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Construction and Validation of a Scale to Measure Islamic Primary School Teachers' Readiness in Implementing Emancipated Curriculum Referring to the Technological Pedagogical and Content Knowledge

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Abstract: This research aims to develop and validate a scale to measure the readiness of science teachers in Islamic primary schools in implementing the Emancipated Curriculum referring to the Technological Pedagogical and Content Knowledge (TPACK). Eight development steps by DeVellis were used to develop the scale. A total of 224 respondents, comprising six experts and 218 science teachers in Central Java Province and the Special Province of Yogyakarta, agreed to participate. Data were analyzed using SEM-PLS. The development process successfully created a scale of 34 valid and reliable items. These items consist of Technological Knowledge factors (four items), Pedagogical Knowledge factors (14 items), Content Knowledge factors (four items), Pedagogical Content Knowledge factors (four items), Technological Content Knowledge factors (two items), Technological Pedagogical Knowledge factors (two items), and Technological Pedagogical and Content Knowledge factors (three items). A high reliability was obtained for the scale developed (0.983). This validated scale is ready to be used to examine teachers' readiness in implementing the Emancipate Curriculum. The measurement with this scale can illustrate the extent to which teachers have TPACK as a provision for implementing the curriculum so that policy recommendations can be made.

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Introduction

Indonesia's lagging in education is one reason the government implemented a reform curriculum called the *Kurikulum Merdeka* (Emancipated Curriculum) (Gumilar et al. 2023). This curriculum is intended to prepare a generation that is resilient to face the technological revolution (Randall et al. 2022), the demands of the 21st century (Faiz and Faridah 2022; Faiz, Parhan, and Ananda 2022), and Society 5.0 (Indarta et al. 2022). The Emancipated Curriculum provides unrestricted space for teachers to create activities that lead students to achieve 21st-century skills, i.e., creative and innovative, critical thinking and problem-solving, communication and collaboration, information literacy, media, and information and communication technology (Yue 2019), in which this creates challenges for teachers.

The main feature of the Emancipated Curriculum is student-centered approach, which gives teachers the freedom to instruct students in determining how to behave, process, and think for students' self-development, therefore this curriculum has a significant potential to increase students' motivation and enthusiasm for learning (Lince, 2022). Emancipated Curriculum is also relevant to the digital era of Industrial Revolution 4.0 and Society 5.0,

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where the information students receive through digital media and technology can stimulate their creativity (Darmayani 2022). Therefore, teachers should also be aware of the Industrial Revolution 4.0 demands that alter teachers' roles in 21st-century classrooms (Shafie, Abd Majid, and Shah Ismail 2019).

Teachers are now encouraged to teach using a student-centered approach and utilizing technologies in their classrooms. A Technological Pedagogical and Content Knowledge (TPACK) framework can reach the teacher's new roles. TPACK is a conceptual framework for preparing teachers to use technology effectively in learning (Chai, Koh, and Tsai 2010; Kaplon-Schilis and Lyublinskaya 2015; Kurt et al. 2014; Mishra and Koehler 2006; Niess 2011; Santos and Castro 2021), aligning with the demands of the Emancipated Curriculum. In this study, the TPACK framework was combined with indicators for ECI according to Minister of Religion Decree No. 183 and 184 of 2019 to portray the readiness of science teachers at Islamic primary schools in implementing the Emancipated Curriculum. Minister of Religion Decree No. 347 of 2022 concerning Guidelines for Emancipated Curriculum Implementation in Islamic Schools states that the Emancipated Curriculum will be implemented in Islamic Schools gradually starting in the 2022/2023 academic year, and some schools were appointed as pilot projects to implement this curriculum.

The ECI leaves challenges for science teachers in elementary schools as the Emancipated Curriculum policy integrated natural and social sciences as a single subject (natural-social science or *IPAS*). Natural science, which is inquiry-based and closer to scientific discovery (Breiner et al. 2012), must collaborate with social science, which has the characteristics of solving social problems involving social intelligence (Talitha and Sari 2016). Natural and social sciences, however, have the same characteristics, namely reasoning and scientific thinking, which is a strong basis in cognitive science (Berland and McNeill 2010; Dunbar and Fugelsang 2005) for studying scientific ways of knowing and understanding the world.

As the main actors in ECI, teachers should be well-trained and ready to change their mindset and performance to succeed in the ECI. Although the government has prioritized the development of teacher competencies and professional development programs to support the ECI, teachers still need to build their capacities for quality teaching, differentiated instruction, as well as assessment to determine student learning needs and to monitor progress and attainment (Randall et al. 2022). Some research highlighted that teachers find many obstacles in implementing the curriculum due to a lack of preparation, such as the absence of definite textbooks, being stuck with the previous curriculum (Syarochil & Abadi, 2023), and limited facilities and infrastructure, such as digital learning media (Ellen and Sudimantara 2023). In addition, there is little research on Islamic primary school teachers' readiness for ECI, primarily focusing on natural-social science subjects. No instrument has been found to capture the teachers' readiness; therefore, this research is fundamental to designing a standard instrument for measuring teacher readiness in ECI, referring to TPACK.

Research Method

Eight development steps by DeVellis (2003) were carried out to develop a reliable and valid scale (see Figure 1).

