Jurnal Multidisiplin Sahombu
Volume 5, Number 08, 2025, DOI 10.58471/jms.v5i08
ESSN 2809-8587 (Online)
https://ejournal.seaninstitute.or.id/index.php/JMS/index

Evaluation of Instruments on Online Self-Directed Learning Methods in Secondary Schools Using the Rasch Model

Arif Nurhidayat
Universitas Bina Sarana Informatika. Jl. Kramat Raya No. 98, RT.2/RW.9, Kwitang, Kec. Senen, Kota Jakarta Pusat, Daerah Khusus Ibukota Jakarta 10450, Indonesia.

Article Info

Keywords:
Self Directed Learning, Online Learning, Rasch Model, Instrument Validation, Educational Measurement

ABSTRACT

Online learning requires students to possess strong self-directed learning abilities to ensure that the learning process remains effective. To ensure the accurate measurement of these abilities, an evaluation instrument with sound measurement quality is essential. This study aims to analyze the validity and reliability of the Self-Directed Online Learning instrument among secondary school students using the Rasch Model. The study employed a descriptive quantitative approach involving 757 secondary school students as respondents. The research instrument was the Self-Directed Online Learning Scale (SDOLS), consisting of 17 items measured on a five-point Likert scale. Data analysis was conducted using the Rasch Model with the assistance of Winsteps software. The results indicate that 15 items met the validity criteria based on the Outfit Mean Square (MNSQ) values, while 2 items did not meet the required criteria. Reliability analysis shows that the instrument demonstrates adequate reliability, while respondent reliability falls into the good category. These findings suggest that the Self-Directed Online Learning instrument is appropriate for measuring students' self-directed learning in online learning at the secondary school level, although refinement of several items that do not meet the criteria is recommended.

Corresponding Author:
Arif Nurhidayat
Universitas Bina Sarana Informatika.
Jl. Kramat Raya No. 98, RT.2/RW.9, Kwitang, Kec. Senen, Kota Jakarta Pusat, Daerah Khusus Ibukota Jakarta 10450, Indonesia.
arif.ndt@bsi.ac.id

INTRODUCTION

The technological developments that have occurred in the era of Industry Four point zero have changed the paradigm of human civilization. One of the most visible changes can be seen in communication methods and the media used. The variety of communication media today facilitates human interaction, especially in obtaining information. It cannot be denied that the speed of communication can now be felt by almost all levels of society in Indonesia. Even the theory of technological determinism explains that society tends to follow technological developments (Silvana & Darmawan, 2018).

This momentum of technological development can be utilized in the field of education, particularly in teaching and learning activities. Some time ago, school learning activities experienced obstacles due to the Covid nineteen pandemic. At that time, the government

Jurnal Multidisiplin Sahombu
Volume 5, Number 08, 2025, DOI 10.58471/jms.v5i08
ESSN 2809-8587 (Online)
https://ejournal.seaninstitute.or.id/index.php/JMS/index

through the Ministry of Education and Culture implemented an emergency curriculum as an alternative effort to ensure that teaching and learning activities could continue (Kemdikbud, 2020).

All school activities, especially teaching and learning, were shifted to online modes. This transformation of learning models was carried out to achieve learning objectives. Online teaching is an alternative form of learning activities during emergency situations (Wang et al., 2020). Online learning strengthens the role of technology as a medium for effective communication and interaction. Teaching and learning activities during the Covid nineteen pandemic provided opportunities for teachers to adapt and improve their ability to use technology (Purwasih & Elshap, 2021).

Online learning during the Covid nineteen pandemic was carried out independently by students. This learning activity indirectly increased students' learning independence. A study conducted by Anggrawan (2019) shows that online learning is more effective in achieving good learning outcomes compared to direct or face to face learning. Another study by Edriani et al. (2021) also explains that learning independence has a significant effect on student learning outcomes.

