

APPLYING INDONESIAN TEACHER ENGAGEMENT INDEX (ITEI) APPS: SELF-DIAGNOSTIC APPS FOR TEACHERS IN INDONESIA

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Received September 2017; accepted December 2017

ABSTRACT. *The Indonesian Teacher Engagement Index (ITEI) is a self-diagnostic instrument used to view teacher engagement profiles. By utilizing smartphone technology, the ITEI instrument is a mobile application, to help teachers in self-assessment, so as to quickly learn their profile engagement. This study presents the design of ITEI applications. The research used the Neuroresearch method through three stages: the exploratory (which constructed the theoretical Indonesian Teacher Engagement Index (ITEI)), explanatory, and confirmatory. The establishment of an ITEI value was completed using the weighted index method. The result of this research is a design of the ITEI application for smartphones.*

Keywords: Applications, Indonesian Teacher Engagement Index (ITEI), Neuroresearch

1. Introduction. The rapid development of technology makes the use of mobile smartphones increasingly diverse and able to answer various needs through applications (apps). The number and popularity of mobile apps rose sharply as a result of smartphone adoptions, which allows for use of various applications across a fast mobile network [1]. In the field of medicine, various studies have found considerable benefits from the use of mobile apps, such as improving patient adherence to treatment. They can be also served as an effective reminder for patients to comply with drug use, compared to traditional reminder systems such as weekly pillboxes [2]. The same is true for education, where faculty have begun experimenting with mobile apps to teach subjects [3]. A study also found the sophistication of smartphone technology allows students to engage with learning environments more flexibly [4]. The increasing popularity of smartphone apps led to the emergence of various innovations in the design of mobile apps [5].

The increased use of smartphone apps is the rationale for this research. Smartphone apps can be one of the tools to improve the quality of education, especially in Indonesia. Teachers determine the success of students, so it requires various efforts to improve the quality of teachers [6]. One effort made is to improve the culture of engagement, because an engaged teacher is able to produce students who are more engaged and have higher achievement [7,8]. The concept of teacher engagement is the basis for the app.

Indonesian teachers who are engaged are positioned not only as teachers, but also help to form the professional characteristics of a model Indonesian educator. Research on teacher engagement proved that it has a positive impact on student education. Engaged teachers are also able to make students more engaged, so as to create a more effective learning atmosphere [9]. The importance of teacher engagement has increased in the 21st century. Students in the millennial generation require teachers to be more sensitive to their competencies, to help develop a culture to self-assess and improve abilities. Therefore, this study aims to build a self-diagnostic app named the Indonesian Teacher Engagement Index (ITEI).

2. Problem Statement and Preliminaries. The concept of engagement is one that has been significantly studied, because it is closely related to the job process and outcomes [10,11]. Engagement relates to a person's overall investment in himself, which shows a comprehensive relationship with his performance [12]. Engagement is related to the source of work and performance, because engagement shows control over their decisions and work [13]. This concept fits perfectly with the teaching profession. Teachers in Indonesia are professional educators with the primary task of educating, teaching, guiding, directing, training, assessing, and evaluating learners in early childhood education on formal, primary, and secondary education [14].

Based on the function of teachers in Indonesia, the Indonesian Teacher Engagement Index (ITEI) is a self-diagnostic instrument based on the concept of engagement, to determine the profile of teachers in Indonesia. The ITEI instrument was developed through various studies on factors influencing teacher engagement and various teacher conditions in Indonesia. The ITEI is formed by six dimensions.

Dimension 2.1. Teacher engagement as a positive psychology. Engagement is a term in positive psychology that describes how one plays a role according to his level of physical, cognitive, and emotional self-characterization. It includes three main characteristics of vigor, absorption, and dedication [11,15,16]. The description of engagement in the realm of positive psychology is the first dimension describing teacher engagement.

