Indonesian teacher engagement index: a rasch model analysis

Sasmoko\textsuperscript{1,2}, B S Abbas\textsuperscript{3}, Y Indrianti\textsuperscript{2} and S A Widhoyoko\textsuperscript{4}

\textsuperscript{1}Faculty of Humanities, Bina Nusantara University, Indonesia
\textsuperscript{2}Research Interest Group in Education Technology, Bina Nusantara University, Indonesia
\textsuperscript{3}Faculty of Engineering, Bina Nusantara University, Indonesia
\textsuperscript{4}Podomoro University, Indonesia

e@sasmoko.com

Abstract. The research aimed to calibrate Indonesian Teacher Engagement Index (ITEI) using instrument with RASCH MODEL. The respondents were 672 teachers of elementary, junior high, high school and vocational school. The number of items planned was 165 items with the initial reliability of 0.98. The ITEI scale uses Likert Scale (1 to 4) which was converted from ordinal scale to Equal Interval Scale. RASCH MODEL analysis was done by selecting based on Outfit Mean Square (MNSQ) between 0.5 - 1.5 as a good item, and measuring Point Measure Correlation (Pt Mean Corr) with the criterion of 0.4 - 0.85. Moderate Outfit Z-Standard (ZSTD) was ignored because the sample was > 500. Conclusions: ITEI is valid with 30 items and reliability of 0.97, and less engage teachers significantly at \( \alpha < 0.05 \).

1. Introduction

The research on teacher engagement has evolved since the 1970s, presenting various results, but conical at one conclusion that teacher engagement is an ideal condition of teachers who have a significant impact on students’ life \([1,2]\). Engaged teachers are able to positively influence both behaviors and thought so as to achieve results that can improve teaching and learning \([3]\). Teacher engagement refers to the combination of teacher characteristics, knowledge and motivation and its participation in the profession will support teachers in shaping teacher engagement \([4,5]\).

The Indonesian Teacher Engagement Index (ITEI) instrument is structured with reference to the concept of characteristics that teachers must have in Indonesia. ITEI is developed into 5 dimensions, that is how the teachers are able to show positive psychology, have an active role in building positive education, able to show good performance, have a supportive competence, posses national character as characteristic of Indonesia and able to show nationalism leadership Engagement \([6–10]\).

Positive psychology shows the level of mental health and well-being of teachers who are able to be understood on the meta-psychological level because it relates to the potential, motive and capacity of a teacher \([6,11,12]\). Positive psychology includes wisdom and knowledge, courage, humanity, justice, temperance and transcendence \([13,14]\). Positive education is formed when teachers are able to develop and have positive emotions, positive engagement, positive accomplishment, positive purpose, positive relationship and positive health \([10]\). Teacher performance measures can be seen when teachers are able to meet task demands and responsibilities as a teacher (task performance), able to demonstrate effective behaviours that support the main tasks and responsibilities as a teacher (contextual performance), minimize unproductive behaviour in work (Counterproductive behaviour) and adapt skilfully with the changes (adaptive performance) \([7,8,15]\).
Teacher competence in Indonesia consists of pedagogic competence, personality competence, social competence, and professional competence [16,17]. The national character that the teachers must possess refer to the ideology and the foundation of the Republic of Indonesia named Pancasila consisting of the character of Godhead, the character of the Justification and Civilized Humanity, the character of the Unity of Indonesia, the character of Democracy Led by Wisdom of Wisdom and the character of Social Justice. While nationalism leadership is formed from the ability of teachers in identifying themselves as educators who have a leadership spirit that represents the interest of Indonesia as a whole, build a positive perception not only towards their regions but also Indonesia show themselves as reliable educators, demonstrate competence in managing multi ethnic learners, become role models in developing the paradigm of students in viewing their areas as an integral part of Indonesia, motivate students to promote national interest and creative and innovative in handling problems with the principle of national stability [18–20]

The formulations of this research problem are 1) finding the validity and reliability of ITEI instrument profile for Indonesian context and 2) finding the tendency of the teacher engagement in Indonesia.

