Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram
https://e-journal.undikma.ac.id/index.php/prismasains/index
e-mail: prismasains.pkpsm@gmail.com

April 2026. Vol. 14, No. 2
p-ISSN: 2338-4530
e-ISSN: 2540-7899
pp. 585-599

Measuring the Practicality of Science Process Skills-Based Electronic Student Worksheet: A Rasch Model Analysis

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Received: March 2026; Revised: April 2026; Published: April 2026

Abstract

This study aims to measure the practicality of science process skills-based electronic student worksheet in the Biology and Environmental Concepts course of a Primary School Teacher Education Program at the University of Jambi. In this study, practicality refers to students' perceptions of ease of use, clarity of language, attractiveness of appearance, practicality in learning, practicality of science process skills-based activities, and efficiency of use. This study uses a quantitative descriptive approach involving 27 primary school education students as respondents. The research instrument is a questionnaire on the practicality of the electronic student worksheet consisting of 12 statements and analyzed using the Rasch Model with the help of Winsteps software. The Rating Scale Model was used because all items employed the same five-point response categories. The analysis was carried out to obtain the person and item reliability values, separation index, item suitability to the model, and mapping of respondent abilities and item difficulty levels. The results of the analysis show that the person reliability value is 0.82 (real) and 0.85 (model), with a Cronbach Alpha value of 0.93 which indicates the consistency of student responses in the very high category. The low item separation indicated limited spread of item difficulty and was interpreted as preliminary evidence of positive but homogeneous practicality perceptions rather than as definitive proof of broad usability. The person separation value of 2.14 (real) and 2.35 (model) indicates that the instrument is able to group respondents into three levels of practicality perception. All statement items were found to fit the Rasch Model with Infit and Outfit Mean Square (MNSQ) values ranging from 0.5 to 1.5. Wright mapping showed that the item difficulty level ranged from -0.62 to 1.10 logit and was below the average respondent's ability (mean person measure = 2.62 logit), indicating that the electronic student worksheet was generally easy to use and understand by students. Thus, the findings provide preliminary, context-bound evidence that the science process skills-based electronic student worksheet is practical for the sampled cohort and can be refined before wider implementation.

Keywords: Electronic student worksheet; Science process skills; Practicality; Rasch model; Primary school teacher education

How to Cite: Risdalina, R., Rosmalinda, D., Pamela, I. S., & Putri, A. G. E. (2026). Measuring the Practicality of Science Process Skills-Based Electronic Student Worksheet: A Rasch Model Analysis. *Prisma Sains: Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram*, *14*(2), 585–599. https://doi.org/10.33394/j-ps.v14i2.19925

https://doi.org/10.33394/j-ps.v14i2.19925

INTRODUCTION

Learning Natural Sciences, particularly the Biology and Environmental Concepts course in the Primary School Teacher Education Program, requires students not only to understand concepts but also to develop scientific skills to prepare them for becoming primary school teachers. One of the essential skills prospective teachers must master is science process skills (Kurniawati, 2021; Mandasari et al., 2021; Wola et al., 2023).

However, in practical lectures, learning is still dominated by the use of teaching materials that do not provide enough space for students to optimally develop science process skills. This is also evident in the low results of science process skills tests. This situation demands

innovative teaching materials that can facilitate active, independent, and contextual learning activities (Melesse et al., 2025; Ngozi, 2021).

To strengthen the empirical basis of this problem statement, the manuscript should report the local diagnostic evidence used by the authors, such as prior science process skills scores, needs-analysis results, lecturer reflections, or classroom observations. In the present revision, the problem is positioned as a context-specific instructional need in the Biology and Environmental Concepts course, where students require learning resources that explicitly guide observation, classification, questioning, prediction, hypothesis formulation, interpretation, conclusion drawing, and scientific communication (Amalia & Nuryady, 2025; Ayuntya & Nuryady, 2025; Azaria & Nuryady, 2025; Fauzi & Fatmawati, 2025; Husamah et al., 2025; Junes et al., 2025; Maulina & Situmorang, 2025; Rahma et al., 2025; Satria et al., 2025; Ully et al., 2024; Werdianto et al., 2025)..