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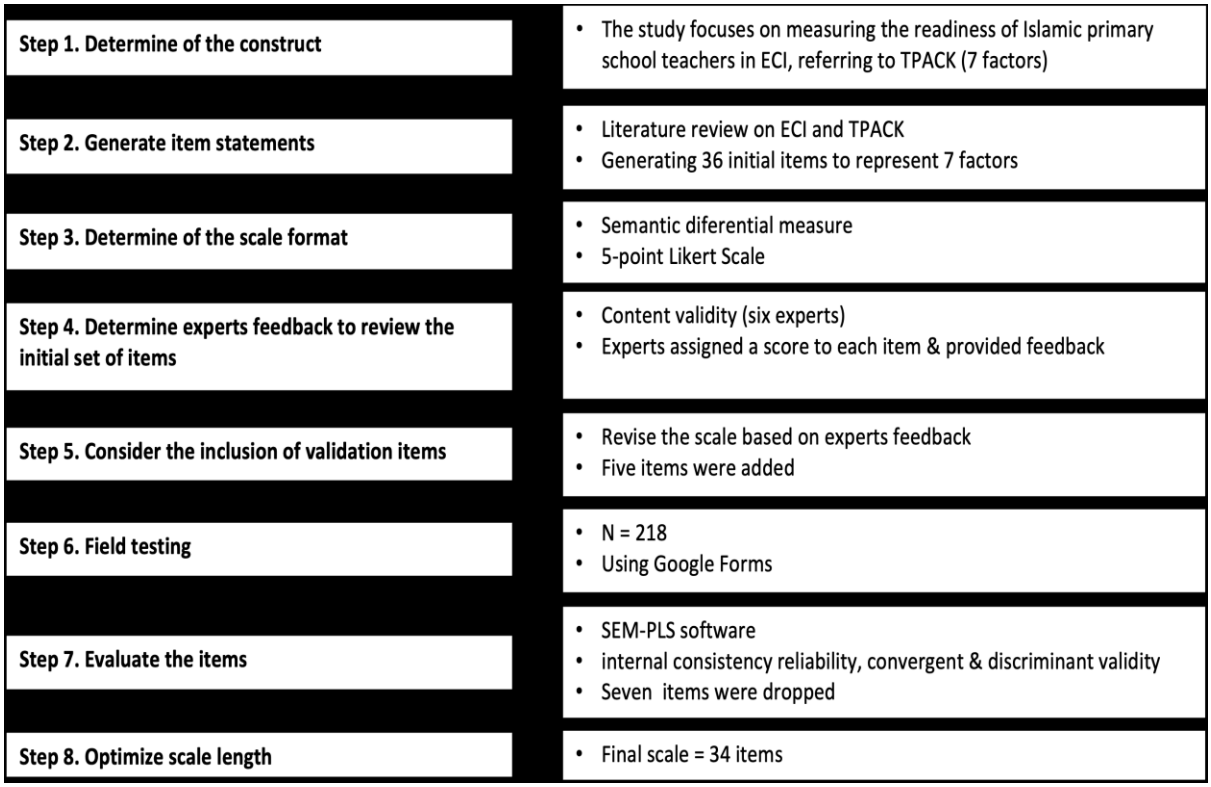

Figure 1. Development procedures of the scale

Results and Discussion

Combining the ECI and TPACK components produces 34 valid items with very high reliability (0.983). The results of each step will be described below.

Step 1. Determining the construct

As an initial stage, the construct to be determined is the teacher's readiness for ECI. The scale developed refers to the ECI guidelines and TPACK framework. This phase also included a comprehensive literature review on ECI and TPACK. The existing TPACK scale from previous studies was adapted to determine the construct.

Step 2. Making item statements

Writing statement items is often the most challenging scale development process. The initial scale consists of 36 items spread across seven aspects, namely Technological Knowledge (TK) (six items), Pedagogical Knowledge (PK) (14 items), Content Knowledge (CK) (four items), Pedagogical Content Knowledge (PCK) (five items), Technological Content Knowledge (TCK) (two items), Technological Pedagogical Knowledge (TPK) (2 items), and Technological Pedagogical Content Knowledge (TPACK) (three items).

Step 3. Determining scale format

Choosing a response format is an essential step of scale development. This scale uses a semantic differential ranging from 1 to 5; the closer to 5, the more towards a positive answer. The score on the scale is calculated based on the number of points selected by the respondent.

Step 4. Reviewing of statement items by experts

Obtaining content validation is also an essential part of the scale development process. A total of 36 initial items were assessed for content validity by six experts through a Forum Group Discussion (FGD). Four faculty members and two primary education teachers who have implemented the Emancipated Curriculum were involved in this step.

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The experts assigned a score to each item examined and offered comments and feedback on the scale's content clarity and conciseness. The expert assignments were then converted to a four-scale (excellent, good, fair, poor), as in Table 1.

Table 1. Scale item criteria

No	Interval scores	Criteria	
1	$x \geq 3{,}67$	Excellent	Valid
2	$3{,}67 > x \geq 3$	Good	Valid
3	$3 > x \geq \bar{x} - 2{,}37$	Fair	Invalid
4	$x < 3{,}27$	Poor	Invalid

A total of 36 items were declared to meet valid criteria, with an average score range of 3.67 to 4 with excellent criteria. Nevertheless, experts and practitioners provide some suggestions. Some items need to be adjusted to the terms in the Emancipated Curriculum, such as the use of teaching modules, not the lesson plan. The term P5 (the Pancasila Student Profile Strengthening Project) needs to be added to the *Rahmatan Lill Alamiin* (Islamic values) Student Profile. Another suggestion was to add a statement of diagnostic assessment, which is a characteristic of ECI. The experts' suggestions were then followed up for improvement.

Step 5. Considering the inclusion of validation items

According to DeVellis (2003), it is necessary to determine the validity of the scale for several additional items to be included in the scale. The experts suggested adding one item in the Technological Knowledge aspect and four in Pedagogical Knowledge. Thus, the total number of items became 41.

