 6 classifications of the differentiating power index categories as shown in table 3.

Table 3 Categories of Distinguishing Power Index for Question Items

Nilai Indeks Daya Pembeda	Kriteria
Negatif	Rusak
0 - 0.19	Buruk
0.20 - 0.29	Sedang
0.30 - 0.39	Baik
= 0.4	Baik sekali
> 0.4	Unggul

Source: (Alfiana et al., 2021)

## RESULTS AND DISCUSSION

### Results

The object of the research was a multiple-choice question of 20 items which were tested on 30 respondents with an age range of 23 years to 73 years, distributed using Google Form over a period of one week in October 2023. The questions were analyzed statistically including validity tests, reliability tests, difficulty index test, and distinguishing power test.

The validity test is carried out in two ways, namely 1) comparing the Pearson correlation value or rcount value with the rtable value, the rcount value must be greater than the rtable value (rcount > rtable). 2) Combining the Pearson correlation value with the significance obtained, the value obtained must be positive and supported by a significance value <0.05. Test results using Pearson correlation can be seen in table 4.

Table 4 Validity Test Results

Soal	Nilai R <sub>hitung</sub>	Nilai Signifikansi	Validitas
1	0.862	0.00	Valid
2	0.668	0.00	Valid
3	0.817	0.00	Valid
4	0.892	0.00	Valid
5	0.700	0.00	Valid
6	0.795	0.00	Valid
7	0.449	0.013	Valid
8	0.562	0.001	Valid
9	0.875	0.00	Valid
10	0.616	0.00	Valid
11	0.524	0.003	Valid
12	0.892	0.00	Valid
13	0.540	0.002	Valid
14	0.817	0.00	Valid
15	0.822	0.00	Valid
16	0.668	0.00	Valid

17	0.612	0.00	Valid
18	0.616	0.00	Valid
19	0.690	0.00	Valid
20	0.651	0.00	Valid

The reliability test based on Chronbach alpha compares the test result values with a magnitude of 0.06. If the test result value is greater than 0.06 then the question item is declared reliable. For the object of this research, the Chronbach alpha value is 0.921, so it can be stated that the results are reliable. Data is displayed in table 5.

Table 5 Reliability Test

Cronbach's Alpha	Part 1	Value	.918
		N of Items	10 <sup>a</sup>
	Part 2	Value	.891
		N of Items	10 <sup>b</sup>
	Total N of Items		20
Correlation Between Forms			.855
Spearman-Brown Coefficient	Equal Length		.922
	Unequal Length		.922
Guttman Split-Half Coefficient			.921

a. The items are: Q01, Q02, Q03, Q04, Q05, Q06, Q07, Q08, Q09, Q10.

b. The items are: Q11, Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20.

The question item difficulty index is carried out to identify the level of difficulty of each question item by comparing the test results and the question item difficulty index in table 2. The test results show that the question items are at an easy and medium level with a presentation of 20% of the questions being in the easy category and 80% questions are in the medium category. More detailed results are presented in table 6.

Table 6 Question Item Difficulty Index

Soal	Nilai R <sub>hitung</sub>	Nilai R <sub>tabel</sub>	Kriteria
1	0.47	≤ 0,30 Sulit	Sedang
2	0.77		Mudah
3	0.67		Sedang
4	0.47	0,30 - 0,70 Sedang	Sedang
5	0.67		Sedang
6	0.50		Sedang
7	0.83		Mudah
8	0.70	≥ 0,70 Mudah	Sedang
9	0.50		Sedang
10	0.70		Sedang
11	0.63		Sedang
12	0.47		Sedang
13	0.57		Sedang
14	0.67		Sedang
15	0.53		Sedang
16	0.77		Mudah
17	0.60		Sedang
18	0.70	Sedang	
19	0.73	Mudah	
20	0.57	Sedang	

The question discrimination power test functions to describe the differences in abilities possessed by each respondent and compare them with the question discrimination power categories in table 3. In this study, the results of the question discrimination power test stated that all the questions tested were in the superior category. The following more accurate data can be seen in table 7.