The development of digital technology has driven significant transformations in the world of education, particularly in the provision of innovative and interactive teaching materials (Makarova & Makarova, 2018; Timotheou et al., 2023). One form of digital teaching material that is increasingly used is the Electronic Student Worksheet. The Electronic student worksheet allows for the presentation of learning materials, activities, and evaluations in a more flexible, engaging, and easily accessible manner for students (Chisunum & Nwadiokwu, 2024; Maharani & Marhamah, 2024; Widiantho et al., 2023). The use of electronic student worksheet also aligns with the demands of 21st-century learning, which emphasizes the development of critical, creative, collaborative, and communicative thinking skills (Dwijayanti et al., 2022; Maulana & Sopandi, 2022).

The development of electronic student worksheet also needs to be directed at strengthening science process skills (SPS) to address the problem of low science process skills among primary school teacher education students. Science process skills include the ability to observe, classify, ask questions, predict, formulate hypotheses, draw conclusions, and communicate observation results (Kriswantoro et al., 2021; Risdalina, 2024; Sutiani et al., 2021).

Science process skills play a crucial role in shaping students' ability to meaningfully understand scientific concepts through hands-on experience and the scientific process (Alali & Al-Barakat, 2024; Gizaw & Sota, 2013; Hacıeminoˇglu et al., 2022). Therefore, electronic student worksheet based on science process skills is expected to be an effective tool for facilitating active, process-oriented learning. Various studies have shown that learning oriented on science process skills can improve students' conceptual understanding, critical thinking skills, and scientific attitudes (Irwanto, 2022; Novitasari et al., 2025; Rosdianto et al., 2022). Therefore, electronic student worksheet designed based on science process skills is considered relevant and strategic to support meaningful science learning.

Previous studies have reported that the use of electronic student worksheet can increase student engagement and motivation and help teachers manage learning more effectively (Elistiyaningsih et al., 2022; Fadillah, Muhammad Aizri Usmeldi et al., 2025; Nguyen et al., 2022). Other studies have also shown that integrating science process skills into teaching materials has a positive impact on learning outcomes and higher-order thinking skills (Astalini et al., 2023; Daulai et al., 2024; Perdana et al., 2017; Supratman et al., 2023). However, most of this research has focused on the development and effectiveness testing of electronic student worksheet.

In addition to validity and effectiveness, practicality is an important indicator in developing teaching materials. Practicality indicates the extent to which electronic student worksheet is easy to use, understand, and implement for both educators and students (Risamasu & Pieter, 2024). Practical teaching materials will increase the chances of learning being implemented in accordance with the designed objectives (Idayanti & Suleman, 2024; Tukiyo et al., 2024). However, practicality measurements are often still conducted conventionally with

simple descriptive analysis, thus failing to provide in-depth information regarding the quality of the instrument and user responses.

The practicality framework in this study was operationalized through six dimensions: ease of use, language clarity, appearance attractiveness, practicality in learning, practicality of SPS-based activities, and efficiency. These dimensions reflect both instructional practicality and usability-oriented aspects of digital learning media, so the instrument does not merely ask whether students like the worksheet but also whether the worksheet can be accessed, understood, followed, and used efficiently during learning.

One measurement approach that can provide more objective and accurate results is the Rasch Model. The Rasch Model is part of item response theory that can convert ordinal data into interval data and simultaneously analyze the suitability of items and respondents (Avcu, 2025). Through the Rasch Model, researchers can more comprehensively determine the level of item difficulty, respondent consistency, and instrument reliability (Boone, 2016; Ridzuan et al., 2020; Yasin et al., 2018). Therefore, the use of the Rasch Model in measuring the practicality of electronic student worksheet is expected to produce more in-depth and scientifically accountable information.

The methodological contribution of using Rasch analysis lies in its ability to examine information that is not available from conventional mean scores, including person-response consistency, item fit, item hierarchy, person-item targeting, potential ceiling effects, and whether particular items need revision (Stano et al., 2024). Therefore, this study is positioned primarily as a preliminary Rasch-based practicality evaluation rather than as a full effectiveness study.

Based on the description, this study aims to measure the practicality of electronic student worksheet based on science process skills using the Rasch Model. The results of this study are expected to contribute to the development of practical, high-quality digital teaching materials and support science learning oriented towards the development of science process skills.

The study was guided by the following research questions: (1) How consistent are students' responses in assessing the practicality of the science process skills-based electronic student worksheet? (2) How do the practicality questionnaire items fit the Rasch Model? (3) What does the Wright map reveal about the targeting between students' practicality perceptions and item difficulty? (4) What aspects of the electronic student worksheet require refinement before broader implementation?