Step 6. Field Testing

After determining the items in the scale, the scale must be administered to a large sample of subjects. The final version of the Islamic primary teachers' readiness in ECI referring to the TPACK scale was given to 305 science teachers of Islamic primary schools in two provinces, namely Central Java and Special Province of Yogyakarta, but 218 people were willing and agreed to be involved as respondents (130 teachers from Central Java and 88 teachers from Special Province of Yogyakarta). This scale was sent via Google Forms and paper via mail, but most respondents were willing to respond through Google Forms.

Step 7. Evaluating the items

After administrating the scale to a large and representative sample, determining the nature of the latent variables underlying the set of items and measuring the reliability of internal consistency is an essential step in the scale development process. At this stage, quantitative research methods are involved to determine the extent to which the instrument, SEM-PLS software, is valid and reliable. Construct validity for each knowledge domain subscale (TK, PK, CK, PTK, PCK, TCK, TPACK) was analyzed using the Partial Least Square (PLS) method assisted by SmartPLS 4.0 software to assess internal consistency reliability, convergent validity, discriminant validity. The validity test includes the unidimensionality, local dependence, and monotonicity tests.

Unidimensionality aims to test the identity of indicators (items) so that one variable can only explain them (J F Hair et al. 2019; De Ayala 2022). The unidimensionality of the instrument was analyzed using Confirmatory Factor Analysis (CFA) via Jamovi (The Jamovi project, 2022) software by considering the values of Chi-square (CMIN), standardized root means square residual (SRMR), root mean square error of approximation (RMSEA), Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI). Several fit index criteria that must be met in the unidimensionality test are (1) for SRMR to be close to 0.60 or below; (2) for RMSEA to be close to 0.80 or below; (3) for CFI and TLI to be close to 0.90 or above

(Hu and Bentler 1998; Whittaker and Schumacker 2022). Because the number of respondents exceeds 200, the p-value is no longer significant. To calculate model fit, we used CMIN relative (CMIN/df) with a value criterion of below 5.00 (Wheaton et al. 1977; Castéra et al. 2020). Several items had to be removed because they disturbed the unidimensionality of the instrument, including TK4, TK6, TK7, PK7, PK8, PK17, and PK18.

The next test is the local dependence test on the statement items. Local dependence is the dependence of a statement item on other statements, which can be caused by the similarity of latent variables (J F Hair et al. 2019; De Ayala 2022). The local dependence value is obtained through the metric residual relationship test from CFA, with the requirement that must be met that the metric residual relationship value is less than 0.25 (Edelen and Reeve 2007; Chen and Thissen 1997). The CFA test demonstrates no inter-residual relationship with a value above 0.25. This shows that the statements used do not have any dependencies between the designed variables.

The final test is the monotonicity test using the "Mokken" package (Van der Ark 2015) in the R-Studio software (RStudio Team 2021). The model fit for monotonicity was tested using the scalability of the H-coefficient with the H-coefficient value that must be met being $H \geq 0.30$ for an item and $H \geq 0.50$ for all items (Mokken 1971; Klaufus et al. 2021). The results of the monotonicity test found that each item had criteria that met the model fit requirements with a value range between 0.635 to 0.758. Then, for all items, a value of 0.706 was obtained, which shows that the monotonicity of the instrument can be said to be valid.

The instrument's reliability was tested with CFA to determine the Cronbach's alpha value and factor loadings of each indicator. The scale and indicators can be reliable if they have a Cronbach's alpha and factor loadings value of more than 0.700 (J F Hair et al. 2019; Joseph F. Hair et al. 2021). The Cronbach's alpha obtained was 0.983, which can be categorized as very reliable. The indicators on the scale have reliable factor loading values ranging from 0.776 to 0.946.

The next step is to calibrate the scale using the Graded Response Model (GRM) to analyze the probability of a respondent's ability to choose a high category compared to choosing a low category on a statement item by considering the degree of discrimination (a) and the degree of difficulty of the question (b) (De Ayala, 2022; Samejima, 2018). The degree of discrimination aims to test the ability of the question items to differentiate respondents' abilities based on the level of difficulty of the question items. The criteria for the degree of discrimination are divided into (1) low (0.4 to 0.99); (2) moderate (1.00 to 2.09); and (3) high (above 2.10). The degree of difficulty of the items is the quality of the items in eliminating respondents with a low level of ability. In other words, respondents with low ability will only respond to statements with a low level of difficulty, whereas respondents with high ability will be able to respond to statements with a high level of difficulty (Fernandes et al. 2020; Baker and Kim 2017). The item fit criteria were tested by testing Orlando-Thissen's $S\text{-}X^2$, with a p-value criterion of more than 0.001 (Orlando and Thissen 2000; Fernandes et al. 2020).

The calibration test results in Table 2 show the value of the degree of discrimination of the questions with a medium to high criteria range (1.541 to 3.322). Regarding the degree of difficulty of the statements, extreme values (b) ranged from -3.763 to 4.297. Each category of answer choices has a wide range of values, which shows the ability of the question item to have a choice category that functions well. Figure 2 shows that each item has almost the same probability pattern and function of answer choice categories. This figure shows that the higher the respondent's ability (x-axis), the lower the probability of choosing the low-choice category (y-axis). For item fit, the p-value ranges from 0.003 to 0.944, indicating that all

items are in the fit category. Thus, the scale items developed in this study can discriminate respondents' abilities at each level.

