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Development of a Cognitive Assessment Instrument for Simple Business, Energy and Aircraft Materials via Wordwall

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Abstract. Cognitive assessment of kids who still frequently use paper documents and certain school-provided software. The objective of this study is to develop a legitimate, dependable, efficient, and useful tool that may be used to teach static electricity concepts through Wordwalls. This study use the ADDIE model in conjunction with the Research and Development technique. Purposive sampling is the sampling technique used, taking into account samples that have finished business, energy, and basic aviation material for science education. 52 individuals served as the samples. The study is being conducted at SMP 1 PGRI in Semarang City. Using SPSS software version 2019 and Ministep, the data analysis technique involves testing the validity, reliability, efficacy, and practicality of test instruments and questionnaires. The study's findings demonstrate that the creation of cognitive tools based on Wordwalls for learning objectives related to business, energy, and simple aircraft is valid, dependable (having received an adequate score of 0.79), effective to use (having received an average score of 74.9), and practically implemented (producing a percentage of 61.40%). This means that future researchers can build on this tool to suit their needs and the reference tools that are used to assess learning.

Keywords: Instrument development, science material, Wordwall.

1. Introduction

One of the justifications for the independent learning curriculum is that it allows educational institutions to oversee curricula based on regional autonomy, as well as providing teachers with the latitude to create and carry out instructional plans. This flexibility has been criticized in light of the current system's intricate and strict structure [1]. It is hoped that the use of various technologies will improve teaching methods. As a driver of independent learning in the independent curriculum, the teacher's role is not limited to being able to master and teach effectively in the classroom; they must also be able to create a positive environment by developing close relationships with students [2]. The speed at which information and communication technology is developing at the moment has led educational professionals to start directing exams and tests toward computerized systems in an effort to raise educational standards [3]. Given the circumstances of today, it is highly anticipated that educators will play a role in helping students acquire the knowledge and skills necessary to use technology in the classroom.

It is intended that innovation through technology can make learning—from diagnostic assessments to learning evaluations—more engaging, relevant, and difficult for teachers and students alike. One of the tasks of educators as implementers of the independent curriculum is teachers. No matter how well-developed the new curriculum is, it cannot function correctly in the teaching and learning process if the teacher is unable to apply it [4]. Therefore, teachers must have a thorough understanding of the present curriculum and all of its components. According to [5] that teachers are the primary developers of this autonomous curriculum, and as such, everyone, particularly school principals, bears full responsibility for raising the caliber of teachers' instruction. In order for students to perceive the benefits of this application on their educational journey and grow in their capacity for critical and analytical thought as well as literacy, public speaking, and creative thought [6].

In addition to providing opportunities for children to learn about themselves and the environment, science education in schools is meant to prepare them for using scientific procedures in everyday life [7]. But teachers are not as prepared to use a range of media and learning methods; they are also not as adept at using technology in the classroom; their teaching materials are too general; and when it comes to putting project-based learning into practice, teachers struggle to choose projects; they don't have enough time; they can't decide which kind of assessment is appropriate given the learning objectives; and they can't decide how to assess students during a project [8]. To explain learning progress and decide on the best course of action, teachers choose which tests are fair, proportionate, legitimate, and dependable [9]. One of the teacher's restrictions is that exams can be created using technology by using the Wordwall website. This allows for the creation of assessments that are relevant, demanding, and engaging, all of which help students advance in their science education.

Wordwall is an educational digital game that combines quiz features, animation, and sound effects into games. Teachers can use Wordwall for science instruction because science education goes beyond memorization and involves making connections between concepts and real-world phenomena [10]. Teachers should boost their students' learning focus in cycle II science classes by employing Wordwall media [11]. In addition to making it easier for teachers to analyze and obtain learning evaluation results, using Wordwall.net learning media as evaluation media can also increase students' interest in learning because, in addition to making the material easier to understand, the media offers a variety of alternative games that can be played. The creation of this Wordwall-based cognitive tool is suited for use in science education, particularly for learning objectives related to simple machines, energy, and commerce[12].