METHOD

Design and Rationale

This study employed a quantitative descriptive product-evaluation design. The Rasch Model was selected because the questionnaire data were ordinal Likert responses that needed to be transformed into interval-level logit estimates while simultaneously evaluating person reliability, item reliability, fit statistics, and person-item targeting.

This research is a quantitative descriptive study that aims to measure the practicality of electronic student worksheet based on science process skills using the Rasch Model. A quantitative approach is used to analyze user responses to electronic student worksheet objectively and measurably.

The research subjects were students of the Primary School Teacher Education Program at Jambi University who had used electronic student worksheet in their Biology and Environmental Concepts course. The number of respondents in this study was 27 students selected using the Convenience Sampling technique.

Participants and Learning Context

The participants were 27 students who had experienced learning with the electronic student worksheet in the Biology and Environmental Concepts course. Because the sample was selected through convenience sampling from one program and one course, the findings should

be interpreted as an initial practicality evaluation rather than as evidence that can be generalized to all primary teacher education students. Future revisions should add participant characteristics such as semester level, gender distribution, prior digital learning experience, and the number of sessions in which the e-worksheet was used.

The data collection instrument was an electronic student worksheet practicality questionnaire, compiled based on practicality indicators. The questionnaire used a five-level Likert scale: strongly disagree, disagree, neutral, agree, and strongly agree. The questionnaire indicators and descriptors are shown in the Table 1.

Table 1. Product Practicality Questionnaire Grid

Indicator	Item	Item Number
Ease of Use	The electronic student worksheet is easy to access and use via digital devices.	K 1
	Instructions for using electronic student worksheet are easy for students to understand.	K 2
Clarity of Language	The language in electronic student worksheet is clear, communicative, and in accordance with the characteristics of primary school teacher education students.	K 3
	The scientific terms in the metamorphosis material are presented in easy-to-understand language.	K 4
Appearance Attractiveness	The appearance of electronic student worksheet is attractive and increases students' interest in learning.	K 5
	The layout, colors, and illustrations support comfortable reading.	K 6
Practicality in Learning	The electronic student worksheet is practically used in primary school science lectures.	K 7
	electronic student worksheet can be used independently by students.	K 8
Practicality of Science Process Skills-Based Activities	The steps for SPS activities in electronic student worksheet are easy to follow.	K 9
	Instructions for practical activities are presented clearly.	K 10
Efficiency of Use	The electronic student worksheet helps students learn more effectively and efficiently.	K 11
	The electronic student worksheet makes it easier for students to complete and submit assignments.	K 12

Note: The data obtained were analyzed using the Rasch Model with the help of Winsteps software. The analysis included person and item reliability tests, separation indexes, item fit analysis, and person -item maps. Item fit criteria were determined based on the Infit and Outfit Mean Square (MNSQ) values, which ranged from 0.5 to 1.5.

Product Description

The electronic student worksheet was designed to support science process skills in the Biology and Environmental Concepts course. It guides students through activities such as observing phenomena, classifying information, formulating questions, predicting, proposing hypotheses, interpreting findings, drawing conclusions, and communicating results. The worksheet also includes instructions, learning tasks, illustrations, and assignment-submission activities that can be accessed through digital devices. To respond to the reviewers' request, the final manuscript should insert representative screenshots of the product, including the cover or opening page, one activity page, one SPS task page, and one assessment/submission page.

Data Collection Procedure and Ethics

The questionnaire was administered after students had used the electronic student worksheet in the course. Participation was voluntary, responses were used only for research

purposes, and students were informed that their responses would be treated anonymously and would not affect course grades. The manuscript should add the institutional approval or consent statement used in the study, including approval number and date if available.

Rasch Analysis Settings

Because the questionnaire used the same five-point Likert categories for all items, the Rating Scale Model was used. The analysis should report not only person and item reliability but also response category functioning, item measures, standard errors, Infit and Outfit MNSQ, ZSTD, PTMEA correlations, person fit, and person-item targeting. Extreme scores and misfitting response patterns should be checked before final interpretation.

RESULTS AND DISCUSSION

To improve readability, the results are organized according to the main Rasch outputs: person reliability and separation, item reliability and separation, item fit, person fit, and Wright map targeting. The discussion then interprets what these outputs mean for product refinement and future implementation.

The practicality data of the Science Process Skills-based electronic student worksheet was analyzed using the Rasch Model with the assistance of Winsteps software. This analysis aims to obtain an overview of the quality of the instrument and the consistency of student responses in assessing the practicality of the developed product.