Dimension 2.2. In the field of education, the concept of engagement is expected to be capable of increasing positive contributions for institutions, students, and teachers. Engaged teachers will seek to apply the best methods and focus on student progress [8,17,18]. Education that seeks to improve skills and happiness is part of the positive education concept that synergies learning and positive emotions [19,20]. Teacher engagement in Indonesia will become more comprehensive when the positive education dimension is included.

Dimension 2.3. Teachers show good performance. A study in the Netherlands attempted to test the teacher engagement model, in which job resources were related to the level of work and engagement and could predict teachers' weekly performance [21]. This suggests that engagement cannot be detached from the resulting performance and has been proven through various studies, which find that there is an influence of determinant engagement on a person's performance [22-24]. Therefore, performance becomes one of the important factors in the formation of teacher engagement in Indonesia.

Dimension 2.4. Basic teacher competencies are present. The law also states that teachers in Indonesia must have basic competencies, namely a set of knowledge, skills, and behaviors that must be possessed, experienced, and mastered to perform professional duties. Teacher competence includes pedagogic, personality, social, and professional competence [14]. This dimension indicates the fulfillment of teacher competence in Indonesia.

Dimension 2.5. A national character is present. The law states that national development in the field of education is the effort to improve the life of the nation and the quality of Indonesian citizens who believe, pious, and noble and master the science, technology, and art in realizing a developed, just, prosperous, and civilized society based on Pancasila

and the Constitution of the State of the Republic of Indonesia Year 1945. Every teacher in Indonesia should apply the nation's philosophy to his or her education. This dimension is considered important for the ITEI, because it shows the character of the teacher who refers to the philosophy of the Indonesian nation.

Dimension 2.6. The nationalism leadership engagement. The existence of teachers in Indonesia has three fundamental things that must be imbued. The national character is reflected through "sila in Pancasila", four basic competencies, as well as nationalism attitudes related to the loving attitude of the homeland, so that they always uphold social justice for all students in Indonesia [25,26]. Therefore, as the last dimension of the great teacher in Indonesia, it should show engagement as a nationalist leader.

3. Research Methods.

Method 3.1. ITEI Instrument Development Method. The research method used is Neuroresearch, a mixed method that combines qualitative and quantitative research methods using three stages of research [27,28]. Neuroresearch is chosen because in building the ITEI, it begins by constructing theoretical constructs qualitatively, then developing the ITEI system as an instrument for the national survey across Indonesia. The first stage of Neuroresearch is the exploratory research stage, which is a literature review of teacher engagement in accordance with the context in Indonesia. This process gives birth to the construction of the theoretical Indonesian Teacher Engagement Index (ITEI).

Method 3.2. Index Development Methods for the Indonesian Teacher Engagement Index (ITEI). An index number is a comparative number expressed as a relative measure of change in one or more variables at a given time or place, compared to the same variable at another time or place. The index number is a tool for measuring change [29]. This is because an activity can experience a change. We require a measuring tool to evaluate these activities. Index number (also known as an index) is one of the measuring tools used for evaluation. Therefore, index numbers are widely used in various branches of science such as economics, medicine, geography, and psychology.

Given the importance of using index numbers, the challenge is to build or create an appropriate index, so that it can be used to evaluate an activity. In this research, the ITEI value is established using the weighted index method. The ITEI encompasses several dimensions. The value of the index should be built from the dimensions that can be represented. The weighted index method is used, because in this research, there are several dimensions, each having different importance/contributions to the building index [29]. The ITEI is calculated as: $ITEI = \sum_{i=1}^n w_i D_i$, where w_i is the weight of each dimension and D_i is the value of each dimension. Determination of weight value in this study used the Analytic Hierarchy Process (AHP). AHP is used to decide and analyze the importance of comparable variables [29]. The determination of which variable has a higher importance than others is done using a weighting. This method compares the degree of importance between dimensions, and then obtains the weight of each dimension [30].