Table 2. Characteristics of scale's items

Items	Degree of discrimination (a)	Thresholds				Items fit	
		b_1	b_2	b_3	b_4	SX^2	P-value
TK1	1.773	-3.763	-0.869	1.537	3.559	26.037	0.517
TK2	2.127	-2.355	-0.551	1.856	4.002	33.233	0.077
TK3	1.541	-3.559	-0.288	1.654	3.427	38.691	0.086
TK5	1.640	-3.469	-0.328	1.355	3.438	40.024	0.084
PK1	2.368	-1.656	-0.233	2.115	3.645	25.492	0.379
PK2	2.722	-1.511	-0.019	1.952	3.921	28.589	0.194
PK3	2.699	-1.572	-0.239	1.895	3.564	23.628	0.425
PK4	2.613	-1.592	-0.483	1.958	3.621	25.054	0.295
PK5	2.502	-1.736	-0.296	1.966	3.743	24.784	0.308
PK6	2.717	-1.546	-0.039	2.091	3.730	22.073	0.632
PK9	3.157	-1.336	-0.356	1.908	3.531	14.778	0.737
PK10	2.939	-1.377	-0.345	1.775	3.214	22.523	0.313
PK11	2.720	-1.602	-0.203	1.982	3.804	19.902	0.464
PK12	2.756	-2.009	-0.179	1.562	3.417	15.719	0.734
PK13	2.493	-1.819	-0.264	1.924	3.448	22.668	0.539
PK14	2.543	-1.660	-0.457	1.746	3.693	20.162	0.632
PK15	2.342	-1.781	-0.369	1.943	3.977	33.342	0.043
PK16	2.755	-1.687	-0.040	1.911	3.609	19.485	0.673
CK1	2.423	-2.214	-0.760	1.227	3.764	44.206	0.003
CK2	2.437	-2.050	-0.751	1.655	3.511	25.925	0.209
CK3	2.372	-1.910	-0.203	2.058	3.710	24.711	0.422
CK4	2.625	-1.728	-0.407	1.511	3.225	16.290	0.753
PCK1	2.730	-1.876	-0.473	1.877	3.866	30.071	0.069
PCK2	3.045	-1.466	-0.339	1.771	3.571	21.328	0.319
PCK3	2.464	-1.624	-0.016	2.178	4.297	26.888	0.310
PCK4	3.073	-1.610	-0.031	1.878	3.562	22.967	0.239
PCK5	2.672	-1.646	-0.267	1.983	3.648	23.901	0.409
TCK1	2.244	-1.911	-0.500	1.500	3.297	29.319	0.297
TCK2	2.532	-1.726	-0.128	1.786	3.547	19.068	0.641
TPK1	2.604	-1.500	-0.123	1.697	3.399	14.206	0.861
TPK2	2.761	-1.494	-0.400	1.672	3.602	17.607	0.674
TPACK1	2.828	-1.566	-0.117	1.890	3.507	22.957	0.346
TPACK2	3.173	-1.563	-0.325	1.946	3.730	8.159	0.944
TPACK3	3.322	-1.439	0.059	2.082	3.205	19.456	0.364

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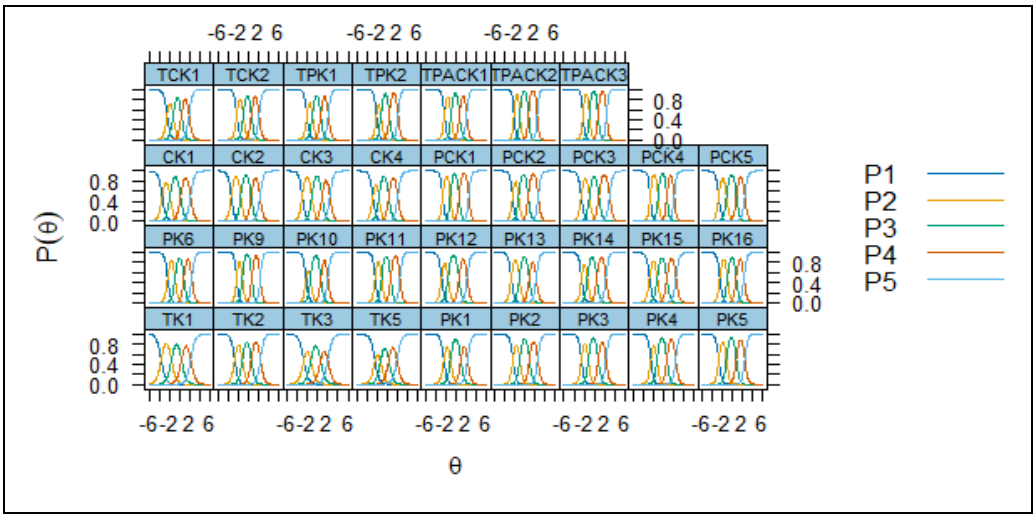

Figure 2. Scale item category curve

GRM also measures the total information curve of each item, which shows the item's potential to contribute information to the respondent's ability position in the entire range of assessment scores (De Ayala 2022; Baker and Kim 2017). Figure 3 shows that on the x-axis, there is information about the respondent's abilities, while on the y-axis, there is information on total items and item standard errors. From this figure, it can also be seen that the total information value and standard error range from logit -4 to logit 4, which has a high information value seen from the low standard error (close to 0). The total information graph has several peaks with peak values close to each other, with the highest peak at logit 1.