The assessment of students cognitive knowledge following the completion of the previously established learning objectives has been modified to take into account the teacher's readiness and willingness to collaborate with students, based on the results of interviews with scientific teachers. Therefore, not all learning outcomes are evaluated using tests, and evaluation tools that are employed without paper often include repetition. Using the system apps that the school already has is an additional choice. Consequently, the question items on this renewable instrument have been designed to assess students' critical thinking skills up to a high level (C4) and then feature representative images relevant to the question, and the media used for the instrument is engaging. The teacher claims according to [13] that students are still unable to respond to questions that require a high cognitive level because they are accustomed to working on difficult problems using examples from the lesson that the teacher still assists them with. As a result, when students are tested on daily repeat tests with questions of the same level, they are still unable to demonstrate high-level thinking abilities. Consistent with studies [14] showing that students' motivation to learn is significantly higher when they use Wordwall media than when they don't.As a result, pupils' cognitive level is measured up to C4 by the cognitive instrument created using Wordwaall, as their analytical capabilities already fall into the area of high cognitive abilities, or HOTS (higher order thinking skills).

Accordingly, the ADDIE model is followed in the creation of a cognitive assessment tool that uses a Wordwall as an evaluation tool. The inflexible linear and hierarchical structure of the ADDIE model is what makes each phase of the model necessary for the success of the next [15]. Accordingly, the ADDIE model is described as a learning system design model that illustrates the basic and easily learned stages of learning system design [16]. Thus, the purpose of this study is to create a Wordwall-based cognitive tool on learning objectives concerning energy, commerce, and simple machines for eighth-grade students, taking into account relevant field data and prior research.

2. Method

The research and development (RND) technique is applied in this study. The ADDIE model (Analysis, Design, Development, Implementation,Evaluation) is referenced in the study design that was employed. The following table provides an explanation of the ADDIE development model's stages:

Table 1. Stages of the ADDIE model.

Stages		Activity
Analyze	:	Examine learning results using the prepared content and the learning aim that the teacher developed. Next, gather references by reading relevant scientific publications and ebooks, and identify the Wordwall model that is used to assess cognitive features.
Design	:	Create grids, evaluation rubrics, and test forms as needed. Based on the goals of the research, choose the best Wordwall model.
Development	:	As scientific professors in schools, confer with field validators and instrument validators from lectures to develop and build test goods. In addition, class XIII will be used for small-scale instrument experiments involving a total of 29 participants. Program, namely IBM SPSSS version 29, was utilized to evaluate the instrument data. The program was used to analyze small class instrument test items linked to validity using bivariate correlation and reliability testing using Cronbach's alpha formula.
Implementation	:	Testing 54 pupils in Class VIII of PGRI Semarang City Middle School 1 using instruments. A form of applying the Rasch model is the analysis of instrument implementation in large-scale classes using Ministep software.
Evaluation	:	Students are given questionnaires about the Tets instrument that is being used for evaluation. Microsoft Excel is utilized in the analysis needed to analyze the practicality questionnaire responses.

The value interpretation criteria used in study [17] to qualify the data from students' cognitive assessment instrument outcomes. These criteria state that:

Table 2. Criteria for instrument effectiveness.

Average Value Score	Category
76 - 100	Very Effective
51 - 75	Effective
26 - 50	Less Effective
0 - 25	Not Effective

In addition, the following qualifying requirements are based on the findings of the analysis of student questionnaires using scale criteria from study [18] :

Tabel 3. Instrument praticality criteria.

Evaluation	Interpretation Criteria
$81 \leq P \leq 100\%$	Highly Appropriate
$61 \leq P \leq 81\%$	Worthy
$41 \leq P \leq 61\ \%$	Decent Enough
$21 \leq P \leq 41\%$	Not Feasible
$0 \leq x \leq 21\%$	Very Inadequate

Purposive sampling was used to choose the research sample. The foundation of purposeful sampling is the instrument's goals, which were established on three materials: energy, labor, and basic machines. Research [19] indicates that only the markers c1, c2, and c3 are utilized as a grid to gauge students' cognitive capacities in energy, work, and simple planes on concepts. Based on these results, the researcher employed indicators C1 through C4 from Bloom's theory to develop students' cognitive instruments regarding energy, work, and simple machines.The researchers made the decision to go further into the assessment of students' conceptual knowledge capacities after taking into account the findings of earlier studies as well as instructor interviews. and evaluating cognitive assessment tools as a means of assessment that is taken into account while developing new instruments. Twenty-five questions were provided, and each question took fifty minutes to complete.