2. Research Method
The respondents of this research are 672 elementary, junior high, high school and vocational high school teachers who are spread in Java. This research is a preliminary research conducted in order to build valid and reliable Indonesian Teachers Engagement Index (ITEI) instrument. The instrument was constructed using one of the stages in Neuroresearch, namely, the exploratory research [21].

The Indonesian Teacher Engagement Index (ITEI) instrument is structured with reference to the characteristics that teachers must possess in Indonesia [6–10]. ITEI is developed with 5 dimensions, those are:

2.1 How the teachers are able to show positive psychological condition (positive psychology)
This dimension is characterized by six indicators embodied in 6 virtues and 24 strength characters, such as 1) Wisdom and Knowledge, cognitive strength that entail the acquisition and use of knowledge consisting of creativity, curiosity, open mindedness, love of learning and perspective; 2) Courage, an emotional strength that involves authenticity, bravery, persistence, and zest; 3) Humanity, an interpersonal strength that involves (tending and befriending) others entailing kindness, love, and social intelligence; 4) Justice, a civic strength that underlies healthy community life entailing fairness, leadership, and teamwork; 5) Temperance, a strength that protects against excess entailing forgiveness, modesty, prudence, self-regulation; and 6) Transcendence, a strength that forges connections to the larger universe and provides meaning entailing appreciation of beauty and excellence, gratitude, hope, humour and religiousness[13,14].

2.2 How the teachers can play an active role in building positive education
This dimension consists of six indicators, such as 1) positive emotion, a positive emotional experience such as joy, gratitude, and hope; 2) positive engagement, e.g. interest, engagement, curiosity, and absorption; 3) positive accomplishment, an incentive to achieve meaningful results; 4) positive purpose, in which the teachers are able to contribute to others and to the community; 5) positive relationships related to social and emotional skills to encourage the establishment of positive relationships; And 6) positive health, a healthy and optimal physical and psychological condition[10]

2.3 How teachers can demonstrate good performance,
Performance is a multi-dimensional concept consists of four indicators: 1) task performance, in which teachers are able to perform their main duties and responsibilities as teachers; 2) contextual performance, in which teachers are able to exhibit positive behaviours that support the effectiveness of performance; 3) counterproductive work behaviour, in which teachers are able to minimize behaviours that reduce the effectiveness of performance and 4) adaptive performance, in which teachers are able to adapt and be proactive with changes [7,8,15,22,23]
2.4 How teachers possesses supportive competencies
Teachers have four main competencies that must be possessed: pedagogic competence, social competence, personal competence and professional competence [16].

2.5 How teachers possess the character of nationality as a characteristic of Indonesia
This dimension is based on the five precepts of Pancasila as the philosophy of the Indonesian nation, so this dimension consists of five indicators, such as 1) Character of Godhead; 2) Fair and Civilized Humanitarian Character; 3) Character of Unity of Indonesia; 4) Character of Democracy Led by Wisdom of Wisdom and 5) Character of Social Justice.

2.6 How teachers are able to demonstrate nationalism leadership engagement.
This dimension was developed by [15] consists of seven indicators, such as 1) Able to identify themselves as educators who possess a leadership spirit that represents the interests of Indonesia as a whole; 2) Have a positive perception of the region as well as Indonesia that Bhinneka Tunggal Ika as its own machine to fight for the integrity of Indonesia; 3) Demonstrate as trustworthy educators; 4) Possess competence in managing multiethnic students; 5) Able to be an example in developing the paradigm of students in seeing their areas as an integral part of Indonesia; 6) Able to motivate students to prioritize national interests; And 7) Creative and innovative in dealing with issues with the principle of national stability.

The ITEI instrument is constructed using the Likert Scale rating with a score rating of 1) indicating that the statement is very unsuitable to the condition that the teachers experience daily and never do at all, 2) showing that the statement is less in line with the condition that the teachers experience daily and do it occasionally, 3) indicating that statement adequately describes the condition they experience daily and several times do it and 4) showing that the statement strongly describes the condition they experience daily and always do it.