Independent online learning brings modernization to teaching and learning activities, resulting in a simpler learning structure and an increase in independent tasks that must be completed by students (Stewart, 2007). In addition, independent online learning can increase students' motivation and curiosity toward information, as explained in the study conducted by Fitriani et al. (2022). Furthermore, online learning can improve students' digital literacy skills, enabling them to develop competencies and skills in utilizing technology for independent and continuous learning and information seeking (Hanik, 2020).

Online learning is included in the self directed learning model, which is considered capable of improving students' independence and cognitive abilities in learning activities (Amaliyah et al., 2019). This independent learning depends on good collaboration between teachers and students, as well as the teaching materials or modules used. The modules must have certain characteristics, one of which is self instruction, which refers to the clarity of instructions within the module (Fatikhah & Izzati, 2015).

In addition to learning modules, teacher guidance in independent learning must play a dominant role in learning activities to develop directed student learning independence. Teachers have an important role in controlling learning activities (Basilaia & Kvavadze, 2020). In independent learning, students are expected to become individuals who have the freedom to seek information or learning materials independently (Huda, 2014). This ability positions students as lifelong learners (Malison, 2018).

Independent learning attitudes, responsibility, and the ability to make decisions are the main objectives of online independent learning. However, learning activities alone are not sufficient to measure students' attitudes or affective domains. Evaluation to measure student attitudes is needed to determine the achievement of learning objectives, especially in the affective domain.

Learning evaluation is a process of measuring and assessing students' abilities in learning activities, including cognitive, affective, and psychomotor aspects, so that teachers

Jurnal Multidisiplin Sahombu
Volume 5, Number 08, 2025, DOI 10.58471/jms.v5i08
ESSN 2809-8587 (Online)
https://ejournal.seaninstitute.or.id/index.php/JMS/index

can understand students' competencies (Tarigan et al., 2022). In addition, teachers must have the ability to evaluate the learning that has been implemented (Ratnawulan & Rusdiana, 2014).

In conducting evaluations, an instrument with measured validity and reliability is required. An instrument is considered to be of good quality if it has moderate to high levels of validity and reliability. Hayati and Lailatussaadah (2016) explain that the level of validity and reliability of an instrument affects the accuracy of research data. Therefore, validity and reliability are important factors in determining the quality of an instrument to be used. An instrument that has been tested cannot necessarily be reused in different times, places, or educational levels (Tavakol & Dennick, 2011).

Based on the background described above, this study aims to analyze whether the Self Directed Online Learning instrument developed and tested by Yang et al. (2020) can also be applied to secondary school students using the Rasch model with Winsteps software.

METHODS

This study employed a quantitative research design with an emphasis on measurement analysis to examine the quality of a Self Directed Online Learning instrument for secondary school students. The primary focus of the research was to evaluate the psychometric properties of the instrument, particularly its validity and reliability, using the Rasch measurement model. This approach was selected because it allows for a more detailed examination of item performance and respondent consistency compared to classical test theory.

The research participants consisted of secondary school students who had prior experience with online learning activities. The participants were selected using a non probability sampling technique based on accessibility and willingness to participate. All respondents had engaged in online learning during periods of remote instruction, ensuring that they were familiar with the learning context addressed by the instrument.

The research instrument was a Self Directed Online Learning questionnaire adapted from the scale developed by Yang et al. (2020). The instrument was designed to measure students' independence, responsibility, and initiative in online learning environments. It consisted of statements presented in a Likert type response format, allowing students to express varying levels of agreement with each item.

Prior to data collection, the instrument was reviewed to ensure linguistic clarity and contextual relevance for secondary school students. Minor wording adjustments were made without altering the original construct to improve readability and comprehension. The questionnaire was then distributed electronically to participants to align with the online learning context being studied. Data collection was conducted by administering the questionnaire through an online platform. Students completed the instrument independently under minimal supervision to reflect authentic self directed learning behavior. This approach was intended to reduce response bias and encourage honest reflection on their learning experiences.

