PSYMPATHIC : Jurnal Ilmiah Psikologi
Volume 9, Nomor 2, 2022: 227-236
eISSN: 2502-2903, pISSN: 2356-3591
DOI: 10.15575/psy.v9i2.10058

Rasch Model Application: Instrument Development of Readiness to Conduct Inclusive Learning

Ratna Sari[1]*, M Nurul Ikhsan Saleh[2]
[1] Department of Islamic Education, Universitas Muhammdiyah Yogyakarta, Indonesia
[2] Department of Islamic Education, Universitas Islam Indonesia, Indonesia
*e-mail: ratna.sari@umy.ac.id

Abstract

This study aims to analyze development of an instrument that measures the level of readiness of Islamic Education (PAI) prospective teachers in conducting inclusive learning. The process was conducted by investigating three important indicators, namely: (1) motivation and value, (2) content-related, and (3) operational and pragmatist. The method employed was a non-experimental quantitative design which was considered a pilot test. Data were collected from 144 samples of PAI students who are prospective teachers from two private universities in Yogyakarta, and the tool used was a questionnaire which was analyzed using Rasch Model measurement software called WINSTEPS. Furthermore, it was used to determine the validity and reliability of items, respondents, and instrument. The results showed that development of readiness instrument in conducting inclusive learning using Rasch model consisted of 34 items with a coefficient of instrument, item, and respondent reliability of 92, 90, and 92, respectively. Therefore, it was discovered that instrument has good psychometric properties and can be used effectively.

Keywords: readiness, inclusive learning, Rasch model

Abstrak

Penelitian ini bertujuan menganalisis pengembangan instrumen tingkat kesiapan dalam menyelenggarakan pembelajaran inklusi pada calon guru Pendidikan Agama Islam (PAI). Kesiapan penyelenggaraan pembelajaran inklusi digali dari tiga indikator penting yaitu; (1) *Motivation and value*, (2) *Content related*, (3) *Operational and pragmatist*. Penelitian ini menggunakan desain kuantitatif non-eksperimental dan bersifat *pilot test*. Data dikumpulkan dari 144 sampel mahasiswa program studi PAI sebagai calon guru yang berasal dari dua universitas swasta di Yogyakarta. Alat ukur menggunakan kuesioner dan dianalisis menggunakan perangkat lunak pengukuran Rasch Model yaitu WINSTEPS. Perangkat ini digunakan untuk mengetahui validitas dan reliabilitas item, responden dan instrumen. Penelitian ini menemukan bahwa pengembangan instrumen kesiapan menyelenggarakan pembelajaran inklusi menggunakan pemodelan Rasch yang terdiri dari 34 item memiliki koefisiensi reliabilitas instrument sebesar .92, reliabilitas item sebesar .90 dan reliabilitas responden sebesar .92. Hal itu menunjukkan instrumen memiliki properti psikometrik yang baik dan dapat digunakan.

Kata Kunci: kesiapan, pembelajaran inklusi, pemodelan Rasch

Introduction

In recent decades, there has been a growing interest in the study of inclusive education in Indonesia among study analysts, academics, and government officials (Andriana & Evans, 2020; Ediyanto et al., 2020; Mukminin et al., 2019; Rante & Tulak, 2020). Furthermore, at the international level, there is an increasing focus on policies and laws regarding inclusive education, as well as readiness of universities in producing teachers who can perform this task (Forlin & Chambers, 2011; Humaira et al., 2021). The Indonesian government has taken several measures such as creating laws and regulations to ensure that institutions support education for all students without discrimination. Some of the national legal products include Ministerial Regulation No. 70 of 2009 on Inclusive Education for all Indonesian citizens, National Education System No. 20 of 2003, and the Constitution of Indonesia Year 1945.

Despite the existence of legal products to support inclusive education in Indonesia, the

implementation in schools across various regions still faces many obstacles and requires continuous improvement (Asri et al., 2021; Poernomo, 2016; Rasmitadila et al., 2021). One crucial issue of the implementation process that needs to be addressed is the lack of competent teachers in educational institutions (Baimenova et al., 2015; Florian, 2012; Qandhi & Kurniawati, 2019; Supratiwi et al., 2021). Furthermore, there is a lack of professional training on ways to conduct inclusive education (Rasmitadila et al., 2022; Zulfija et al., 2013). Finally, there is inadequate support from teachers in implementing creative inclusion-based methods in the teaching and learning process in both public and private schools (Isosomppi & Leivo, 2015).