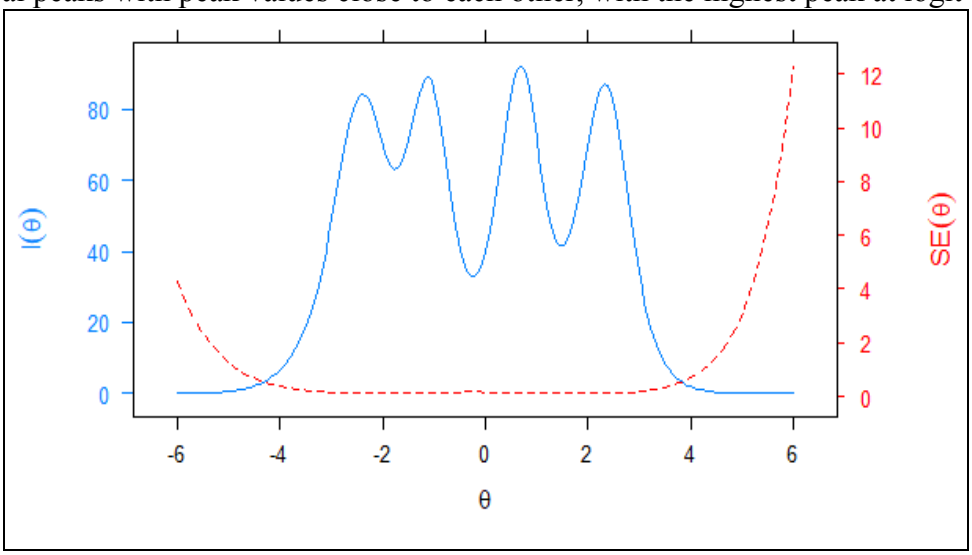

Figure 3. Scale total information curve

The final analysis in the form of differential item functioning (DIF) (see Table 3) aims to test the performance of items on respondents with two different characteristics (De Ayala 2022; Baker and Kim 2017). DIF analysis was done using the snowIRT module in Jamovi software (Seol, 2023; The Jamovi project, 2022). DIF analysis was carried out using the CMIN calculation, which was significant at 0.05 with the logistic regression detection method in the difNLR package (De Ayala 2022; Hladká and Martinková 2020). The variables tested in the DIF analysis are gender (DIF_1), respondent's education level (DIF_2), type of school (DIF_3), certification (DIF_4), ECI training (DIF_5), place of teaching (DIF_6), length of time teaching (DIF_7), and age (DIF_8).

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Table 3. Differential item functioning (DIF)

Items	P-value							
	DIF $_1$	DIF $_2$	DIF $_3$	DIF $_4$	DIF $_5$	DIF $_6$	DIF $_7$	DIF $_8$
TK1	0.265	0.311	0.441	<.001*	0.824	0.684	<.001*	<.001*
TK2	0.904	0.832	0.299	0.038*	0.588	0.967	<.001*	<.001*
TK3	0.192	0.293	0.744	0.017*	0.463	0.887	<.001*	<.001*
TK5	0.913	0.449	0.523	0.002*	0.412	0.482	<.001*	<.001*
PK1	0.026*	0.420	0.974	0.770	0.887	0.398	0.421	0.767
PK2	0.136	0.142	0.551	0.800	0.117	0.685	0.915	0.643
PK3	0.303	0.828	0.860	0.697	0.691	0.799	0.070	0.523
PK4	0.899	0.721	0.490	0.262	0.666	0.182	0.328	0.666
PK5	0.173	0.969	0.601	0.474	0.350	0.924	0.396	0.648
PK6	0.376	0.739	0.582	0.115	0.836	0.192	0.183	0.983
PK9	0.943	0.054	0.740	0.724	0.431	0.760	0.320	0.628
PK10	0.502	0.601	0.127	0.306	0.821	0.518	0.110	0.085
PK11	0.502	0.061	0.825	0.495	0.424	0.556	0.661	0.896
PK12	0.120	0.632	0.640	0.829	0.731	0.017*	0.332	0.305
PK13	0.586	0.174	0.108	0.513	0.010	0.482	0.137	0.041*
PK14	0.867	0.520	0.335	0.145	0.432	0.003*	0.175	0.022*
PK15	0.309	0.448	0.540	0.011*	0.472	0.001*	<.001*	<.001*
PK16	0.457	0.517	0.366	0.074	0.685	0.765	0.036*	0.015*
CK1	0.447	0.813	0.280	0.168	0.251	0.231	0.787	0.734
CK2	0.212	0.442	0.397	0.955	0.292	0.642	0.756	0.698
CK3	0.157	0.368	0.056	0.805	0.025*	0.504	0.051	0.422
CK4	0.622	0.474	0.389	0.988	0.836	0.620	0.007*	0.070
PCK1	0.218	0.771	0.612	0.507	0.014*	0.346	0.138	0.951
PCK2	0.679	0.245	0.876	0.731	0.594	0.372	0.007*	<.001*
PCK3	0.416	0.421	0.312	0.820	0.194	0.207	0.980	0.196
PCK4	0.490	0.461	0.573	0.243	0.051	0.007*	0.028*	0.068
PCK5	0.907	0.866	0.356	0.072	0.850	0.463	0.057	0.034*
TCK1	0.286	0.264	0.755	0.192	0.325	0.595	0.223	0.281
TCK2	0.455	0.499	0.550	0.005*	0.355	0.514	0.019*	<.001*
TPK1	0.736	0.819	0.798	0.002*	0.584	0.276	<.001*	<.001*
TPK2	0.609	0.852	0.361	<.001*	0.724	0.482	0.005*	0.001*
TPACK1	0.089	0.804	0.285	0.347	0.209	0.880	0.904	0.796
TPACK2	0.231	0.231	0.759	0.768	0.030*	0.855	0.262	0.736
TPACK3	0.519	0.032*	0.791	0.123	0.950	0.797	0.412	0.747