In addition, the questionnaire makes use of five indications that were taken from a research study [20]. These indicators are tangibility (appearance), reliability, respondents' responsiveness, assurance, and students' empathy for the instrument. Research by [21]confirmed that the five factors—tangibility, reliability, assurance, responsiveness, and empathy are used to gauge the caliber of faculty management services Seven surveys with the Guttman scale.

3. Result and Discussions

This study results in a valid, dependable, efficient, and useful cognitive assessment tool for Wordwall-based science learning. Given that the findings align with the four steps that have been implemented in accordance with the ADDIE model, which are as follows:

3.1. *Analysis*

In order to conduct the analysis, references in the form of articles and ebooks about the learning objectives that the teacher has implemented in accordance with the findings of the interviews are gathered. It was discovered that the autonomous curriculum's achievement standards for energy, labor, and basic machines provide crucial information regarding the labor involved in moving objects and the power required to move them. Moreover, potential energy, kinetic energy, and mechanical energy are sub-materials of energy. Then, commonplace items like wheels, pulleys, tilt planes, and levers can be used to make rudimentary aircraft. Next, identify the indicators and sub-indicators related to the key material by looking up prior research references that served as reference indicators and taking into account indicators that were introduced throughout the instrument's development. Lastly, choose a multiple-choice assessment model that is appropriate for the instrument. If students select the correct answer, they will receive a score of 1, and if they select the incorrect answer, they will receive a score of 0. The same goes for choosing the markers and quantity of statements to include in a practicality questionnaire in order to gauge how satisfied students are with the exam tool.

3.2. *Design*

Currently, questions are created using the essential content of 25 items based on the indicators and sub-indicators found on the instrument grid sheet. In addition, Yosi Sarjunawati, S.Pd., a science teacher, and Prof. Dr. Supriyadi, M.Si., the supervisor, were the two expert validators for whom the researcher submitted validation sheets pertaining to the instruments. Lastly, the researcher used an open box model with a magic library motif to enter the queries on the Wordwall. As the Wordwall's appearance is shown in Figure 1.

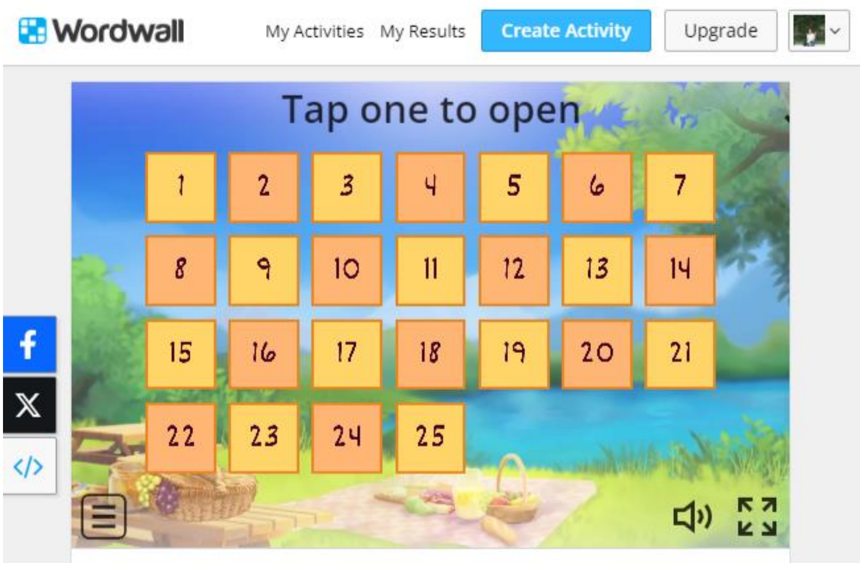

Figure 1. Display of simple energy, work and aircraft material instruments on Wordwall.