According to the explanation above, it is crucial to measure teachers' readiness to develop professional competencies related to deep, comprehensive, and holistic knowledge and skills toward inclusive education. This is a vital part of optimizing and successfully implementing inclusive learning, which upholds the ideals of education. By measuring readiness, steps can be taken to prepare professional teachers who have the potential to improve the quality of national education that is fully integrated with inclusive learning and empowers students with special needs. Through good measurement, careful preparation, and comprehensive steps, it becomes possible to provide education that guarantees diversity and social justice for all children (Keddie, 2012). A study used psychometric scale measurement to examine teacher readiness for inclusive education in Asia (Moosa, et al., 2022).

This study focuses on development of instrument for measuring teacher readiness in implementing inclusive learning in schools, primarily using Rasch model. The aim is to analyze readiness in conducting inclusive learning, especially for teachers in Islamic Education (PAI) institutions in Indonesia. This study provides new insights into readiness of teachers to implement inclusive learning. It also serves as an example of how to evaluate readiness of prospective or current teachers in educational institutions at various levels, ranging from elementary education to higher institutions.

The preparedness of prospective teachers to become professionals in their field with adequate competencies is an essential aspect of the success of inclusive learning implementation, both in public and private schools (Leifler, 2020; Zulfija et al., 2013). To improve the quality of teachers, the Indonesian government has enacted legislation in the form of Law Number 14/2005 on Teachers and Lecturers. However, many studies doubt the effectiveness of this policy and it seems to contribute little to improving competencies, particularly those related to inclusive learning. On the contrary, the implementation of this teaching approach is a priority in realizing equitable education. Despite this, studies on inclusive learning in the literature mostly discuss the attitudes of teachers toward students with disabilities and their impact on those with special needs in social interactions (Boyle et al., 2020; Moberg et al., 2020).

Several studies have discovered that teachers' ability to implement inclusive learning is inadequate 2023/5/1. Furthermore, many urban schools still do not embrace this teaching approach and have not fully accepted students with special needs (Ainscow & Sandill, 2010; Baimenova et al., 2015). The lack of teacher professionalism in inclusive education has affected student performance and created a negative image of the school community (Ainscow & Sandill, 2010). In Indonesia, learning process for students with special needs faces challenges related to public acceptance and policies (Poernomo, 2016), particularly the professionalism of teachers (Faragher et al., 2021; Tanang & Abu, 2014). Therefore, further study is needed to understand the limitations and challenges encountered, especially regarding readiness of teachers to become more professional in handling inclusive education.

The uses of Rasch model in studies conducted in Indonesia remain scarce, with

limited application in various disciplines (Munika et al., 2022; Rost, 2001). However, this method is highly suitable for measuring readiness of prospective teachers to implement inclusive education.

Rasch model focuses on measuring and analyzing student creativity (Susanto et al., 2018). Specifically, this study aims to assess readiness of PAI prospective teachers to conduct inclusive learning. In recent years, no study has specifically investigated readiness of PAI teachers in conducting this teaching approach. Therefore, this report is valuable in evaluating readiness of PAI teachers before they are deployed in the world of inclusive learning. It aims to analyze development of an instrument to measure the level of readiness of PAI prospective teachers to implement inclusive education.

Methods

This study employed a non-experimental quantitative method using Rasch model which has become one of the prominent item response model in recent years (Robitzsch, 2021). The subjects were prospective teachers enrolled in PAI Program, who have completed a minimum of three semesters completed, meeting the criteria for inclusion. They make a total of 144 students from two private campuses in the Special Region of Yogyakarta.

The study comprised several stages, including 1) identifying the variables to be measured, which, in this case, was readiness to conduct inclusive learning, and 2) formulating the aspects and indicators of the variable into a blueprint. Instrument for measuring readiness in conducting inclusive learning was developed based on three main aspects, namely motivation and value (A1), content-related (A2), as well as operational and pragmatist (A3) (Movkebayeva et al., 2016). The indicator in each aspect had different sub-indicators, based on the Quality for Effective Inclusive Education Guidebook (NJCIE, 2018). Instrument blueprint is presented in Table 1.

Table 1 presents information on the aspects, indicators, sub-indicators, and their total items or weights. When added up, it was observed that the weight of aspects A1, A2, and A3 were 29%, 41%, and 30%. The weights were determined based on the number of sub-indicators. Aspects A1, A2, and A3 had 6, 8, and 7 sub-indicators, with the highest weight being discovered in A2.