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	51.4	12.0	2.62	.62	.97	-.03	.94	-.10
SEM	1.4	.0	.32	.02	.13	.26	.13	.26
P.SD	7.1	.0	1.63	.13	.64	1.33	.66	1.33
S.SD	7.2	.0	1.66	.13	.65	1.36	.67	1.35
MAX.	59.0	12.0	5.64	1.05	3.17	4.57	3.21	4.35
MIN.	21.0	12.0	-1.72	.27	.05	-2.14	.03	-2.57

REAL RMSE	.69	TRUE SD	1.47	SEPARATION 2.14	PERSON RELIABILITY .82
MODEL RMSE	.64	TRUE SD	1.50	SEPARATION 2.35	PERSON RELIABILITY .85

S.E. OF PERSON MEAN = .32

PERSON RAW SCORE-TO-MEASURE CORRELATION = .90

CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .93 SEM = 1.84

STANDARDIZED (50 ITEM) RELIABILITY = .96

Figure 1. Person Summary Statistics at Winsteps

Based on the results of the Summary Statistics Person, the person reliability values were 0.82 (real) and 0.85 (model). These values indicate that the level of consistency of respondents' answers to the electronic student worksheet practicality questionnaire was in the good category. This means that respondents provided relatively stable and non-random responses, so the resulting data can be trusted to represent perceptions of the practicality of electronic student worksheet based on science process skills. Theoretically, a person reliability value of ≥0.80 in Rasch analysis indicates high response stability, this value also contributes to increasing validity, credibility of findings, and also reduces the potential for bias in the analysis (Arviyenna et al., 2025).

A Cronbach's Alpha value of 0.93 reinforces these findings by demonstrating very high internal reliability. The previous label KR-20 was corrected because KR-20 is intended for dichotomous items, whereas this study used a five-point Likert scale. This indicates that all questionnaire items support each other in measuring the same construct of practicality. Furthermore, the person raw score-to-measure correlation of 0.90 indicates a very strong relationship between respondents' raw scores and their estimated abilities (logit), thus the measurement results are considered internally valid.

Person separation values of 2.14 (real) and 2.35 (model) indicate that the instrument is able to group respondents into approximately three levels of response tendency (high, medium, and low). This indicates that the practicality questionnaire is quite sensitive in distinguishing the level of perception of the practicality of electronic student worksheet among respondents. This is in line with the opinion that states that a separation value above 2.00 indicates that the instrument has good discrimination power and is able to differentiate respondent performance (Arviyenna et al., 2025)s.

The average measure person of 2.62 logits indicates that respondents generally responded positively to the practicality of electronic student worksheet. This value is higher than the midpoint of the logit scale (0.00), indicating that electronic student worksheet is perceived as easy to use, clear, and useful in science learning based on science process skills.

However, the mean person measure of 2.62 logits also indicates a potential targeting issue or ceiling tendency because the average respondent perception was far above the average item difficulty. This means that the items were generally easy for respondents to endorse, and the instrument may need additional, more diagnostic items to capture higher levels of practicality demands.

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	115.8	27.0	.00	.38	1.04	.15	.94	-.15
SEM	.9	.0	.13	.00	.12	.30	.09	.26
P.SD	3.0	.0	.43	.01	.39	1.00	.29	.87
S.SD	3.1	.0	.45	.01	.40	1.04	.30	.91
MAX.	120.0	27.0	1.10	.39	1.92	2.08	1.48	1.37
MIN.	108.0	27.0	-.62	.35	.54	-1.29	.55	-1.43

REAL RMSE	.41	TRUE SD	.11	SEPARATION	.27	ITEM	RELIABILITY	.07
MODEL RMSE	.38	TRUE SD	.20	SEPARATION	.52	ITEM	RELIABILITY	.21
S.E. OF ITEM MEAN = .13								

ITEM RAW SCORE-TO-MEASURE CORRELATION = -1.00
Global statistics: please see Table 44.
UMEAN=.0000 USCALE=1.0000

Figure 2. Item Summary Statistics on Winsteps

Based on the Summary Statistics Item, item reliability values were 0.07 (real) and 0.21 (model), and item separation values were 0.27 (real) and 0.52 (model). These values indicate that the variation in difficulty levels between items is relatively low, so differences in difficulty levels between items are not particularly striking. From a Rasch measurement perspective, low item separation values indicate that the distribution of item difficulty is not very widespread, thus limiting the instrument's ability to differentiate between item difficulty strata (Bintang & Suprananto, 2024). This condition is common in practicality instruments, as most items tend to elicit positive responses when the evaluated product is deemed suitable for use. Recent research has shown that in perception-based evaluation instruments, the homogeneity of respondent responses can lead to relatively low item reliability and separation index values due to a narrow distribution of item difficulty (Harun et al., 2023).