3.3. *Development*

Additionally, at this point, one instrument was developed using the previously created materials. The instrument was evaluated right away in a small class of 29 students as the two validators had not provided input notes regarding the instrument's applicability. Utilizing SPSS, an analysis was conducted based on the small-scale experiment to determine the hurdles discovered as well as the validity and reliability of the statement items. Nine invalid items were discovered to exist, specifically items 1, 2, 3, 4, 6, 14, 17, 18, and 22, and the instrument reliability value was determined to be 0.792. To conduct the reliability test, Cronbach Alpha was used. The instrument can be interpreted with a limit of more than 0.6, which is pretty reliable, a limit of 0.8, which is dependable, and above 0.8, which is very reliable, in order to determine its reliability [22]. This leads the researcher to conclude that the instrument can be trusted to be used on a large class scale. However, given that nine of the instrument's items have r calculated < from the r table at a significance level of 5%, the researcher corrects the nine invalid items with the same answers, changing the questions' display to remove the highlighted editorial and image. Students in the same class were then given the nine items that had not yet been tested back, and the results were determined using r computations in accordance with the criterion. As a result, the 25-item instrument has been deemed fully legitimate. Table 3 displays the validity outcomes of small-scale experiments.

Table 3. Validity test with bivariate correlation.

Kode Butir	R Hitung	Tanda	R Tabel	Keterangan	
				Valid	Signifikan
B1	0,807	>	0,361	Valid	Signifikan
B2	0,493	>	0,361	Valid	Signifikan
B3	0,48	>	0,361	Valid	Signifikan
B4	0,373	>	0,361	Valid	Signifikan
B5	0,613	>	0,361	Valid	Signifikan
B6	1	>	0,361	Valid	Signifikan
B7	0,979	>	0,361	Valid	Signifikan
B8	1	>	0,361	Valid	Signifikan
B9	0,496	>	0,361	Valid	Signifikan
B10	0,367	>	0,361	Valid	Signifikan
B11	0,589	>	0,361	Valid	Signifikan
B12	1	>	0,361	Valid	Signifikan
B13	0,675	>	0,361	Valid	Signifikan
B14	1	>	0,361	Valid	Signifikan
B15	0,496	>	0,361	Valid	Signifikan
B16	0,758	>	0,361	Valid	Signifikan
B17	0,029	>	0,361	Valid	Signifikan
B18	0,438	>	0,361	Valid	Signifikan
B19	0,502	>	0,361	Valid	Signifikan
B20	0,723	>	0,361	Valid	Signifikan
B21	0,686	>	0,361	Valid	Signifikan
B22	0,592	>	0,361	Valid	Signifikan
B23	1	>	0,361	Valid	Signifikan
B24	0,445	>	0,361	Valid	Signifikan
B25	0,619	>	0,361	Valid	Signifikan

Source: Researcher's SPSS results

3.4. *Implementation*

At this point, a big class scale is administered using a legitimate and trustworthy instrument. 52 pupils were present for the test in the large class under investigation, which was divided into two classes by the researcher and a trial class. In order to perform instrument analysis on item quality from a single question using the Rach model in Ministep software, three distinct forms of data interpretation and analysis of the instrument's efficiency can be performed with Microsoft Excel's assistance.

3.5. *Analysis of Rach Models*

Item fit order, Wright map, item measure, and summary statistics are used in the interpretation of Rasch model output data. In the same way that summary statistics are meant to ascertain the dependability of the instrument's items, criteria for item, person, and Cronbach's alpha reliability were developed in order to ascertain the consistency of student responses, the consistency of question item answers, and the overall reliability of the instrument.

The person dependability value of 0.75 fell into the sufficient category, the item reliability value of 0.80 fell into the good category, and the item Cronbach's alpha value of 0.76 fell into the suitable category, according to the interpretation of summary data. Thus, the instrument inquiries are good, contributing to the overall good development of the instrument. According to study [23], a variable can be said to be dependable or consistent in measurement if its reliability score demonstrates a Cronbach Alpha value > 0.60.