Construct validity of ITEI through instrument item validity is done by Rasch Model analysis. Rasch Model is a model developed by Dr. Georg Rasch in 1960. Rasch model is a model of calculation analysis where item parameters can be estimated independently of the characteristics of sample calibration parameters (Masters, 1982; Curtis & Boman, 2007; Lewandowski, Co-investigator, & Lewandowski, 2015). The advantage that can be obtained by using the Rasch Model is that the interaction between the respondents and the items in the instrument uses the same logit scale intervals as well as able to analyze polytomous items[27]. The Rasch Model is able to demonstrate a response to statistical independence of a number of items[28].

Because the ITEI instrument uses the Likert Rating Scale, each item checked with four answer choices will be modeled into three thresholds. The threshold of each item has a predicted difficulty (F) with the following equation:

\[ P_{ni1}(X = 1|\beta, \delta, F_1) = \frac{e^{(\beta - [\delta + F_1])}}{1 + e^{(\beta - [\delta + F_1])}} \]  

RASCH MODEL is trying to measure the instrument from the mean value outfit Mean Square (MNSQ). MNSQ shows the size of randomness or distortion in a measurement. The value of MNSQ has some implications on the measurement, in which the MNSQ value indicates that the item has good conditions for measurement in the range of 0.5 - 1.5. The MNSQ is able to determine how well each item contributes to defining a common construction [29].

This analysis also attempts to measure the instrument in terms of Standardized fit Statistics (ZSTD) which is an analysis to see the suitability of data with the model. The value of ZSTD illustrates that the data has a logical approximation which is ranged between -1.9 - 1.9 [30].

The third value seen by RASCH MODEL analysis is the value of Point Measure Correlation (Pt Mean Corr) with a range of values 0.4 - 0.85.
Initial reliability test results of instrument items consist of 165 items indicate that good item reliability is 0.90.

| Person | 672 | INPUT | 672 | MEASURED | INFIT | OUTFIT |
|--------|-----|-------|-----|----------|-------|--------|
| MEAN   | 600.5 | 165.0 | 2.27 | .16 | 1.05 | .2 | 1.00 | .0 |
| S.D.   | 24.9 | 0 | .53 | .05 | .21 | 1.2 | .27 | 1.3 |
| REAL RHSE | .17 | TRUE SD | .50 | SEPARATION 2.95 | Person RELIABILITY .90 |

Figure 1. Reliability Test Results

The results of analysis by using RASCH MODEL regarding the MNSQ, ZSTD, and PT mean Corr are as follows:

From the results of the analysis, there are 30 valid and eligible items. ITEI instrument reliability test results with 30 valid items obtains:

Calculating Fit Statistics

Standardized Residuals N(0,1) Mean: .01 S.D.: .99
Time for estimation: 0:0:0.250
Processing Table 0
F:\KONFERENSI INTERNASIONAL\CAPEU UNESA 2017\Equal Interval Fit 672 ITEI.prn

| Person | 672 | INPUT | 672 | MEASURED | INFIT | OUTFIT |
|--------|-----|-------|-----|----------|-------|--------|
| MEAN   | 189.5 | 30.0 | 3.07 | .63 | 1.00 | .0 | .98 | .0 |
| S.D.   | 8.9 | 0 | 1.61 | .54 | .31 | 1.1 | .37 | 1.1 |
| REAL RHSE | .83 | TRUE SD | 1.38 | SEPARATION 1.66 | Person RELIABILITY .73 |

Figure 2. ITEI Reliability Test Results for 30 items

After obtaining the valid items, the actual condition of the population can be immediately found out by doing SPSS analysis which results as follows:

| Descriptors | Statistic | Std. Error |
|-------------|-----------|------------|
| ITEI/Equal Interval Scale (CY) | Mean | 3.0699 | 0.0211 |
| | 95% Confidence Interval | 2.4440 | 3.1898 |
| | for Mean | .9989 | .9989 |
| | 5% Trimmed Mean | 3.0104 |
| | Median | 2.7000 |
| | Variance | 2.502 |
| | Std. Deviation | 1.01005 |
| | Minimum | .96 |
| | Maximum | 5.01 |
| | Range | 5.01 |
| | Interquartile Range | 1.68 |
| | Skewness | .061 | .014 |
| | Kurtosis | -2.96 | 1.06 |