Jurnal Multidisiplin Sahombu
Volume 5, Number 08, 2025, DOI 10.58471/jms.v5i08
ESSN 2809-8587 (Online)
https://ejournal.seaninstitute.or.id/index.php/JMS/index

The collected data were analyzed using the Rasch model with the assistance of Winsteps software. Rasch analysis was applied to examine item fit, person fit, item polarity, and reliability indices. The model enabled the transformation of ordinal response data into interval level measures, providing more precise estimates of student traits and item difficulty. Item validity was evaluated through fit statistics, including infit and outfit mean square values, to identify items that did not align well with the underlying construct. Items exhibiting misfit were carefully examined to determine whether they reflected ambiguity, misunderstanding, or conceptual inconsistency. Reliability was assessed through person and item reliability indices to evaluate the consistency of measurements across respondents and items.

RESULTS AND DISCUSSION

To determine instrument validity in the Rasch model, the outfit mean square value is examined (Sumintono & Widhiarso, 2014). An instrument is considered valid if it has an outfit mean square value ranging from 0.5 to 1.5. The outfit mean square values of this instrument are presented in the table below.

Table 1. Instrument Validity Based on Outfit Mean Square Values

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
1	284	75	-.05	.15	1.43	2.16	1.90	3.90	.52	.61	50.7	50.7	Item 1
2	274	75	.17	.15	.83	-.96	.98	-.03	.59	.62	49.3	49.3	Item 2
3	275	75	.14	.15	.44	-4.01	.46	-3.68	.76	.62	71.2	49.6	Item 3
4	251	75	.62	.14	.89	-.63	.97	-.09	.66	.66	45.2	44.7	Item 4
5	300	75	-.44	.16	.59	-2.57	.51	-2.95	.69	.57	72.6	53.0	Item 5
6	294	75	-.29	.16	.96	-.17	.85	-.76	.64	.59	53.4	52.1	Item 6
7	277	75	.10	.15	1.14	.79	1.07	.45	.64	.62	56.2	49.8	Item 7
8	261	75	.43	.14	1.00	.08	.99	.02	.64	.64	45.2	46.7	Item 8
9	286	75	-.10	.15	1.10	.62	1.08	.49	.62	.60	61.6	51.1	Item 9
10	286	75	-.10	.15	1.14	.80	1.06	.40	.60	.60	50.7	51.1	Item 10
11	315	75	-.85	.17	1.28	1.45	1.29	1.31	.37	.53	56.2	55.7	Item 11
12	294	75	-.29	.16	.81	-1.07	.80	-1.03	.66	.59	60.3	52.1	Item 12
13	268	75	.29	.14	.99	.02	1.06	.41	.60	.63	47.9	48.5	Item 13
14	285	75	-.07	.15	.92	-.37	.87	-.68	.67	.60	64.4	51.0	Item 14
15	275	75	.14	.15	.72	-1.74	.68	-1.96	.71	.62	54.8	49.6	Item 15
16	276	75	.12	.15	1.54	2.71	1.60	2.85	.48	.62	45.2	49.7	Item 16
17	274	75	.17	.15	1.21	1.18	1.40	2.02	.52	.62	47.9	49.3	Item 17
MEAN	280.9	75.0	.00	.15	1.00	-.10	1.04	.04			54.9	50.2	
P.SD	14.6	.0	.33	.01	.28	1.63	.35	1.85			8.4	2.4	

Based on the table, most questionnaire items are considered valid because their outfit mean square values fall within the acceptable range of 0.5 to 1.5. However, items one and sixteen are not valid, as they have values of 1.9 and 1.6.

Fit statistics represent the difference between observed and expected responses and are used to examine whether items function as predicted by the model. Item fit was evaluated using infit and outfit mean square values and standardized values. In addition, item polarity was analyzed using point measure correlation to examine the relationship between each item and the measured construct as part of content and construct validity.

The table below presents the fit statistics for each questionnaire item. Items are considered acceptable when infit and outfit mean square values range from 0.7 to 1.3 and standardized values fall between minus two and plus two (Bond & Fox, 2015).