The next step involves doing an item fit order analysis to determine the validity (or degree of appropriateness) of the items used to explain an item working normally while assessing students' cognitive abilities. With the provisions when the MNSQ and Pt values, the outfit mean square value (MNSQ), z-standard outfit value (ZSTD), and point measure correlation value (Pt.Measure Corr) are used as the criteria for item fit order. The item is still deemed fit or maintained even though the ZSTD value does not match the criteria and the Measure Corr does not. El. The following criteria are applied to assess the appropriateness or correctness of respondents: First, 0.5 < MNSQ < 1.5 is the mean square (MNSQ) value that was obtained. Second, -2.0 < ZSTD < +2.0[1] is the recognized Z-standard (ZSTD) outfit value. Third, according to [24] that 0.4 < Pt Measure Corr < 0.85 is the acceptable point measure correlation (Pt Mean Corr) value. In light of the stated MNSQ, ZSTD, and Pt Measure Corr criteria, all of the fit order items for the instruments that were discovered were valid items.

```
|          TOTAL                         MODEL         INFIT        OUTFIT
|          SCORE      COUNT     MEASURE   S.E.      MNSQ   ZSTD   MNSQ   ZSTD
|-----------------------------------------------------------------------------
| MEAN      15.3       25.0         .61    .48       .99    .14    .97    .10
|  SEM        .6         .0         .14    .01       .02    .11    .03    .12
| P.SD       4.5         .0         .99    .10       .14    .80    .24    .84
| S.SD       4.6         .0        1.00    .10       .14    .81    .24    .84
| MAX.      24.0       25.0        3.43   1.03      1.33   2.24   1.67   2.08
| MIN.       6.0       25.0       -1.28    .42       .74   -.98    .46  -1.16
|-----------------------------------------------------------------------------
| REAL RMSE    .50 TRUE SD     .85  SEPARATION  1.68  Person RELIABILITY  .74
|MODEL RMSE    .49 TRUE SD     .85  SEPARATION  1.74  Person RELIABILITY  .75
| S.E. OF Person MEAN = .14
-------------------------------------------------------------------------------
Person RAW SCORE-TO-MEASURE CORRELATION = .99
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .76  SEM = 2.20
STANDARDIZED (50 ITEM) RELIABILITY = .86

     SUMMARY OF 25 MEASURED Item
-------------------------------------------------------------------------------
|          TOTAL                         MODEL         INFIT        OUTFIT
|          SCORE      COUNT     MEASURE   S.E.      MNSQ   ZSTD   MNSQ   ZSTD
|-----------------------------------------------------------------------------
| MEAN      31.8       52.0         .00    .33      1.00    .05    .97    .02
|  SEM       1.5         .0         .15    .01       .03    .22    .04    .20
| P.SD       7.2         .0         .74    .03       .13   1.06    .21    .99
| S.SD       7.4         .0         .75    .03       .13   1.08    .22   1.01
| MAX.      45.0       52.0        1.68    .42      1.31   2.24   1.54   2.09
| MIN.      15.0       52.0       -1.56    .31       .73  -2.53    .69  -1.84
|-----------------------------------------------------------------------------