Table 7 Differentiating Power Test

Soal	Nilai $R_{hitung}$	Nilai $R_{tabel}$	Kriteria
1	0.862	0 - 0.19 = Buruk	Unggul
2	0.668		Unggul
3	0.817	0.20 - 0.29 = Sedang	Unggul
4	0.892		Unggul
5	0.700		Unggul
6	0.795	0.30 - 0.39 = Baik	Unggul
7	0.449		Unggul
8	0.562	= 0.4 = Baik Sekali	Unggul
9	0.875		Unggul
10	0.616		Unggul
11	0.524	> 0.4 = Unggul	Unggul
12	0.892		Unggul
13	0.540		Unggul
14	0.817		Unggul
15	0.822		Unggul
16	0.668		Unggul
17	0.612		Unggul
18	0.616		Unggul
19	0.690		Unggul
20	0.651		Unggul

**Discussion**

Evaluation of the learning process at course and training institutions is different from evaluation of learning at formal schools (Haerullah et al., n.d.). In skills learning, especially in zero waste pattern cutting material, measuring student learning outcomes is based on the ability to create and modify existing products (Maruwae et al., 2020). Therefore, different assessments are needed to measure students' ability to understand the theory and basic concepts of skills material so that they can balance practical abilities and theoretical and conceptual knowledge (Li et al., 2022).

To measure students' ability to understand theories and concepts, appropriate measuring tools are needed, namely using assessments in the form of multiple choice questions (Sosialita, 2022). Multiple choice questions are designed to broaden students' insight and make it easier to assess learning to what extent students can absorb knowledge material (Helmi & Choiruddin, 2021). Question items are designed and distributed via Google Form so that students can immediately receive feedback on each answer sent (MARLINA, 2021). Some respondents who were over 50 years old experienced some difficulties at the beginning of the process, but the evaluation process went well and obtained the results as mentioned above.

In skills learning, especially in zero waste pattern cutting material, the application of evaluation using question items as a reference for assessing students' knowledge and understanding is a new thing (Grasheli Kusuma Andhini, 2023) which is applied in courses and

training institutions. So it requires some adjustments and identification of the abilities of each respondent to determine the appropriate evaluation tools and distribution media to use. The development of this measuring tool is very important and is needed as a basic foundation for building students' knowledge as well as good practical skills (Asrul et al., 2022).

The results of developing measuring tools in this research are very useful for identifying students' abilities to determine the next level of learning (Asrul et al., 2022). Advanced learning can be tailored to students' interests, talents, knowledge and abilities. Knowing the extent of knowledge possessed by students can enable more effective learning (L Fitrianti - Al-Ishlah, 2018).

Measuring tools in the form of multiple choice questions allow respondents to choose several alternative answers provided (Kurniawan, 2021), so that they can trigger a deeper sense of curiosity about things that are not yet understood. The advantages of evaluation questions in multiple choice form include: unlimited sample size, objective, accurate, easy to summarize, and higher validity and reliability values compared to other types of questions (Marianti, 2023).

Multiple choice question instruments must be consistent when used repeatedly (B Busnawir, 2023) but the consistency of an assessment instrument is not always directly proportional to its validity/accuracy. So, to ensure the quality of the instrument is suitable for use as a measuring tool for data collection, it must undergo validity and reliability tests simultaneously (Purwanto, 2018). The validity test functions as a basis for the accuracy or accuracy of measuring instruments for assessing student learning achievements (Anggraini et al., 2022). If the instrument has gone through these two test stages and obtained appropriate results, the measuring instrument can be used as intended.

The suitability parameters of an instrument are not only determined by validity and reliability but must also be able to describe differences in students' knowledge and abilities, therefore a difficulty index instrument and the ability to differentiate questions are needed to be able to differentiate the level of ability of each student (Fatayah et al., 2022). A good question item must have a difficulty index value and discriminating power  $>0.30$  (Pradani et al., 2023).

In this study, the results obtained showed that all instruments were declared valid with the highest significance value of 0.013 and at the reliability level the resulting value was 0.921, so it can be concluded that all the questions tested were included in the valid and reliable category. Then, in the analysis of the difficulty level of the questions, two results were obtained, namely the easy and medium category levels with the presentation of 20% of the questions being declared easy and the other 80% being declared medium. Meanwhile, in the test of the differentiating power of the questions, the results showed that all the questions were categorized as superior. With these results, it can be stated that all the items tested are of good enough quality to be used as an evaluation tool and do not require improvement.

## CONCLUSION

This research developed an evaluation measuring tool in the form of multiple choice questions to measure students' understanding of the concept of zero waste pattern cutting in fashion design courses and training institutions. The results of the research show that the measuring tool is valid and reliable with a question difficulty level of 80% at the medium level and 20% on easy level. All questions have superior discriminating power. Based on the research results, it can be concluded that this research is an important step to create a balance between understanding theory and practice in skills learning in courses and training institutions. The implications of this research can help adjust learning based on students' understanding in the field of fashion. Evaluation results can help adjust learning based on student understanding. However, this research has limitations because the data was obtained from a relatively small number of respondents and only focused on one material. Therefore, further research with a

larger population and a variety of other materials is needed for more in-depth validation and development of broader evaluation measuring tools.

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