The item review was conducted by two professional educators, who were lecturers in Psychology Education courses from two private universities in Yogyakarta. This process aimed to assess the suitability of the statement items with the aspects and indicators of the behavior to be measured, especially in terms of language use.

During the data analysis phase, the Winsteps version 4.6.2 program was utilized to employ Rasch model approach. This model not only takes into account the item aspect but also the respondent aspect. The data analysis results were displayed in various forms, including item reliability, respondent reliability, instrument reliability, item suitability level, respondent suitability level, scalogram, unidimensionality, and rating scale analysis.

Item reliability shows the level of trustworthiness of an item in measuring a psychological contract. Its higher coefficient indicates a greater quality item. Furthermore, respondents' reliability shows the consistency of the answers provided. Instrument reliability was assessed to determine the quality of instrument, which is the result of the interaction between respondents and items. The level of the item fit was examined to determine whether the items in the questionnaire are appropriate for the model. Meanwhile, the level of respondent fit is used to evaluate the accuracy of respondents with the model. The accuracy of items and respondents was evaluated based on the outfit means square value, Z-standard outfit value, and point measure correlation value. The good criteria for item and respondents were mean square (MNSQ), Z-standard (ZSTD), and point measure correlation (PT Mean

Table 1
Readiness Instrument Blueprint in Implementing Inclusive Learning

Code of Behavioral Aspects/Indicators	Expected Total Items	Total Items Made/Weight
Aspect (A1) Motivation and Value		
(A1.1) Belief in the need for inclusive education	2	5 (8%)
Sub indicators:		
1. Encouragement for the implementation of inclusive education		
2. The push for equal rights for children with special educational needs		
(A1.2) The impetus for development of the idea of inclusive education	5	12 (16%)
Sub indicators:		
3. Belief in each child's character and unlimited abilities		
4. High level of empathy		
5. High degree of tolerance		
(A1.3) Readiness for independent learning	2	4 (5%)
Sub indicators:		
6. Confidence in increasing knowledge and self-development for the successful implementation of inclusive education		
Aspect (A2) Content Related		
(A2.1) Basic knowledge of inclusive education regulations	4	8 (11%)
Sub indicators:		
1. Basic knowledge of inclusive education		
2. Knowledge of the basis of inclusive education regulations in the world and in Indonesia		
(A2.2) Knowledge of the peculiarities of educational structures or educational processes in inclusive education	5	15 (19%)
3. Knowledge of physical access requirements of children with special needs		
4. Knowledge of adaptation to academic programs		
5. Knowledge of the peculiarities of lesson structure in inclusive education		
6. Knowledge of the basic principles of differentiation and individuation in the educational process of children with special needs		
(A2.3) Basic knowledge of communication development in inclusive education	3	8 (11%)
Sub indicators:		
7. Knowledge of forms and methods for working with parents of children with special needs		
8. Knowledge of functional duties of professionals in inclusive education		
Aspect (A3) Operational and Pragmatist		
(A3.1) Ability to implement communicative connections with children with special educational needs	4	8 (11%)
Sub indicators:		
1. The ability to design communication with children with special needs		
2. The ability to develop relationships with parents of children with special needs as the main subject of the "team" in inclusive education		
(A3.2) Ability to develop education in a collective learning system for children who have different educational needs	6	8 (11%)
Sub indicators:		
3. The ability to create comprehensive physical access conditions for children with special needs		
4. Ability to adjust academic programs		
5. The skill to construct lessons by taking into account the principles of differences and individual characteristics		
(A3.3) Ability to work in a team	3	6 (8%)
Sub indicators:		
6. The ability to distribute professional duties to other professionals		
7. Skills to share knowledge and to submit to professional opinion		
Total	34	74 (100%)

Corr) values, which included 5 < MNSQ < 1.5, -2.0 < ZSTD < +2, and 4 < Pt Mean Corr < .85, respectively (Sumintono & Widhiarso, 2015). Reliability in this study was also tested using the classical test approach, namely Cronbach's alpha formula.

Results and Discussion

The use of Rasch model in data analysis provided detailed information about the items, respondents, and instrument. In development of instrument for readiness to conduct inclusive learning, two trials were performed with different respondents. The first trial involved 70 respondents with 74 items. Among these, 43 respondents were identified as outliers and were eliminated as they did not fit the model. The second analysis was conducted with 27 respondents and 74 items, where 40 misfit items were identified and eliminated.