| REAL RMSE    .33 TRUE SD     .66  SEPARATION  1.97  Item   RELIABILITY  .79
|MODEL RMSE    .33 TRUE SD     .66  SEPARATION  2.03  Item   RELIABILITY  .80
| S.E. OF Item MEAN = .15
-------------------------------------------------------------------------------
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Figure 2. Summary statistics according to the rasch model.

Item STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	JMLE MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item	
11	35	52	-.28	.32	.90	-.78	1.54	2.09	A .40	.37	73.1	70.1	A11	Valid
13	21	52	1.05	.31	1.31	2.24	1.31	1.76	B .14	.42	59.6	69.8	A13	Valid
24	24	52	.77	.31	1.12	.98	1.21	1.32	C .30	.42	63.5	69.1	A24	Valid
14	24	52	.77	.31	1.18	1.47	1.15	1.01	D .26	.42	55.8	69.1	A14	Valid
3	15	52	1.68	.34	1.16	1.02	1.13	.61	E .27	.41	67.3	74.8	A3	Valid
21	24	52	.77	.31	1.12	.99	1.14	.94	F .31	.42	67.3	69.1	A21	Valid
2	22	52	.96	.31	1.12	.97	1.11	.69	G .32	.42	59.6	69.5	A2	Valid
6	29	52	.30	.31	1.10	.87	1.12	.73	H .31	.41	65.4	68.1	A6	Valid
5	33	52	-.08	.31	1.11	.94	1.11	.61	I .29	.39	61.5	69.0	A5	Valid
1	29	52	.30	.31	1.06	.57	1.03	.22	J .36	.41	65.4	68.1	A1	Valid
18	33	52	-.08	.31	1.05	.46	1.06	.33	K .34	.39	65.4	69.0	A18	Valid
9	30	52	.21	.31	1.04	.41	.99	.03	L .37	.40	69.2	68.2	A9	Valid
20	38	52	-.60	.34	1.00	.06	.87	-.40	M .37	.35	75.0	74.4	A20	Valid
4	45	52	-1.56	.42	.98	.02	.81	-.23	l .30	.26	86.5	86.5	A4	Valid
15	42	52	-1.10	.37	.98	-.03	.77	-.52	k .36	.31	78.8	80.9	A15	Valid
23	40	52	-.84	.35	.98	-.04	.94	-.07	j .35	.33	75.0	77.5	A23	Valid
8	27	52	.49	.31	.96	-.28	.96	-.21	i .45	.41	75.0	68.4	A8	Valid
10	39	52	-.72	.34	.95	-.25	.81	-.56	h .40	.34	76.9	76.0	A10	Valid
25	37	52	-.49	.33	.92	-.53	.87	-.45	g .44	.36	76.9	72.7	A25	Valid
17	38	52	-.60	.34	.91	-.57	.78	-.73	f .45	.35	78.8	74.4	A17	Valid
7	36	52	-.38	.32	.90	-.76	.78	-.89	e .48	.37	75.0	71.4	A7	Valid
19	38	52	-.60	.34	.89	-.68	.74	-.94	d .47	.35	71.2	74.4	A19	Valid
16	30	52	.21	.31	.81	-1.72	.73	-1.65	c .59	.40	76.9	68.2	A16	Valid
12	35	52	-.28	.32	.80	-1.66	.69	-1.44	b .57	.37	76.9	70.1	A12	Valid
22	31	52	.11	.31	.73	-2.53	.69	-1.84	a .64	.40	82.7	68.2	A22	Valid
MEAN	31.8	52.0	.00	.33	1.00	.05	.97	.02			71.2	71.9		
P.SD	7.2	.0	.74	.03	.13	1.06	.21	.99			7.7	4.5		

Figure 3. Item fit order according to the rasch model.

Use item measure analysis after that. By using a high logit value to represent the maximum level of item difficulty, the analysis aims to ascertain the difficulty of the items that are shown in the measure column. According to [25], the question categories are grouped as follows: very easy with a value smaller than –SD; tough question category with a value of 0.0 logit +1 SD; easy question category with a value of 0.0 logit -1 SD; and difficult question category with a value more than +1 SD. This cognitive value development tool has an SD value of 0.74. View the figure 3.

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	JMLE MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item	
3	15	52	1.68	.34	1.16	1.02	1.13	.61	.27	.41	67.3	74.8	A3	Sukar
13	21	52	1.05	.31	1.31	2.24	1.31	1.76	.14	.42	59.6	69.8	A13	Sukar
2	22	52	.96	.31	1.12	.97	1.11	.69	.32	.42	59.6	69.5	A2	Sukar