Table 3 shows that only the variable type of school (DIF_3) where the respondent teaches does not have a significant difference. In the gender variable (DIF_1), it can be seen that the male gender has a greater advantage than the female gender in answering the PK1 question items. In the educational level variable (DIF_2), respondents with a higher level of education (master's degree) have an advantage in responding TPACK3 statement. In the certification variable (DIF_4), respondents who already have teaching certification have an advantage in

answering questions TK1, TK2, TK3, TK5, TCK2, TPK1, and TPK2, while respondents who do not have teaching certification have an advantage in answering question items PK15. In the ECI training variable (DIF_5), respondents who have attended training have an advantage in answering questions CK3 and TPACK2, while respondents who have not participated in training have an advantage in answering questions PCK1. In the teaching location variable (DIF_6), respondents who teach in Central Java have an advantage in answering PK12, PK14, and PK15 questions, while respondents who teach in the Special Province of Yogyakarta have an advantage in answering PCK4 questions. In the variable of teachers' experiences (DIF_7), respondents who have teaching experience of less than 15 years have an advantage in answering questions TK1, TK2, TK3, TK5, TCK2, TPK1, and TPK2, while respondents who have taught for more than 15 years have more advantage in answering questions CK4, PCK2, and PCK4. In the age variable (DIF_8), respondents who are under 40 years of age have an advantage in answering questions TK1, TK2, TK3, TK5, TCK2, TPK1, and TPK2, while respondents who are over 40 years of age have an advantage in answering questions PK13, PK14, PK15, PK16, PCK2, and PCK5.

Step 8. Scale length optimization

Based on the SEM-PLS output results, seven items were eliminated, leaving 34 remaining from the previous 41 items. The 34 items include TK (4 items), PK (14 items), CK (4 items), PCK (5 items), TCK (2 items), TPC (2 items), and TPACK (3 items).

This research compiled a scale for the readiness of Islamic primary school teachers for the ECI referring to TPACK. Theoretically, the indicators in the ECI are closely related to TPACK, which is an essential element for lecturers, teachers, and preservice teachers in designing and implementing learning that contains a well-adjusted combination of knowledge between technology, pedagogy, and content. The TPACK model has been widely used in both quantitative (Chai et al., 2011; Hall et al., 2020; Pamuk et al., 2015; Yildiz Durak, 2019)and qualitative (Canbazoglu Bilici et al., 2016; Demir & Bozkurt, 2011; Groth et al., 2009; Koh et al., 2014; Mcgrath et al., 2011; Santos & Castro, 2021). In recent years, the TPACK model has also been used to investigate the development of teachers' TPACK according to different learning contexts, such as science (Canbazoglu Bilici et al., 2016; Jang & Tsai, 2013), mathematics (Hernawati & Jailani, 2019; Muhtadi et al., 2017; Niess et al., 2009), and English (Kurt et al., 2014; Solak & Cakir, 2014). A study conducted by Koh (2020) shows that TPACK can provide a theoretical framework for teaching and learning centers to compile and disseminate types of institutional knowledge through three approaches*:* technology modeling, pedagogical modeling, and deepening practice. Practically, the scale can provide a tool for teachers to self-evaluate their pedagogical practices. Teachers could identify which areas of their TPACK need improvement.

Conclusion

This study succeeded in developing a scale to measure the readiness of Islamic elementary school teachers for ECI, referring to the TPACK Framework, with 34 valid and reliable items (0.983). The scale contains indicators of TK (4 items), PK (14 items), CK (4 items), PCK (5 items), TCK (2 items), TPK (2 items), and TPACK (3 items). The scale can potentially be used as a tool to evaluate teacher readiness in implementing the independent curriculum. In addition, a portrait of teachers' readiness for ECI can be captured as a way to evaluate the curriculum itself and which training needs to be provided to elevate the teachers' knowledge and skills for ECI.

Recommendation

This study has limitations in that the respondents involved include those from Central Java and the Special Region of Yogyakarta, two large provinces with good access to education. As a comparison, other studies need to be carried out in other provinces to meet regional representation and produce more comprehensive data.

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References

Arifa, F. N. (2022). "Implementasi Kurikulum Merdeka Dan Tantangannya (Translation: Implementation of the Emancipated Curriculum and Its Challenges)." *INFO Singkat: Kaijan Singkat Terhadap Isu Aktual Dan Strategis* XIV (9): 25–30.

Ark, L. Andries Van der. (2015). "Package 'Mokken.'" *R*.

Ayala, Rafael Jaime De. (2022). *The Theory and Practice of Item Response Theory Second Edition*. Guilford Publications.

Baker, F B, and S H Kim. (2017). *The Basics of Item Response Theory Using R*. Statistics for Social and Behavioral Sciences. Springer International Publishing.

Berland, Leema K., and Katherine L. McNeill. (2010). "A Learning Progression for Scientific Argumentation: Understanding Student Work and Designing Supportive Instructional Contexts." *Science Education* 94 (5): 765–93. https://doi.org/10.1002/sce.20402.

Breiner, Jonathan M., Shelly Sheats Harkness, Carla C. Johnson, and Catherine M. Koehler. (2012). "What Is STEM? A Discussion about Conceptions of STEM in Education and Partnerships." *School Science and Mathematics* 112 (1): 3–11. https://doi.org/10.1111/j.1949-8594.2011.00109.x.

Castéra, Jérémy, Claire Coiffard Marre, Margaret Chan Kit Yok, Kezang Sherab, Maria Antonietta Impedovo, Tago Sarapuu, Alice Delserieys Pedregosa, Sufiana Khatoon Malik, and Hélène Armand. (2020). "Self-Reported TPACK of Teacher Educators across Six Countries in Asia and Europe." *Education and Information Technologies* 25 (4). https://doi.org/10.1007/s10639-020-10106-6.

Chai, C S, J H L Koh, and C C Tsai. (2010). "Facilitating Preservice Teachers' Development of Technological, Pedagogical, and Content Knowledge (TPACK)." *Educational Technology & Society* 13 (4): 63–73. https://www.jstor.org/stable/jeductechsoci.13.4.63.

Chen, Wen Hung, and David Thissen. (1997). "Local Dependence Indexes for Item Pairs Using Item Response Theory." *Journal of Educational and Behavioral Statistics* 22 (3). https://doi.org/10.3102/10769986022003265.