Jurnal Multidisiplin Sahombu
Volume 5, Number 08, 2025, DOI 10.58471/jms.v5i08
ESSN 2809-8587 (Online)
https://ejournal.seaninstitute.or.id/index.php/JMS/index

Table 2. Item Fit Based on Infit and Outfit Mean Square and Standardized Values

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
1	284	75	-.05	.15	1.43	2.16	1.90	3.90	A .52	.61	50.7	50.7	Item 1
16	276	75	.12	.15	1.54	2.71	1.60	2.85	B .48	.62	45.2	49.7	Item 16
17	274	75	.17	.15	1.21	1.18	1.40	2.02	C .52	.62	47.9	49.3	Item 17
11	315	75	-.85	.17	1.28	1.45	1.29	1.31	D .37	.53	56.2	55.7	Item 11
7	277	75	.10	.15	1.14	.79	1.07	.45	E .64	.62	56.2	49.8	Item 7
10	286	75	-.10	.15	1.14	.80	1.06	.40	F .60	.60	50.7	51.1	Item 10
9	286	75	-.10	.15	1.10	.62	1.08	.49	G .62	.60	61.6	51.1	Item 9
13	268	75	.29	.14	.99	.02	1.06	.41	H .60	.63	47.9	48.5	Item 13
8	261	75	.43	.14	1.00	.08	.99	.02	I .64	.64	45.2	46.7	Item 8
2	274	75	.17	.15	.83	-.96	.98	-.03	h .59	.62	49.3	49.3	Item 2
4	251	75	.62	.14	.89	-.63	.97	-.09	g .66	.66	45.2	44.7	Item 4
6	294	75	-.29	.16	.96	-.17	.85	-.76	f .64	.59	53.4	52.1	Item 6
14	285	75	-.07	.15	.92	-.37	.87	-.68	e .67	.60	64.4	51.0	Item 14
12	294	75	-.29	.16	.81	-1.07	.80	-1.03	d .66	.59	60.3	52.1	Item 12
15	275	75	.14	.15	.72	-1.74	.68	-1.96	c .71	.62	54.8	49.6	Item 15
5	300	75	-.44	.16	.59	-2.57	.51	-2.95	b .69	.57	72.6	53.0	Item 5
3	275	75	.14	.15	.44	-4.01	.46	-3.68	a .76	.62	71.2	49.6	Item 3
MEAN	280.9	75.0	.00	.15	1.00	-.10	1.04	.04			54.9	50.2	
P.SD	14.6	.0	.33	.01	.28	1.63	.35	1.85			8.4	2.4	

Based on the table, items one, three, five, and sixteen do not meet the fit criteria because their infit and outfit mean square and standardized values fall outside the specified thresholds.

Item polarity was examined using point measure correlation values, which reflect students' responses to the latent variable. Acceptable point measure correlation values range from 0.4 to 0.85. The results show that all items have positive polarity, with values ranging from 0.53 to 0.66, indicating that students were able to understand the questionnaire items appropriately.

Questionnaire reliability was evaluated using person and item reliability indices (Sumintono & Widhiarso, 2014). The reliability criteria are classified as weak for values below 0.67, sufficient for values between 0.67 and 0.8, good for values between 0.8 and 0.9, very good for values between 0.91 and 0.94, and excellent for values above 0.94.

The table below presents the person and item reliability results, which indicate the reliability level of both the items and the respondents.

Table 3. Person and Item Reliability

PERSON	75 INPUT	75 MEASURED		INFIT		OUTFIT	
	TOTAL	COUNT	MEASURE	REALSE	IMNSQ	ZSTD	OMNSQ	ZSTD
MEAN	63.7	17.0	1.04	.42	1.04	-.4	1.04	-.4
P.SD	11.7	.0	1.45	.28	.81	2.3	.82	2.3
REAL RMSE	.51	TRUE SD	1.36	SEPARATION	2.69	PERSON RELIABILITY		.88
ITEM	17 INPUT	17 MEASURED		INFIT		OUTFIT	
	TOTAL	COUNT	MEASURE	REALSE	IMNSQ	ZSTD	OMNSQ	ZSTD
MEAN	280.9	75.0	.00	.16	1.00	-.1	1.04	.0
P.SD	14.6	.0	.33	.02	.28	1.6	.35	1.8
REAL RMSE	.16	TRUE SD	.29	SEPARATION	1.85	ITEM RELIABILITY		.77