14	24	52	.77	.31	1.18	1.47	1.15	1.01	.26	.42	55.8	69.1	A14	Sulit
21	24	52	.77	.31	1.12	.99	1.14	.94	.31	.42	67.3	69.1	A21	Sulit
24	24	52	.77	.31	1.12	.98	1.21	1.32	.30	.42	63.5	69.1	A24	Sulit
8	27	52	.49	.31	.96	-.28	.96	-.21	.45	.41	75.0	68.4	A8	Mudah
1	29	52	.30	.31	1.06	.57	1.03	.22	.36	.41	65.4	68.1	A1	Mudah
6	29	52	.30	.31	1.10	.87	1.12	.73	.31	.41	65.4	68.1	A6	Mudah
9	30	52	.21	.31	1.04	.41	.99	.03	.37	.40	69.2	68.2	A9	Mudah
16	30	52	.21	.31	.81	-1.72	.73	-1.65	.59	.40	76.9	68.2	A16	Mudah
22	31	52	.11	.31	.73	-2.53	.69	-1.84	.64	.40	82.7	68.2	A22	Mudah
5	33	52	-.08	.31	1.11	.94	1.11	.61	.29	.39	61.5	69.0	A5	Sangat Mudah
18	33	52	-.08	.31	1.05	.46	1.06	.33	.34	.39	65.4	69.0	A18	Sangat Mudah
11	35	52	-.28	.32	.90	-.78	1.54	2.09	.40	.37	73.1	70.1	A11	Sangat Mudah
12	35	52	-.28	.32	.80	-1.66	.69	-1.44	.57	.37	76.9	70.1	A12	Sangat Mudah
7	36	52	-.38	.32	.90	-.76	.78	-.89	.48	.37	75.0	71.4	A7	Sangat Mudah
25	37	52	-.49	.33	.92	-.53	.87	-.45	.44	.36	76.9	72.7	A25	Sangat Mudah
17	38	52	-.60	.34	.91	-.57	.78	-.73	.45	.35	78.8	74.4	A17	Sangat Mudah
19	38	52	-.60	.34	.89	-.68	.74	-.94	.47	.35	71.2	74.4	A19	Sangat Mudah
20	38	52	-.60	.34	1.00	.06	.87	-.40	.37	.35	75.0	74.4	A20	Sangat Mudah
10	39	52	-.72	.34	.95	-.25	.81	-.56	.40	.34	76.9	76.0	A10	Sangat Mudah
23	40	52	-.84	.35	.98	-.04	.94	-.07	.35	.33	75.0	77.5	A23	Sangat Mudah
15	42	52	-1.10	.37	.98	-.03	.77	-.52	.36	.31	78.8	80.9	A15	Sangat Mudah
4	45	52	-1.56	.42	.98	.02	.81	-.23	.30	.26	86.5	86.5	A4	Sangat Mudah
MEAN	31.8	52.0	.00	.33	1.00	.05	.97	.02			71.2	71.9		
P.SD	7.2	.0	.74	.03	.13	1.06	.21	.99			7.7	4.5		

Figure 4. Item measure according to the rasch model.

Three items were identified as difficult to adopt based on the item measure; these items became extremely difficult since the tough and difficult redactions in the KBBI had the same meaning. This suggests that errors in earlier research that were adopted may have been readjusted in this study. Regarding the products you truly enjoy, numbers 3, 13, and 2. There are now three challenging items: items 14, 21, and 24. Six of the items are simple, and they are numbers 8, 1, 6, 9, 16, and 22. Finally, the group of very easy items consists of thirteen items, specifically items 5, 18, 11, 12, 7, 25, 17, 19, 19, 20, 10, 23, 15, and 4.

3.6. *Instrument Effectiveness*

The average student score can be understood as follows based on the findings of the instrument answers. One of the key elements that affects how well learning is implemented in the classroom is effectiveness [26]. Because it has an average score of 69.8 in the effective category, this instrument is therefore useful for evaluating students' cognitive ability in the areas of energy, business, and simple aircraft. For students to continue with other models and various online-based uses, the development of this instrument has, in the beginning, provided an innovative and successful learning experience through the use of technology.

Table 4. Student scores.

No	Identitas	Skor	Nilai	No	Identitas	Skor	Nilai	No	Identitas	Skor	Nilai
1	ET	13	52	11	RAd	15	60	21	AZ	11	44
2	RA	11	44	12	RR	13	52	22	DA	11	44
3	AP	11	44	13	RF	15	60	23	MRF	12	48
4	KC	10	40	14	JAP	13	52	24	RN	8	32
5	DP	16	24	15	NN	14	56	25	AZ	18	72