This result should be interpreted critically. The very low item reliability and separation indicate that, in this sample, the instrument could not strongly differentiate the hierarchy of item difficulty. Therefore, the Rasch results support preliminary evidence of positive user perception but do not yet provide strong evidence for fine-grained item-level discrimination. A future version of the instrument should include more challenging items, broader practicality indicators, and several carefully worded reverse or diagnostic items to reduce acquiescence bias.

The average item measure of 0.00 logit indicates that item difficulty falls within the average range of respondents' abilities. This indicates that the practicality questionnaire items

were structured proportionally and relevant to the respondents' characteristics, so that no items were extremely easy or extremely difficult. In Rasch theory, the average item difficulty is calibrated by default at 0.00 logit as the reference point for the measurement scale, so that the estimated respondent's ability and item difficulty are within the same linear measurement system (Pratiwi & Sugiharto, 2025)

Although the item separation and item reliability values were relatively low, this does not necessarily indicate poor instrument quality. Rather, this condition indicates that respondents provided relatively homogeneous assessments of the practicality of the E-LKPD. In other words, the E-LKPD was perceived as practical by users evenly, resulting in minimal variation in difficulty levels between items. This finding aligns with Rasch studies on educational instruments, which show that low variation in item difficulty levels can reflect the consistency of respondents' perceptions of the construct being measured, especially when the product has undergone a previous validation stage (Bintang & Suprananto, 2024; Harun et al., 2023).

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%	PERSON
26	59	12	5.64	1.05	.77	.00	.40	-.50	.77	.14	91.7	91.6	026L
19	58	12	4.84	.78	.75	-.35	.57	-.68	.79	.18	83.3	83.3	019P
22	58	12	4.84	.78	1.11	.38	1.16	.46	-.11	.18	83.3	83.3	022P
5	57	12	4.31	.68	1.05	.25	1.01	.16	.09	.20	75.0	75.0	005P
12	57	12	4.31	.68	.94	-.04	.98	.09	.26	.20	75.0	75.0	012P
23	57	12	4.31	.68	.81	-.42	.77	-.49	.60	.20	75.0	75.0	023P
2	56	12	3.89	.62	.86	-.44	.85	-.45	.47	.21	75.0	68.3	002P
3	56	12	3.89	.62	.81	-.64	.78	-.71	.59	.21	75.0	68.3	003P
15	56	12	3.89	.62	.75	-.88	.73	-.93	.72	.21	75.0	68.3	015L
7	55	12	3.53	.59	.85	-.61	.88	-.49	.44	.21	83.3	61.9	007P
8	54	12	3.20	.57	.78	-1.06	.77	-1.07	.59	.21	75.0	57.7	008P
24	53	12	2.87	.57	2.53	4.57	2.54	4.35	-.36	.21	33.3	57.4	024P
14	52	12	2.54	.58	1.30	.99	1.37	1.12	.63	.20	50.0	63.1	014P
20	52	12	2.54	.58	.91	-.19	.96	.00	.01	.20	66.7	63.1	020P
17	51	12	2.20	.60	.75	-.56	.73	-.60	.24	.19	75.0	69.5	017P
6	50	12	1.83	.62	.64	-.65	.63	-.64	.11	.19	83.3	74.8	006P
10	50	12	1.83	.62	3.17	2.93	3.21	2.93	-.37	.19	33.3	74.8	010P
11	50	12	1.83	.62	.51	-1.02	.48	-1.09	.49	.19	83.3	74.8	011P
18	50	12	1.83	.62	.64	-.65	.63	-.64	.11	.19	83.3	74.8	018P
21	50	12	1.83	.62	1.85	1.51	1.84	1.48	.59	.19	50.0	74.8	021L
9	49	12	1.44	.63	.46	-.82	.48	-.82	-.29	.19	91.7	78.4	009P
13	49	12	1.44	.63	.35	-1.15	.35	-1.22	.23	.19	91.7	78.4	013P
27	49	12	1.44	.63	.37	-1.08	.38	-1.11	.13	.19	91.7	78.4	027P
16	48	12	1.06	.61	.05	-2.14	.03	-2.57	.00	.22	100.0	79.6	016P
25	48	12	1.06	.61	.77	-.06	.86	.03	.07	.22	83.3	79.6	025P
1	44	12	.05	.40	.82	-.08	.84	.06	-.30	.39	58.3	69.9	001L
4	21	12	-1.72	.27	1.48	1.40	1.27	.60	.18	.32	25.0	25.2	004P
MEAN	51.4	12.0	2.62	.62	.97	-.03	.94	-.10			72.8	71.3	
P.SD	7.1	.0	1.63	.13	.64	1.33	.66	1.33			18.9	11.9	