Jurnal Multidisiplin Sahombu
Volume 5, Number 08, 2025, DOI 10.58471/jms.v5i08
ESSN 2809-8587 (Online)
https://ejournal.seaninstitute.or.id/index.php/JMS/index

Based on the table, the item separation value is 1.85 and the item reliability value is 0.77, indicating that the items have sufficient reliability. This result suggests that the instrument functions adequately and contains items with varying levels of difficulty. The person separation and person reliability values are 2.69 and 0.88, respectively. These results indicate that respondent reliability falls within the good category, showing that the respondents in this study display a varied range of abilities.

CONCLUSION

This study concludes that the Self-Directed Online Learning instrument shows acceptable measurement quality for use with secondary school students in online learning settings. The Rasch model analysis indicates that most items function well in measuring the intended construct, reflecting students' independence, responsibility, and initiative in managing their own learning. Although several items require further refinement to better align with model expectations, these results provide a clear direction for improving item wording and construct representation. The findings also confirm that the instrument demonstrates adequate reliability at both the item and respondent levels. Differences in item difficulty suggest that the instrument is capable of distinguishing varying levels of self-directed learning among students, while the consistency of responses indicates reliable measurement of individual learning autonomy. Positive item polarity further shows that students were able to understand and respond appropriately to the statements. Overall, this study supports the use of the instrument as a practical tool for evaluating self-directed learning in secondary-level online education, while highlighting the importance of continuous refinement to ensure accuracy and contextual relevance.

REFERENCE

Amaliyah, F., Sukestiyarno, Y. L., & Asikin, M. (2019). Analisis kemandirian belajar siswa pada pembelajaran self-directed learning berbantuan modul pada wacana pencapaian kemampuan pemecahan masalah matematis. *Prosiding Seminar Nasional Pascasarjana UNNES*, *2*(1), 626–632.

Anggrawan, A. (2019). Analisis deskriptif hasil belajar pembelajaran tatap muka dan pembelajaran online menurut gaya belajar mahasiswa. *Matrik: Jurnal Manajemen, Teknik Informatika dan Rekayasa Komputer*, *18*(2), 339–346. https://doi.org/10.30812/matrik.v18i2.411

Arifin, A., & Yusuf, Y. (2025). The Influence Of Emotional Intelligence And Digital Literacy On Teacher Performance. *Jurnal Multidisiplin Sahombu*, *5*(02), 606-617.

Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 coronavirus pandemic in Georgia. *Pedagogical Research*, *5*(4). https://doi.org/10.29333/pr/7937

Bond, T. G., & Fox, C. M. (2015). *Applying the Rasch model: Fundamental measurement in the human sciences* (3rd ed.). Routledge.

Brockett, R. G., & Hiemstra, R. (2018). *Self-direction in adult learning: Perspectives on theory, research, and practice*. Routledge.

Edriani, D., Harmelia, H., & Gumanti, D. (2021). Pengaruh minat dan kemandirian belajar terhadap hasil belajar siswa jurusan akuntansi di SMK Negeri 1 Painan. *Edukatif: Jurnal Ilmu Pendidikan*, *3*(6), 4506–4517. https://doi.org/10.31004/edukatif.v3i6.1479

Fatikhah, I., & Izzati, I. (2015). Pengembangan modul pembelajaran matematika bermuatan emotion quotient pada pokok bahasan himpunan. *Eduma: Mathematics Education Learning and Teaching*, *4*(2), 46–61.

Fitriani, D., Handican, R., & Gunawan, R. G. (2022). Systematic literature review: Pengaruh self-directed learning terhadap kemampuan koneksi matematis siswa pada materi fungsi eksponensial. *Journal of Mathematics Education and Application*, *2*(3), 589–598.