The second phase of the pilot test was conducted with 74 respondents, of which 47 were identified as outliers and eliminated. Subsequently, a fourth analysis was conducted with 27 respondents and 34 items. In this analysis, 11 items were identified as misfits and were revised for wording. The results of the pilot test are presented in Table 2. The psychometric attribute information of the first and second tests showed good instrument quality, and the summary is presented in Table 3. Instrument items that have undergone pilot testing and analysis are listed in Table 4.

Table 2
Trial Phase Analysis

Trial Phase / Analysis Phase	Total Respondents / Total Items	Result/Action
1/1	70/74	43 misfit/outlier respondents/ eliminate misfit/outlier respondents
1/2	27/74	40 misfit/outlier items/eliminate misfit/outlier items
2/3	74/34	47 misfit/outlier respondents/ eliminate misfit/outlier respondents
2/4	27/34	11 misfit/outlier items/item editorial revisions

Table 3
Instrument Quality Summary

Statistics	Results	
	Trial 1	Trial 2
Item		
Item reliability	.89	.90
Highest logged value	2.28	2.67 (A8)
Lowest log-in value	-2.33	-3.15 (A4)
Separation item value	-	2.94
Respondents		
Respondent reliability	.94	.92
Highest logged value	5.51	5.17 (R06; R07)
Lowest log-in value	-.57	.42 (R41)
The value of personal separation	-	3.97
Instrument		
Cronbach's alpha	-	.92
Instrument-explainable variance	-	44.8 %
Instrument's unexplained variance	-	8.9 %

According to Table 3, the reliability values obtained from the first and second trials showed similar results. These include respondent reliability, item reliability, and Cronbach's alpha values of 94 and 92 (excellent), 89 and 90 (good), as well as 95 and 92 (excellent). In the second trial, the lowest logit value was -3.15, which was identified in A4, making it the most difficult item to agree on. However, the easiest item to agree on was A8, with the highest logit value of 2.67. Among respondents, the highest logit value was 5.17, which was obtained by codes R06 and R07. This indicates that R06 and R07 were highly prepared for inclusive learning. Meanwhile, the lowest logit value of 42 was obtained by respondent R41, implying that it has low preparedness for this teaching approach.

Unidimensionality analysis was used to determine the accuracy of the developed measuring instrument and determine whether it was capable of evaluating the variable or construct being measured (Sumintono & Widhiarso, 2015). Its minimum requirement was 20%, and when the value became greater than 40%, it was considered very good (Sumintono & Widhiarso, 2015). Therefore, instrument for inclusive learning can measure readiness to conduct this teaching approach.

Table 4
Readiness Instrument Items for Implementing Inclusive Learning

Aspect	Item
Aspect A1	
Indicator A1.1	
Subindicator 1	1. School residents should not differentiate between the treatment of normal children and children with special needs.
Subindicator 2	2. Normal and special needs students can study in regular schools.
Indicator A1.2	
Subindicator 3	3. Each child has their strengths.
	4. Teachers need to find out the strengths of children and provide opportunities to develop them.
Subindicator 4	5. I will pay special attention to children with special needs.
Subindicator 5	6. The teacher must train students not to make fun of their friends with disabilities.
	7. The teacher gives examples of students to help students with disabilities in their activities at school.
Indicator A1.3	
Subindicator 6	8.I am interested in learning methods for students with special needs and normal students.
	9.The ability to be able to teach students with different conditions and backgrounds needs to be learned by the teacher.
Aspect A2	
Indicator A2.1	
Subindicator 1	10. One of the basic principles of education is for children to learn together and learn to live together.
	11. Gifted children can go to the same school as children with mental retardation.
Subindicator 2	12. In the preamble of the 1945 Constitution, it is stated that education is the right of all citizens regardless of background and physical condition.
	13. School for all or school for all is the jargon that was coined by the Salamanca Conference participants to support education for disabilities and normal students.
Indicator A2.2	
Subindicator 3	14. Schools need to provide access to learning for students with physical disabilities.
Subindicator 4	15. Minimum Completeness Criteria (KKM) can be adjusted according to student abilities.
Subindicator 5	16. People with disabilities who have difficulty reading should be given practice questions accompanied by pictures.
	17. Teachers can use different media in explaining material to students with disabilities and normal.
Subindicator 6	18. Differences in background, physical condition, and the intelligence and talents of students are positive things that schools have.
Indicator A2.3	
Subindicator 7	19. Student learning problems in class need to be discussed with parents.
	20. Schools must facilitate regular meetings with parents hence student progress can be monitored.
Subindicator 8	21. Special Assistance Teachers (GPK) and class teachers jointly identify the media needed by students with special needs in learning.
Aspect A3	
Indicator A3.1	
Subindicator 1	22. Teachers need to use symbols and signs to explain lessons to deaf students.
	23. The teacher needs to use clear intonation and speak slowly hence all students understand what the teacher is saying.
Subindicator 2	24. Schools should provide family counseling with disabilities as a means to find out about children's development and provide child care assistance.
	25. Teachers must make learning development books for students with disabilities hence parents can read them.
Indicator A3.2	
Subindicator 3	26. Students with disabilities who have difficulty walking can be given a seat close to the exit.
	27. Seating should be arranged in such a way that students with disabilities can participate in learning.
Subindicator 4	28. Students with special needs should be able to adjust to learning in class like normal students.
	29. Teachers should provide different evaluation questions for students with special needs.
Subindicator 5	30. A good teacher does not equalize the workload for students with disabilities and normal students.
	31. The curriculum needs to be modified according to the circumstances of the students in the class.
Indicator A3.3	
Subindicator 6	32. Students with special needs who cannot adjust to class should receive treatment from a psychologist.
	33. Classroom teachers need to work together with special companion teachers in teaching students with disabilities.
Subindicator 7	34. Teachers should provide understanding to other parents that the existence of disabilities will not interfere with normal students in learning.