Figure 3. Person Measure Winsteps

The results of the Rasch Model person measure analysis showed that the majority of respondents had a positive perception of the practicality of electronic student worksheet based on science process skills. The average person measure value of 2.62 logits indicated that respondents tended to agree with practicality statements that included ease of use, clarity of language, attractiveness of appearance, practicality in learning, and efficiency of using electronic student worksheet. The distribution of person measure values in the range of -1.72 to 5.64 logits indicated that there were variations in the level of respondents' perceptions, with a dominance in the positive category.

The person measure output also provides information on differences in individual perceptions and the quality of respondents' responses. Respondents with high logit values indicate very positive perceptions, while those with lower logits tend to be more critical. This

variation reflects user characteristics, not instrument inconsistencies. This is reinforced by the average Infit MNSQ value of 0.97 and Outfit MNSQ of 0.94, which are within the ideal range (0.5–1.5), indicating that the respondent response pattern is consistent and in line with Rasch Model expectations.

Furthermore, most respondents had ZSTD scores close to 0, indicating no significant deviant responses. Although some respondents had relatively high Outfit ZSTD scores, their MNSQ scores were still within the tolerance limit and therefore not categorized as misfit. The agreement between the observed and expected exact match scores also indicated that respondents understood the statement items well and provided consistent responses. Therefore, no respondents needed to be excluded from the analysis, and all personal data were deemed suitable for interpreting the practicality of the electronic student worksheet and supporting the validity and reliability of the research findings.

For transparency, the final manuscript should add a person-fit summary indicating whether any respondents exceeded the selected misfit criteria. If all respondents were retained, the reason should be explicitly stated, for example because their MNSQ values remained within the accepted range and no response pattern substantially distorted the analysis.

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
8	108	27	1.10	.35	1.14	.46	1.33	.81	.51	.70	63.0	70.2	K8
9	113	27	.41	.39	.83	-.27	.93	-.09	.61	.70	74.1	72.9	K9
10	113	27	.41	.39	.54	-1.14	.55	-1.36	.74	.70	81.5	72.9	K10
1	116	27	-.03	.38	.56	-1.29	.57	-1.43	.77	.68	81.5	70.8	K1
4	116	27	-.03	.38	1.92	2.08	1.48	1.37	.56	.68	63.0	70.8	K4
2	117	27	-.18	.38	1.44	1.28	1.02	.17	.57	.67	66.7	71.0	K2
3	117	27	-.18	.38	.90	-.19	.98	.05	.65	.67	63.0	71.0	K3
5	117	27	-.18	.38	.81	-.52	.76	-.70	.77	.67	85.2	71.0	K5
6	117	27	-.18	.38	.83	-.43	.79	-.58	.83	.67	77.8	71.0	K6
11	117	27	-.18	.38	1.42	1.23	1.06	.29	.67	.67	74.1	71.0	K11
7	118	27	-.33	.38	1.26	.91	1.25	.80	.70	.66	66.7	70.9	K7
12	120	27	-.62	.38	.89	-.35	.62	-1.14	.76	.64	77.8	71.8	K12
MEAN	115.8	27.0	.00	.38	1.04	.15	.94	-.15			72.8	71.3	
P.SD	3.0	.0	.43	.01	.39	1.00	.29	.87			7.8	.8	

Figure 4. Item Measure Winsteps

The results of the Rasch Model item measure analysis indicate that all items in the electronic student worksheet practicality statement are within a reasonable difficulty range and are in accordance with the respondents' abilities. The item measure values range from –0.62 to 1.10 logit, with an average value of 0.00 logit, indicating that the item difficulty level is generally balanced with the respondents' perception tendencies. The item with the highest logit value is K8 (1.10 logit), indicating that the statement regarding the independent use of electronic student worksheet is the aspect that is relatively most difficult for respondents to agree with. In contrast, item K12 (–0.62 logit) is the statement that is easiest to agree with, indicating that electronic student worksheet is very helpful for students in completing and submitting assignments efficiently.