6	CA	19	76	16	DAR	11	44	26	DE	7	28
7	WF	13	52	17	DK	15	60	27	AR	12	48
8	SAS	10	40	18	AA	14	56	28	AI	25	100
9	MNaF	11	44	19	M	20	80	29	HS	22	88
10	PL	10	40	20	IA	25	100	30	MRi	24	96
31	MF	10	40	41	NF	15	60	51	RR	25	100
32	DW	18	72	42	AC	25	100	52	YK	21	84
33	AF	20	80	43	Sa	18	72	53	SA	23	92
34	SD	21	84	44	FR	25	100	54	AP	24	96
35	AS	24	96	45	CA	24	96				
36	WI	19	76	46	IA	23	92				
37	B	24	96	47	TS	23	92				
38	AT	23	92	48	MA	24	96				
39	S	20	80	49	SA	24	96				
40	ADM	10	40	50	PM	25	100				
Skor rata-rata = 69,778											

Source: Researcher's Personal Data

3.7. *Evaluation*

Students who have finished the preceding instrument are now given a questionnaire. Students use instruments to provide satisfaction assessments. With a total of two statement items, the average per indicator for the tangible indicators (display) connected to the form of items in the Wordwall is thus 102. Next is the trustworthy indicator, which has an average score of 49 on one statement item. The response indicator, which has two statement items total with an average score of 75, comes next. Then, with a total of one statement item, the assurance indication (guarantee) has an average score of 45, and the empathy indicator, with a total of one item, has an average score of 36. If expressed as a specific image, the percentage for each indicator is shown in the figure 5.

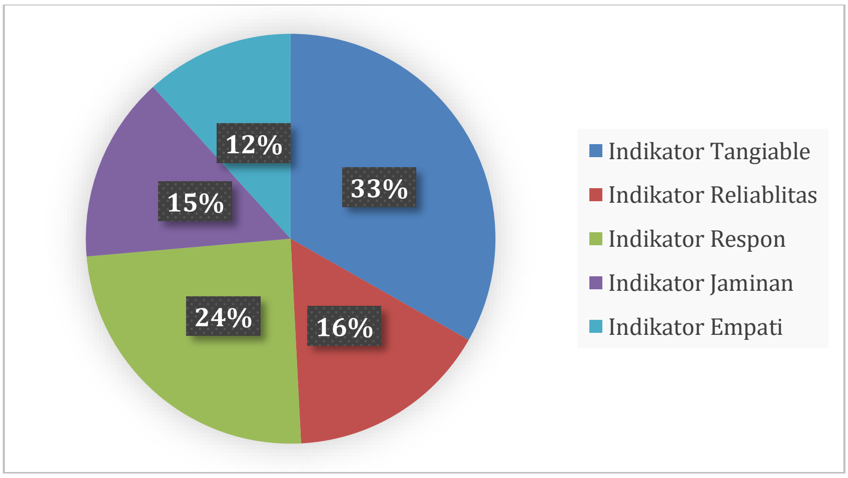

Figure 5. Results of student response questionnaire.

Source: Researcher's Personal Data

Determining the feasibility of the learning tools under development is the goal of the practicality analysis of learning tools outcomes [27] The average score for all indicators in the practical category, which will be used in the implementation of learning evaluations on energy, business, and. simple aircraft, is 61.40%, according to the results of the percentage analysis. According to [28], student responses can be used to determine practicality. According to student responses, the Wordwall's design and appearance are appealing and simple to use.

4. Counclusion

The research on the cognitive development instrument on static electricity learning outcomes has led to the following conclusion: the development instrument, which has different levels of difficulty ranging from very difficult to very easy, has been deemed valid through Rasch model analysis, with 25 items meeting the criteria for mean square fit value (MNSQ), z-standard outfit value (ZSTD), and point measure correlation (Pt.Measure Corr). Rasch model analysis was then used to determine the development instrument's reliability. This revealed that the Cronbach's alpha value was 0.79, which is already in the sufficient range. Additionally, the effectiveness of the development tool was demonstrated by the average score of 74.9 obtained from the students' response values. Subsequently, the development tool was deemed practical based on a score of 61.40% provided by students who answered the questionnaire. In order to improve the instrument's quality, it is possible to develop it with a number of additional parameters that were not investigated in this study.

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