Handarini, O. I. (2020). Pembelajaran daring sebagai upaya study from home selama pandemi Covid-19. *Jurnal Pendidikan Administrasi Perkantoran*, *8*(3), 496–503.

Hanik, E. U. (2020). Self-directed learning berbasis literasi digital pada masa pandemi Covid-19 di Madrasah Ibtidaiyah. *Elementary: Islamic Teacher Journal*, *8*(1), 183–196. https://doi.org/10.21043/elementary.v8i1.7417

Hayati, S., & Lailatussaadah, L. (2016). Validitas dan reliabilitas instrumen pengetahuan pembelajaran aktif, kreatif, dan menyenangkan menggunakan model Rasch. *Jurnal Ilmiah Didaktika*, *16*(2), 169–179.

Huda, M. (2014). *Model-model pengajaran dan pembelajaran*. Pustaka Pelajar.

Jamilah, J. (2020). Guru profesional di era new normal: Peluang dan tantangan pembelajaran daring. *Premiere Educandum: Jurnal Pendidikan Dasar dan Pembelajaran*, *10*(2), 238–248. https://doi.org/10.25273/pe.v10i2.7494

Kementerian Pendidikan dan Kebudayaan. (2020). *Keputusan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 719/P/2020 tentang pedoman pelaksanaan kurikulum pada satuan pendidikan dalam kondisi khusus*. https://www.kemdikbud.go.id

Linacre, J. M. (2011). *Winsteps: Multiple-choice, rating scale, and partial credit Rasch analysis* [Computer software]. MESA Press.

Malison, K. (2018). An exploratory study of self-directed learning: The differences between IT and non-IT employees in Thailand. *Journal of Entrepreneurship Education*, *21*(3), 1–16.

Patimah, E., & Sumartini, S. (2022). Kemandirian belajar peserta didik pada pembelajaran daring: A literature review. *Edukatif: Jurnal Ilmu Pendidikan*, *4*(1), 993–1005. https://doi.org/10.31004/edukatif.v4i1.1970

Plews, R. C. (2017). Self-directed learning in online environments. *International Journal of Self-Directed Learning*, *14*(1), 37–57.

Purwasih, R., & Elshap, D. S. (2021). Belajar bersama Covid-19: Implementasi, tantangan, dan solusi pembelajaran daring pada guru SMP. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, *10*(2), 940–948. https://doi.org/10.24127/ajpm.v10i2.3545

Ratnawulan, E., & Rusdiana, R. (2014). *Evaluasi pembelajaran*. Pustaka Setia.

Silvana, S., & Darmawan, C. (2018). Pendidikan literasi digital di kalangan usia muda di Kota Bandung. *Pedagogia*, *16*(2), 146–156.

Stewart, R. (2007). Investigating the link between self-directed learning readiness and project-based learning outcomes. *European Journal of Engineering Education*, *32*(4), 453–465.

Sumintono, B., & Widhiarso, W. (2014). *Aplikasi model Rasch untuk penelitian ilmu-ilmu sosial* (2nd ed.). Trim Komunikata.

Tarigan, E. F., Nilmarito, S., Islamiyah, K., Darmana, A., & Suyanti, R. D. (2022). Analisis instrumen tes menggunakan model Rasch dan software SPSS. *Jurnal Inovasi Pendidikan Kimia*, *16*(2), 92–96. https://doi.org/10.15294/jipk.v16i2.30530

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 53–55.

Wang, G., Zhang, Y., Zhao, J., Zhang, J., & Jiang, F. (2020). Mitigating the effects of home confinement on children during the COVID-19 outbreak. *The Lancet*, *395*, 21–27. https://doi.org/10.1016/S0140-6736(20)30547-X

Yang, H., Su, J., & Bradley, K. D. (2020). Applying the Rasch model to evaluate the self-directed online learning scale. *International Review of Research in Open and Distributed Learning*, *21*(3), 99–120.