Table 2. Item-level Rasch reporting and product-revision implications.

Item	Practicality aspect	Measure / fit information to report	Revision implication
K1-K12	All questionnaire items	Measure, SE, Infit MNSQ, Outfit MNSQ, ZSTD, PTMEA Corr.	Insert complete Winsteps item table in the final manuscript.
K8	Independent use of the e-worksheet	Highest item difficulty = 1.10 logit	Add onboarding tutorial, clearer navigation, and embedded help.

Item	Practicality aspect	Measure / fit information to report	Revision implication
K12	Completion and submission of assignments	Lowest item difficulty = -0.62 logit	Maintain this feature because it was easiest for students to endorse.

In terms of model fit, the average Infit MNSQ value of 1.04 and Outfit MNSQ of 0.94 are within the ideal range (0.5–1.5), so all items are deemed fit to the Rasch Model. No items showed extreme MNSQ values or ZSTD outside the tolerance limit indicating serious deviations. This indicates that each statement item functions consistently in measuring the construct of electronic student worksheet practicality.

In addition, the point measure correlation (PTMEA Corr.) values for all items were positive, indicating that all items had the correct measurement direction and were in line with the construct of practicality. The agreement between the exact match values of observations and expectations also indicated that respondents could understand the statements well and provided stable responses. Thus, the results of the item measure analysis confirmed that all practicality questionnaire items were suitable for use, did not require deletion or revision, and supported the conclusion that the electronic student worksheet based on science process skills had a good level of practicality.

Although all items showed acceptable fit, acceptable fit alone does not eliminate the need for instrument refinement. The low item separation and high person mean indicate that the current items may not be sufficiently difficult or varied to distinguish higher levels of user practicality perception.

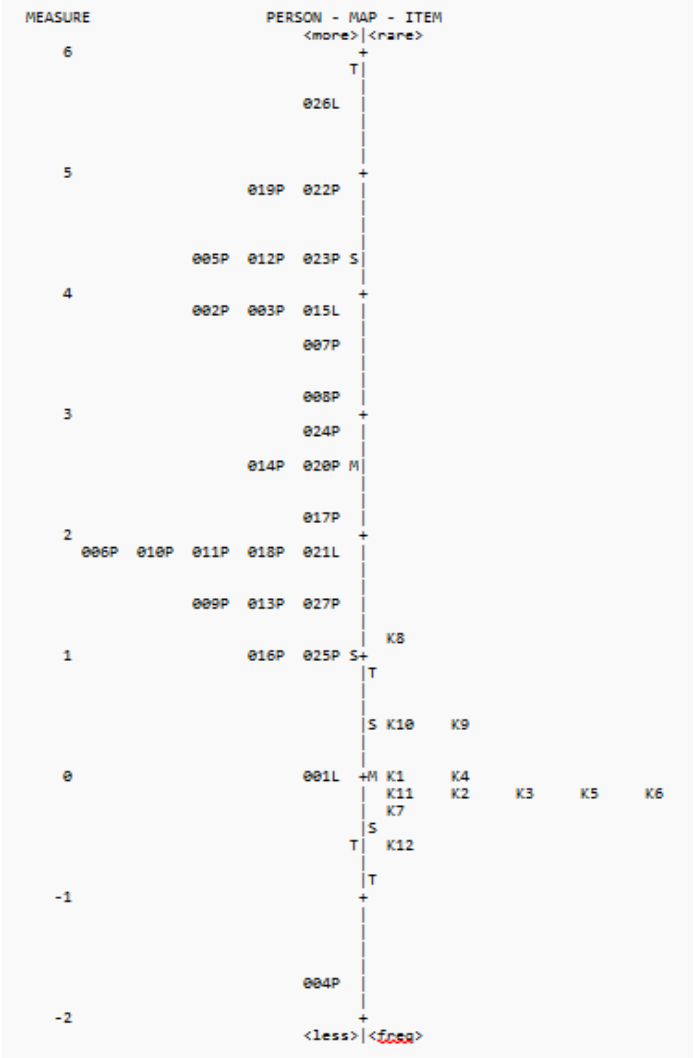

Figure 5. Wright Map Winsteps

The Wright map shows the distribution of respondents' abilities and the difficulty level of the electronic student worksheet practicality items on the same logit scale. The mapping results show that most respondents are in the logit range of 0 to +4, which indicates that the majority of students have good abilities in using electronic student worksheet based on Science Process Skills.