Darmayani. (2022). *Implementasi "Merdeka Belajar" Dalam Dunia Pendidikan Kita (Translation: Implementation of "Emancipated Learning" in Our Education)*. Salatiga.

DeVellis, R F. (2003). *Scale Development: Theory and Applications*. 2nd ed. Newbury Park: Sage.

Dunbar, K., and J. Fugelsang. (2005). "Scientific Thinking and Reasoning." In *The Cambridge Handbook of Thinking and Reasoning*, edited by K. J. Holyoak and R. G. Morrison, 705–25. Cambridge University Press.

Edelen, Maria Orlando, and Bryce B. Reeve. (2007). "Applying Item Response Theory (IRT) Modeling to Questionnaire Development, Evaluation, and Refinement." In *Quality of Life Research*. Vol. 16. https://doi.org/10.1007/s11136-007-9198-0.

Ellen, Kapitariyani Kimpo, and Lala Bumela Sudimantara. (2023). "Examining Emancipated Curriculum Development in Middle Schools: A Case Study." *PANYONARA: Journal of English Education* 5 (2). https://doi.org/10.19105/panyonara.v5i2.8779.

Faiz, Aiman, and Faridah Faridah. (2022). "Program Guru Penggerak Sebagai Sumber Belajar (Translation: Transfomational Teacher Program as a Learning Resource)." *Konstruktivisme: Jurnal Pendidikan Dan Pembelajaran* 14 (1): 82–88. https://doi.org/10.35457/konstruk.v14i1.1876.

Faiz, Aiman, Muhamad Parhan, and Rizki Ananda. (2022). "Paradigma Baru Dalam Kurikulum Prototipe (Translation: New Paradigm in Prototype Curriculum)." *EDUKATIF: Jurnal Ilmu Pendidikan* 4 (1): 1544–50. https://doi.org/10.31004/edukatif.v4i1.2410.

Fernandes, Karla P., Bruno S. Teixeira, Benjamin J. Arnold, Tânia M.da S. Mendonça, Sthela M. Oliveira, and Carlos Henrique M.da Silva. (2020). "Cross-Cultural Adaptation and Validation of the Universal Portuguese-Version of the Pediatric Functional Assessment of Chronic Illness Therapy – Fatigue (PedsFACIT-F)." *Jornal de Pediatria* 96 (4). https://doi.org/10.1016/j.jped.2019.01.003.

Gumilar, Gumgum, Dian Perdana Sulistya Rosid, Bambang Sumardjoko, and Anik Ghufron. (2023). "Urgensi Penggantian Kurikulum 2013 Menjadi Kurikulum Merdeka (Translation: The Urgency of Replacing the 2013 Curriculum with the Emancipated Curriculum)." *Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar* 5 (2): 148–55. https://doi.org/10.36232/jurnalpendidikandasar.v5i2.4528.

Hair, J F, R E Anderson, R L Tatham, and W C Black. (2019). *Multivariate Data Analysis*. *Book*. 8th editio. Vol. 87.

Hair, Joseph F., G. Thomas M. Hult, Christian M. Ringle, Marko Sarstedt, Nicholas P. Danks, and Soumya Ray. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. *Practical Assessment, Research and Evaluation*. Vol. 21.

Hattarina, Shofia, Nurul Saila, Adenita Faradilla, Dita Refani Putri, and Ghina Ayu Putri. (2022). "Implementasi Kurikulum Medeka Belajar Di Lembaga Pendidikan (Translation: The Implementation of Emancipated Curriculum in Educational Institutions)." In *Seminar Nasional Sosial Sains, Pendidikan, Humaniora (SENASSDRA)*, edited by Sardulo Gembong, 181–92. Madiun: IKIP PGRI.

Hladká, Adéla, and Patrícia Martinková. (2020). "DifNLR: Generalized Logistic Regression Models for DIF and DDF Detection." *R Journal* 12 (1). https://doi.org/10.32614/rj-2020-014.

Hu, Li Tze, and Peter M. Bentler. (1998). "Fit Indices in Covariance Structure Modeling: Sensitivity to Underparameterized Model Misspecification." *Psychological Methods* 3 (4). https://doi.org/10.1037/1082-989X.3.4.424.

Indarta, Yose, Nizwardi Jalinus, Waskito Waskito, Agariadne Dwinggo Samala, Afif Rahman Riyanda, and Novi Hendri Adi. (2022). "Relevansi Kurikulum Merdeka Belajar Dengan Model Pembelajaran Abad 21 Dalam Perkembangan Era Society 5.0 (Translation: The Relevance of the Emancipated Learning Curriculum with the 21st Century Learning Model in the Development of the Society 5.0 Era)." *EDUKATIF: Jurnal Ilmu Pendidikan* 4 (2): 3011–24. https://doi.org/10.31004/edukatif.v4i2.2589.

Kaplon-Schilis, A, and I Lyublinskaya. (2015). "Exploring Changes in Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK) and

TPACK of Pre- Service, Special Education Teachers Taking Technology-Based Pedagogical Course." In *Proceedings of Society for Information Technology & Teacher Education International Conference 2015*, edited by D Slykhuis & G Marks, 3296–3303. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Klaufus, L. H., M. A.J. Luijten, E. Verlinden, M. F. van der Wal, L. Haverman, P. Cuijpers, M. J.M. Chinapaw, and C. B. Terwee. (2021). "Psychometric Properties of the Dutch-Flemish PROMIS® Pediatric Item Banks Anxiety and Depressive Symptoms in a General Population." *Quality of Life Research* 30 (9). https://doi.org/10.1007/s11136-021-02852-y.