Figure 3. SPSS Test Results
3. Result and Analysis
The Rasch Model analysis shows that of 165 items in the ITEI instrument, there are 30 items that have good conditions for measurement. While other items are less good and less productive (MNSQ values are between 1.5 - 2.0 or MNSQ <0.5) for measurement although no items degrade the quality of the measurement system (MNSQ> 2.0). Of these 30 items, the dimension of nationalism leadership engagement is not represented, so there is a change represented in the following picture:

| Table 1. ITEI Dimensions, Indicators and Number of Items before and after analysis |
|-----------------------------------------------|-----------------|-----------------|-----------------|
| Dimension                           | Indicator                        | Number of ITEI Items before analysis | Number of ITEI Items after analysis |
|-----------------------------------------------|-----------------|-----------------|-----------------|
| Positive Psychology                  | Wisdom & knowledge                      | 7               | 1               |
| Positive Education                    | Positive emotion                     | 3               | 0               |
| Teacher performance                  | Task performance                      | 3               | 1               |
| Teacher competence                   | Pedagogic competences                 | 48              | 9               |
| Character nationality                | God Character                        | 3               | 0               |
| Nationalism Leadership Engagement     | Able to identify themselves as educators who possess a leadership spirit that represents the interests of Indonesia as a whole | 3 | 0 |
The categorization for the ITEI instrument consists of four categories defined as the score 1 = Not Engage, score 2 = Less Engage, score 3 = Engage, and score 4 = very engaged. The SPSS test generates confidence interval with a significance level of 5% as follows:

The summary is as follows:

| Class Interval     | Information           |
|--------------------|-----------------------|
| 0.175 – 1.974      | 1 = not engage        |
| 1.975 – 3.774      | 2 = less engage       |
| 3.375 – 5.574      | 3 = engage            |
| 5.575 – 7.374      | 4 = very engage       |

The results of the analysis in the population show that the population is in the category of less engage.

4. Discussion
This research is a preliminary research conducted in order to construct an Indonesian Teacher Engagement Index instrument which will eventually be tested and implemented nationally to see the condition of teachers in Indonesia. Although the Rasch Model analysis eliminates one dimension, the five dimensions are able to describe an engagement condition in the teacher. The teacher relates closely to the students, the school, and the community, so that the character of the engaged teacher becomes the deciding factor that can affect the students’ life [31–33]; The formation of values developed in schools brings the character of the nation manifested in the behaviour and competence the students possess[1,17].

Based on the results of the two types of research above, the ITEI instrument is worthy of being used as a measuring tool to rationally measure the state of teachers’ engagement to complement the teacher profiling illustrated through the Teacher Performance Assessment and Teacher Competency Test.