Method 3.3. Development of ITEI Apps. Self-diagnostic ITEI apps are developed to improve the effectiveness of implementing the ITEI. The ITEI application installed on smartphones is easily accessible to teachers across Indonesia.

4. Control Design.

Result 4.1. Based on theoretical studies, the ITEI instrument contains six dimensions and 19 indicators, consisting of 44 items with a reliability of 1.0.

Result 4.2. Calculation of the Statistical Value of the Index ITEI. The ITEI is built from six dimensions. The first stage is to weight each dimension. Each dimension is compared, to identify the dimensions that are more important and how comparable their importance is. The second stage is the calculation process of matrix normalization. The

TABLE 1. The ITEI instrument development

Dimension	Indicators
Positive Psychology	(1) Courage, (2) Humanity, (3) Justice, (4) Temperance, (5) Transcendence
Positive Education	(6) Positive Emotion, (7) Positive Purpose, (8) Positive Health
Teacher Performance	(9) Task Performance, (10) Contextual Performance, (11) Adaptive Performance
Nationality Character	(12) Character of God, (13) The Character of Unity of Indonesia
Nationalism Leadership Engagement	(14) Nationalism, (15) Keeping Unity
Teacher Competences	(16) Pedagogic Competences, (17) Personality Competences, (18) Social Competences, (19) Professionalism Competences

TABLE 2. Weight of each dimension

Dimension	A	B	C	D	E	F
Weight	0.108	0.343	0.199	0.17	0.087	0.092

weight value is obtained by averaging. Table 2 includes the weight value of each dimension.

$$\begin{aligned} \text{ITEI} = & (0.108)(3.517) + (0.343)(3.938) + (0.199)(3.429) + (0.17)(4) \\ & + (0.087)(4) + (0.092)(3.494) \end{aligned}$$

From the above calculation, the appropriate values are obtained. Because the scale of the instrument is 4, if the value of the ITEI is closer to 4, then the index of respondents is improving.

Result 4.3. Design of ITEI Apps. The developed ITEI app is a client-server application. Teachers provide input data by answering questions on the Android app. The input data is sent to the server and used to produce a profile. Based on data recorded in the Ministry of Education and Culture of Indonesia, there are 2,926,565 teachers across 216,666 schools in Indonesia [31]. Each teacher must participate by answering the questions contained in the ITEI app, so as to ensure accurate, real-time data processing and minimize processing time and server failure of the ITEI system architecture on the server side using a load balancer.

A load balancer acts as a reverse proxy, to efficiently distribute all the incoming network traffic to many back-end servers, where each server is the cloning of a server application. Cloning this server is also called an instant server [32-34]. These back-end servers access and manipulate the same database, to ensure the data accessed in the ITEI is real-time. The initial design of the ITEI system is shown in Figure 1, using a server with Login Intel Xeon E3-1270 (3.40GHz) specification 4 Cores 2GB RAM 500GB SATA. This server specification in the future will change according to the load server traffic and processing conditions of each input.

The database used in the ITEI system is a relational database, as depicted in Figure 3, to ensure that the operations performed on the data will be stored in a structured table. Data storage in related tables will ensure integration between data. Each of the stored data will have an identity, hereinafter referred to as the primary key. The use of relational databases also ensures the data in the same group will be stored in a single table. Tables that require data from other tables will use a foreign key as a link [35].