Kurt, G, A Akyel, Z Kocoglu, and P Mishra. (2014). "TPACK in Practice : A Qualitative Study on Technology Integrated Lesson Planning and Implementation of Turkish Pre-Service Teacher of English." *ELT Research Journal* 3 (3): 153–66.

Lince, Leny. (2022). "Implementasi Kurikulum Merdeka Untuk Meningkatkan Motivasi Belajar Pada Sekolah Menengah Kejuruan Pusat Keunggulan (Translation: Implementation of the Independent Curriculum to Increase Learning Motivation at the Center of Excellence Vocational High School)." *Prosiding Seminar Nasional Fakultas Tarbiyah Dan Ilmu Keguruan IAIM Sinjai* 1 (May): 38–49. https://doi.org/10.47435/sentikjar.v1i0.829.

Mardapi, Djemari. (2008). *Teknik Penyusunan Instrumen Tes Dan Nontes (Translation: Techniques for Administrating Test and Non-Test Instruments)*. Yogyakarta: Mitra Cendikia Press.

Mishra, Punya, and Matthew J Koehler. (2006). "Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge." *Teachers College Record: The Voice of Scholarship in Education* 108 (6): 1017–54. https://doi.org/10.1177/016146810610800610.

Mokken, R. J. (1971). *A Theory and Procedure of Scale Analysis*. *A Theory and Procedure of Scale Analysis*. https://doi.org/10.1515/9783110813203.

Muhammedi. (2016). "Perubahan Kurikulum Di Indonesia: Studi Kritis Tentang Upaya Menemukan Kurikulum Pendidikan Islam Yang Ideal (Translation: Curriculum Change in Indonesia: A Critical Study of Efforts to Find the Ideal Islamic Education Curriculum)." *Jurnal Raudhah* IV (1): 49–70.

Niess, M L. (2011). "Investigating TPACK: Knowledge Growth in Teaching with Technology." *Journal of Educational Computing Research* 44 (3): 299–317. https://doi.org/10.2190/EC.44.3.c.

Nugroho, O., A. Permanasari, and H. Firman. (2019). "The Movement of STEM Education in Indonesia: Science Teachers' Perspectives." *Jurnal Pendidikan IPA Indonesia* 8 (3): 417–25. https://doi.org/10.15294/jpii.v8i3.19252.

Orlando, Maria, and David Thissen. (2000). "Likelihood-Based Item-Fit Indices for Dichotomous Item Response Theory Models." *Applied Psychological Measurement* 24 (1). https://doi.org/10.1177/01466216000241003.

Randall, R., G.A. Sukoco, M. Heyward, R. Purba, S. Arsendy, I. Zamjani, and A. Hafiszha. (2022). "Reforming Indonesia's Curriculum: How Kurikulum Merdeka Aims to Address Learning Loss and Learning Outcomes in Literacy and Numeracy." Jakarta.

Rosser, A. (2018). *Beyond Access: Making Indonesia's Education System Work*. Melbourne : Lowy Institute.

RStudio Team. (2021). "RStudio: Integrated Development for R." *RStudio, Inc., Boston, MA*.

Samejima, Fumiko. 2018. "Graded Response Models." In *Handbook of Item Response Theory: Three Volume Set*. Vol. 1–3. https://doi.org/10.1201/9781315119144-6.

Santos, Joseline M., and Rowell D.R. Castro. (2021). "Technological Pedagogical Content Knowledge (TPACK) in Action: Application of Learning in the Classroom by Pre-Service Teachers (PST)." *Social Sciences and Humanities Open* 3 (1). https://doi.org/10.1016/j.ssaho.2021.100110.

Seol, Hyunsoo. (2023). "SnowIRT: Item Response Theory for Jamovi." [Jamovi module].

Shafie, Hidayu, Faizah Abd Majid, and Izaham Shah Ismail. (2019). "Technological Pedagogical Content Knowledge (TPACK) in Teaching 21st Century Skills in the 21st Century Classroom."

Syarochil, Ahmad Imdadus, and Machrus Abadi. (2023). "Problematics of the Implementation of the Emancipated Curriculum (IKM) in Indonesian Language of Class X." *Jurnal Pendidikan: Teori Dan Praktik* 8 (1): 1–8. https://doi.org/10.26740/jp.v8n1.p1-8.

Talitha, Rahma Intan, and Tiara Cempaka Sari. (2016). "Penerapan Metode Role Playing Untuk Meningkatkan Pemahaman Konsep Menghargai Keragaman Suku Bangsa Dan Budaya Di Indonesia Pada Pembelajaran IPS Kelas V SDN Cijati (Translation: Application of the Role Playing Method to Increase Understanding of the Concept of Respecting Ethnic and Cultural Diversity in Indonesia in Class V Social Studies Learning at SDN Cijati)." *Didaktik: Jurnal Ilmiah PGSD STKIP Subang* 1 (2): 231–41. https://doi.org/10.36989/didaktik.v1i2.29.

The jamovi project. (2022). "Jamovi. (Version 2.3)." *[Computer Software]. Retrieved from Https://Www.Jamovi.Org.*

Wheaton, Blair, Bengt Muthen, Duane F. Alwin, and Gene F. Summers. (1977). "Assessing Reliability and Stability in Panel Models." *Sociological Methodology* 8. https://doi.org/10.2307/270754.

Whittaker, T A, and R E Schumacker. (2022). *A Beginner's Guide to Structural Equation Modeling*. Taylor \& Francis.

Yue, XiaoYao. (2019). "Exploring Effective Methods of Teacher Professional Development in University for 21st Century Education." *International Journal for Innovation Education and Research* 7 (5): 248–57. https://doi.org/10.31686/ijier.vol7.iss5.1506.