References
[1] Rutter R A and Jacobson J D 1986 Facilitating Teacher Engagement Educ. Res.
[2] Burns A 2010 Teacher engagement in research: Published resources for teacher researchers Books from regional locations Gregory Hadley (ed.). Action research in action, Singapore: SEAMEO Regional Language Centre (2003). Pp. iv + 54. ISBN 9971-74-081-8. Gertrude Tinker Lang. Teach. 43 pp 527–36
[3] Stanton K C 2011 Engineering Faculty Motivation for and Engagement in Formative Assessment 171
[4] Gardee A and Brodie K 2015 A teacher’s engagement with learner errors in her Grade 9 mathematics classroom Pythagoras 36 pp 1–9
[5] Kathleen Travis Knowles 1999 THE EFFECT OF TEACHER ENGAGEMENT ON STUDENT MOTIVATION AND ACHIEVEMENT Dep. Hum. Dev.
[6] Gable S L and Haidt J 2005 What (and Why) Is Positive Psychology? Rev. Gen. Psychol. 9 pp 103–10
[7] Koopmans L, Bernaards C M, Hildebrandt V H, Van Buuren S, Van der Beek A J and De Vet H C W 2013 Development of an individual work performance questionnaire Int. J. Product. Perform. Manag. 62 6–28
[8] Koopmans L, Bernaards C M, Hildebrandt V H, Schaufeli W B, de Vet Henrica C W and van der Beek A J 2011 Conceptual Frameworks of Individual Work Performance J. Occup. Environ. Med. 53 pp 856–66
[9] Darling-Hammond L 2000 How teacher education matters J. Teach. Educ. 51 pp 166–73
[10] Norrish J 2013 An applied framework for Positive Education Int. J. Wellbeing 3 147–61
[11] Alex Linley P, Joseph S, Harrington S and Wood A M 2006 Positive psychology: Past, present, and (possible) future J. Posit. Psychol. 1 3–16
[12] King L A 2017 Why Positive Psychology Is Necessary pp 216–8
[13] Seligman M E P, Steen T A, Park N and Peterson C 2005 Positive psychology progress: Empirical validation of interventions. Am. Psychol. 60 pp 410–21
[14] Seligman M E P, Ernst R M, Gillham J, Reivich K and Linkins M 2009 Positive education: positive psychology and classroom interventions Oxford Rev. Educ. 35 pp 293–311
[15] Yusoff R Bin, Ali A and Khan A 2014 Assessing reliability and validity of job performance scale among university teachers. J. Basic Appl. Sci. Res. 4 pp 35–41
[16] Anon 2005 Undang Undang Republik Indonesia No 14 Tahun 2005 tentang Guru dan Dosen
[17] Kementerian Pendidikan Nasional D J P M P dan T K 2011 Pedoman Pelaksanaan Penilaian Kinerja Guru
[18] Schildkraut D J 2005 The rise and fall of political engagement among latinos: The role of identity and perceptions of discrimination Polit. Behav. 27 pp 285–312
[19] Bass B M, Avolio B J, Jung D I and Berson Y 2003 Predicting unit performance by assessing transformational and transactional leadership. J. Appl. Psychol. 88 pp 207–18
[20] Susanto H 2013 Understanding of Regional History and Perception of Int. J. Hist. Educ. XIV
[21] Sasmoko; Ying Yi 2015 Construct Validity in NeuroResearch Adv. Sci. Lett. 21 pp 2438—41
[22] Rotundo M and Sackett P R 2002 The Relative Importance of Task, Citizenship and Counterproductive Performance to Global Ratings of Job Performance: A Policy-Capturing Approach J. Appl. Psychol. 87 pp 66–80
[23] Campbell J P and Wiernik B M 2015 The Modeling and Assessment of Work Performance 2
[24] Curtis D D and Boman P 2007 X-ray your data with Rasch Int. Educ. J. 8 249–59
[25] Lewandowski C M, Co-investigator N and Lewandowski C M 2015 Self-directed Learning Oriented Assessments in the Asia-Pasific Eff. Br. mindfulness Interv. acute pain Exp. An Exam. Individ. Differ. 1 pp 1689—99
[26] Masters G N 1982 A Rasch model for partial credit scoring Psychometrika 47 pp 149–74
[27] Sousa L B, Prieto G, Vilar M and Firmino H and Simões M R 2014 The Adults and Older Adults Functional Assessment Inventory: A Rasch Model Analysis. Res. Aging 37 7 pp 87–814
[28] Goh H E, Marais I and and Ireland Michael James 2015 A Rasch Model Analysis of the Mindful Attention Awareness Scale Assessment pp 1–12
[29] Kim B S K and Hong S 2004 A Psychometric Revision of the Asian Values Scale Using the Rasch Model Meas. Eval. Couns. Dev. 37 pp 15–27
[30] Karabatsos G 2001 The Rasch model, additive conjoint measurement, and new models of probabilistic measurement theory. J. Appl. Meas. 2 pp 389–423
[31] Cardwell M E 2011 Patterns of Relationships Between Teacher Engagement and Student Engagement Fish. Digit. Publ
[32] Basikin 2007 Vigor, dedication and absorption: Work engagement among secondary school English teachers in Indonesia AARE Int. Conf. Perth, Aust. 27-28 Novemb. 2007 pp 25–9
[33] Boyd A C 2011 Washington State High School Science Teacher Engagement in and Motivation for Formative Classroom Assessment 169