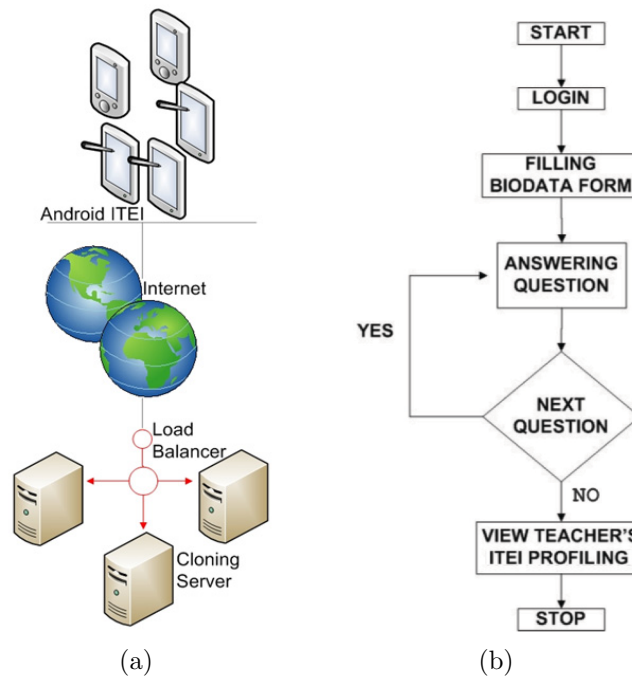


FIGURE 1. (a) ITEI system architecture; (b) Android ITEI application flow diagram

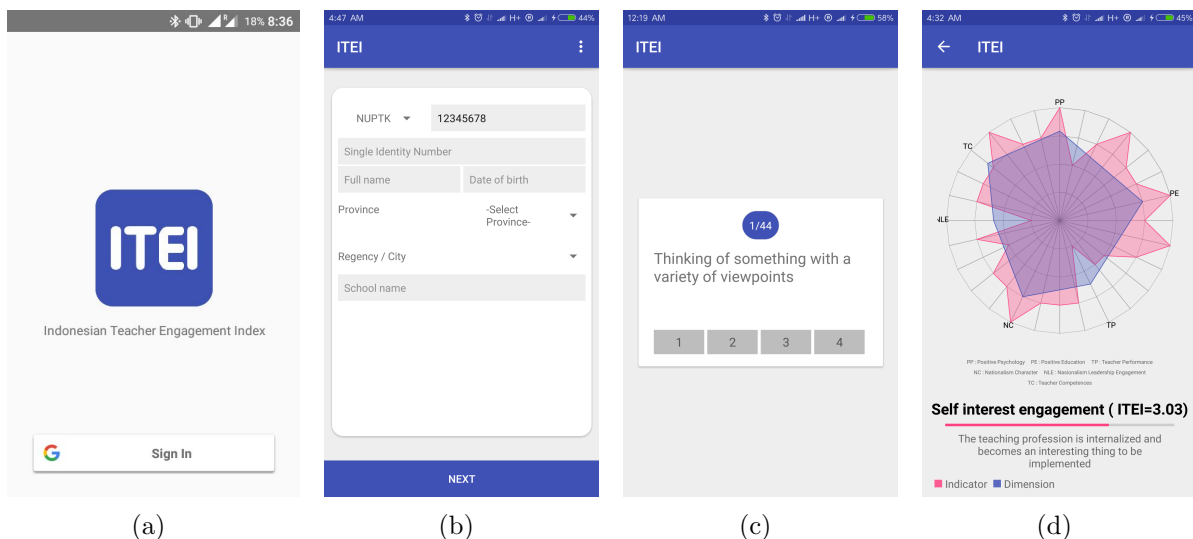


FIGURE 2. (a) Login page view; (b) pageviews of personal data; (c) views of page answering Android ITEI application questions; (d) self-profiled profile page views

The ITEI client application follows the path shown in Figure 1. Teachers are first prompted to log in using a Google account, as shown in Figure 2. The selection of the Google account assumes most Android users have smartphone settings that already use their Google account. Thus, teachers need not register into the system and memorize passwords again, instead simply using the default Google account. This account is also the identity of teachers on the database, so that the self-profiling results remain stored in the database.