Meanwhile, the variance that cannot be explained by instrument was 8.9%, and does not exceed the maximum criterion (the variance that cannot be explained by a measuring instrument) of 15%(Sumintono & Widhiarso, 2015).

Rasch model analysis showed that readiness instrument for inclusive learning is capable of measuring one construct (unidimensionality). This includes readiness to conduct inclusive learning. Furthermore, instrument consists of 34 items with a reliability coefficient of 92. It indicates that readiness instrument for inclusive learning has very high reliability. With Cronbach's alpha reliability coefficient of .92, readiness instrument for inclusive learning is deemed highly reliable, indicating its high quality as a measuring tool.

Cronbach's alpha reliability coefficient, in Rasch model, is not the main determinant of instrument quality. Item and respondent reliability coefficients are important information to determine the quality of an instrument with rating scales (Fisher, 2018). They are considered good and very good when their values are above 81 and 91, respectively. The item and respondent reliabilities in readiness instrument for inclusive learning were 90 and 92, indicating that it has good quality.

According to the results of Rasch model analysis, the item "*Teachers do not need to develop the abilities of children with disabilities*" was discovered to be the most challenging for respondents to agree on, with a logit value of -3.15. This difficulty can be attributed to the respondents' understanding that all students should be developed based on their talents and interests. This material was received in lectures, hence, they are aware that developing students' abilities is a teacher's obligation. Meanwhile, the item: *"Children with disabilities can learn alongside regular children in the same school"* was easily agreed on by respondents, with a logit value of 2.67. This could be due to a clear understanding of the essence of education which is an equal right for everyone.

The item and person separation indices are important indicators of the quality of a rating scale instrument (Fisher, 2018). When these values increase, the quality of instrument improves because item and respondent groups become distinguishable (Sumintono & Widhiarso, 2015). A rating scale instrument is considered good when it has an item separation value of 3-4 (Fisher, 2018). Readiness instrument for inclusive learning has an item separation value of 2.94 (rounded to 3), implying that the items can be divided into three levels of difficulty, namely easy, moderate, and difficult. The person separation value of 3.97 (rounded to 4) shows that readiness of respondents in organizing inclusive learning can be categorized into four groups such as low, medium, high, and very high.

This study has limitations in terms of the limited number of respondents. Additionally, the third test, which aims to evaluate the quality of instrument items after improving the wording or language, was not conducted. Future studies should be aimed at increasing the number of respondents, grouping respondents based on demographic data, and conducting the third test.

Conclusion

Based on the analysis using Rasch model, instrument to measure readiness for implementing inclusive learning has been shown to effectively evaluate the intended variable. There are 34 items with instrument, item, and respondents reliability coefficients of 92 and 90, and .92. Therefore, it was concluded that instrument has good psychometric properties, making it suitable for measuring readiness for implementing inclusive learning.

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