Practicality items ranged in logit range from −0.5 to +1.5, indicating that they were in the easy to moderate category. Some items were at relatively higher logits, while others were at lower logits, indicating adequate variation in item difficulty levels.

In general, the items were ranked below the average respondent's ability. This indicates that the developed electronic student worksheet is easy to use and understand for students, thus having a high level of practicality. Furthermore, the proportional distribution of items indicates that the practicality instrument is able to effectively measure student perceptions without any tendency for items to be too easy or too difficult.

The Wright map also provides direct guidance for product improvement. Because K8 was the most difficult item to endorse, independent use appears to be the main aspect requiring refinement (Bernard et al., 2019; Dozier et al., 2023). The product should therefore include clearer starting instructions, a brief tutorial, navigation cues, examples of completed tasks, and troubleshooting guidance. Conversely, K12 suggests that the assignment-completion and submission features were perceived as highly practical and should be retained.

This study has several limitations. First, the sample consisted of only 27 students from one course and one institution, so the findings are context-bound. Second, convenience sampling limits the generalizability of the results. Third, the data were based on self-report perceptions, which may be affected by social desirability or students' familiarity with the lecturer and course. Fourth, the study did not triangulate questionnaire results with observation, task-completion time, usability testing, learning analytics, or interviews. Fifth, the very low item reliability and separation indicate that the instrument requires refinement before it can provide stronger item-hierarchy evidence.

CONCLUSION

The results of the analysis using the Rasch Model indicate that the electronic student worksheet based on Science Process Skills in the Biology and Environmental Concepts course provided preliminary, context-bound evidence of practicality among the sampled students. This is indicated by the good consistency of student responses, high instrument reliability, and all statement items that are stated to fit the Rasch Model. Wright mapping also shows that the difficulty level of practicality items is below the average ability of respondents, which indicates that the electronic student worksheet is easy to use, understand, and implement in science learning in primary school teacher education program. Nevertheless, the low item reliability and separation show that the instrument should be refined before the findings are used to support broader implementation claims.

The use of the Rasch Model in this study was able to provide more objective and comprehensive practicality measurement information compared to conventional descriptive analysis, thereby strengthening the validity of the research findings. In particular, Rasch analysis identified not only positive practicality perceptions but also targeting limitations and the need to improve items related to independent use. Based on these results, it is recommended that Science Process Skills based electronic student worksheet can be implemented more widely in science learning in primary school teacher education program. Wider implementation should be conducted gradually and accompanied by product documentation, usability observation, and effectiveness testing. Future research should test the effectiveness of electronic student worksheet on improving student learning outcomes and science process skills, and involve a larger number of respondents and different learning contexts to obtain stronger generalizability of the results.

RECOMMENDATION

Based on the findings of this study, the Science Process Skills-based electronic student worksheet has been proven to have a high level of practicality and is suitable for use in science learning, particularly in the Biology and Environmental Concepts course in the Primary School Teacher Education Program. Practically, lecturers should provide an initial orientation before students use the worksheet independently, especially because the independent-use item was the most difficult aspect to endorse. Therefore, it is recommended that this electronic student worksheet be implemented more widely to support active and process-oriented science learning. For research purposes, the practicality questionnaire should be refined by adding more discriminating items and by reporting complete Rasch diagnostics, including category functioning, dimensionality, item fit, person fit, and targeting.

Future studies are recommended to further examine the effectiveness of the electronic student worksheet in improving students' learning outcomes, science process skills, and higher-order thinking skills. In addition, future research should involve a larger number of participants and different educational contexts to obtain more comprehensive results and strengthen the generalizability of the findings.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to the Primary Teacher Education Study Program, Faculty of Teacher Training and Education, Universitas Jambi, for the institutional support provided during the implementation of this research. The authors also appreciate all students who participated as respondents and contributed valuable data for this study.

FUNDING INFORMATION

This research received no external funding.

AUTHOR CONTRIBUTIONS STATEMENT

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Risdalina	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓
Desy Rosmalinda	✓		✓	✓			✓			✓	✓	✓		
Issaura Sherly Pamela	✓		✓	✓			✓			✓	✓	✓	✓	
Andi Gusmaulia Eka Putri	✓		✓	✓			✓			✓	✓	✓	✓	

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [R. R.], upon reasonable request.

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