After the initial login, teachers will complete self-profile information consisting of school, age, and length of teaching, as shown in Figure 2. To ensure respondents feel comfortable and are not threatened, the ITEI does not ask for their identity card numbers, teacher

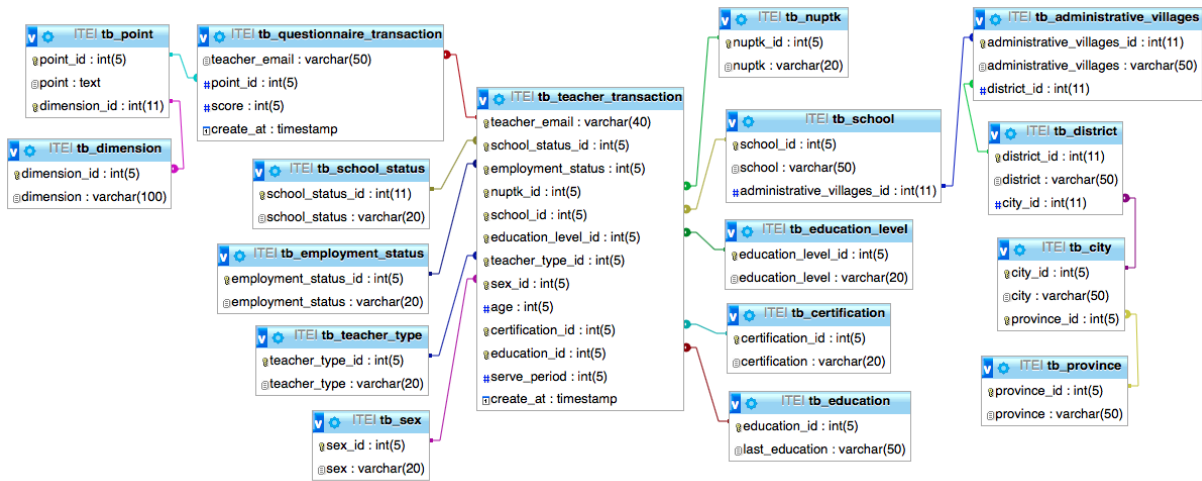


FIGURE 3. The ITEI system database design

numbers, or other identity information. After logging in, the teacher must answer a number of questions as shown in Figure 2(c), ranging from 1 for “very inappropriate” to 4 for “very suitable”. When the teacher has answered the question entirely, it is sent to the server for processing. The server will recognize this as network traffic. The load balancer acts as if a server will evenly distribute network traffic to each cloning server, so that data processing is faster, this ensuring all network traffic is processed. Detecting if each cloning server has a full process does this. It is not possible to receive new information for processing, as the load balancer will create a new instant server or cloning server [36].

The operation performed on the server runs the algorithm to generate a teacher profile. The questions displayed on the ITEI represent each weighted dimension. Algorithm running on the server to process the input data is as follows:

- ¹Start
- ²Set weight dimension
- ³Select the items of each dimension based on the database
- ⁴Get data input
- ⁵Group data entries by dimension
- ⁶Calculate the average dimension
- ⁷Click the average dimension with the dimension weight
- ⁸Generate the hexagon graph
 - Set the value of each point according to the dimension
 - Generate the result graph according to the result of multiplication
- ⁹Sum the total multiplication of each dimension
- ¹⁰Generate and display the description based on the sum
- ¹¹End

The results displayed on the ITEI based on the algorithm are illustrated in Figure 2(d). The ITEI displays the average results that teachers obtained in each dimension. From the average results, the teacher can see his strengths and weaknesses, as well as what things can be improved in the future.

5. Conclusions. The presence of self-diagnostic apps for the teachers has become very important, allowing them to perform self-assessment to shape their level of engagement quickly through smartphones. Thus, technological developments can also be perceived as early detection methods for teachers to determine the programs most needed to improve competence and engagement. This is very important, considering the influence of the teacher’s engagement in determining the success of the students and school [8,37].

Acknowledgment. This work is partially supported by Ministry of Research, Technology, and Higher Education of the Republic of Indonesia and The Ministry of Education and Culture of the Republic of Indonesia. The authors also gratefully acknowledge the helpful comments and suggestions of the reviewers, which have improved the presentation.

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