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Teacher Engagement: Confirmatory Factor Analysis (CFA) in Measuring Preschool Teacher Engagement Behaviorally, Emotionally and Cognitively

Indriani Rusydi[1]
[1]Faculty of Psychology, University of Indonesia
Email: [1]indriani.rusydi@ui.ac.id

Tulus Budi Sulistyo Radikun[2]
[2]Faculty of Psychology, University of Indonesia
Email: tulus@ui.ac.id

Correspondence:

Indriani Rusydi
Faculty of Psychology, University of Indonesia
Email: indriani.rusydi@ui.ac.id

Abstract

Currently, student engagement is still a hot topic of discussion. Previous studies show that students who are involved in the learning process tend to achieve better results. Student engagement in learning cannot be separated from the teacher's involvement in teaching. This study aims to test the construct validity of the preschool teacher engagement measuring tool in terms of behavior, emotions and cognition developed by Pedler et al. (2020) Participants in this research were early childhood teachers with at least 1 year of teaching experience and numbered around 230 people. The measurement method uses self-report with 4 Likert scales. The total number of question items in this questionnaire is 23. The data were analyzed using confirmatory factor analysis techniques with STATA version 13 software. Through the confirmatory factor analysis procedure, a Teacher Involvement Scale was obtained that matched the model, namely the Teacher Involvement Scale is a tool for measuring teacher involvement which consists of 3 factors, namely behavioral, emotive and cognitive factors. Apart from that, a shorter number of items was obtained, namely 12 items which also had good internal reliability, overall and for each factor or dimension. Thus, the Teacher Involvement Scale can be used to measure teacher involvement in teaching students in the classroom.

Keyword: Emotional Involvement, Teacher Involvement, Cognitive Involvement, Behavioral Involvement.

Abstrak

Saat ini keterlibatan siswa masih merupakan topik yang hangat diperbincangkan. Penelitian-penelitian sebelumnya menunjukkan bahwa siswa yang terlibat dalam proses pembelajaran cenderung mencapai hasil yang lebih baik. Keterlibatan siswa dalam belajar tidak terlepas dari keterlibatan gurunya dalam mengajar. Penelitian ini bertujuan untuk menguji validitas konstruk alat ukur keterlibatan guru prasekolah dari segi perilaku, emosi, dan kognitif yang dikembangkan oleh Pedler et al. (2020) Partisipan dari penelitian ini adalah guru anak usia dini dengan pengalaman mengajar minimal 1 tahun dan berjumlah sekitar 230 orang. Metode pengukuran menggunakan self-report dengan 4 skala Likert. Total aitem pertanyaan dalam kuisioner ini berjumlah 23 buah. Data dianalisis menggunakan teknik analisis faktor konfirmatori dengan software STATA versi 13. Melalui prosedur analisis faktor konfirmatori didapatkan Skala Keterlibatan Guru yang cocok dengan modelnya, yaitu Skala Keterlibatan Guru merupakan alat ukur keterlibatan guru yang terdiri dari 3 faktor, yaitu faktor perilaku, emotif dan kognitif. Selain itu, diperoleh jumlah aitem yang lebih singkat, yaitu berjumlah 12 item yang juga memiliki reliabilitas internal yang baik, secara keseluruhan maupun tiap faktor atau dimensinya. Dengan demikian Skala Keterlibatan Guru dapat digunakan untuk mengukur Keterlibatan Guru dalam mengajar siswa di kelas.

***Kata Kunci** : Keterlibatan Emosi, Keterlibatan Guru, Keterlibatan Kognitif, Keterlibatan Perilaku.*

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INTRODUCTION

Involvement is a key factor in the learning process which can be defined as the amount of time spent participating in an activity, interacting with peers or teachers, and viewing or using material in a developmentally appropriate way (Bailey & Wolery, 1992; McWilliam et al., 1985). National guidelines such as the Early Years Learning Frameworks in Australia (Australian Government Department of Employment Education and Workplace Relations., 2009) state that helping children to engage is a primary responsibility of educators. Currently student engagement is still considered as the hot topic to be discussed throughout the world, with research showing that students who are active in the learning process tend to achieve better results, even up to seven months faster than their peers (Center for Educational Statistics and Evaluation (CESE, 2017) Student engagement has been recognized as a crucial classroom indicator in predicting student achievement not only now, but also in the future (CESE, 2015).

Although it has been agreed that teacher engagement has a positive impact on student engagement, educators' actions often did not align with their theoretical understanding of effective teaching and learning. The difference seems apparent when the teachers' understanding of students' learning processes with the teaching methods that was being used were compared, as well as the significance of the relationship between teachers and students compared to the time spent on student interactions during learning sessions (Goldspink et al., 2008). Overall, (Goldspink et al., 2008) revealed that considering students' backgrounds, needs and interests is often neglected in the general approach applied by teachers. In relation to this, (Harris, 2015) found that teachers' understanding of student engagement tends to vary widely, with some teachers describing it as purely behavioral while others include emotional and/or cognitive aspects.

Every day, teachers make many decisions such as facilitating teacher-student relationships, and relationships between students (Pianta et al., 2008). They responsible for ensuring students' participation within the learning process, which not only aims to improve their academic achievement and growth, but also to prevent a decline in interest in learning, failure in education, or even dropping out of school (Havik & Westergård, 2019). These things are expected to be carried out by teachers in all programs, from early childhood programs to high school.

In early childhood education programs, a strong understanding of how teachers influence student engagement has been expressed in various literature, highlighting the teacher's role as critical to ensuring students can experience meaningful engagement (Pedler et al., 2020). (Wang & Jessica, 2014) stated that over the last 25 years student engagement has become the main focus in the fields of psychology and education as it is considered to be able to overcome problems such as boredom, low academic achievement, and high school dropout rates. When students are engaged in learning, they can focus attention and energy to master tasks, persevere when difficulties arise, establish positive relationships with adults and peers, and connect with school (Wang & Eccles, 2012).

Numerous aspects of the classroom process are critical to early student engagement. For instance, engagement is greater in classrooms where assignments are direct, challenging, and authentic (Marks, 2000). Teachers who provided clear expectations and instructions, strong guidance during lessons, and constructive feedback would make students more engaged behaviorally and cognitively (Jang & Deci, 2010). Children's positive engagement with teachers and peers has a major impact on their learning achievement. In the context of early childhood learning in the classroom, it is important for a teacher to systematically observe how a child interacts with teachers, peers, and learning tasks in the classroom environment. This is very important to support teachers in ensuring the development of each child (Williford et al., 2013).

Pedler et al (2020) stated that the teacher's role in student engagement was based on the student engagement theory proposed by (Fredricks et al., 2004a), and additional conceptual framework from (Lawson & Lawson, 2013). This conceptual framework has a multidimensional dimension that is more flexible and responsive to contextual changes. The aim of the combination of these dimensions is to improve overall learning outcomes and student achievement. The construct of student engagement theory consists of 3 dimensions, respectively: behavioral engagement, emotional engagement, and cognitive engagement.

The implementation of teacher engagement practices to support student engagement from these three dimensions is crucial in describing the overall engagement theory. To support this, the researchers decided to develop a measuring tool that can assess the extent of PAUD teachers' involvement in every aspect of student involvement in the learning process. The measuring instrument developed is expected to be reliable, have good construct validity, and have norms based on a representative sample in Indonesia. This research focuses on examining the construct validity of the Teacher Engagement Scale using confirmatory factor analysis procedures.

To develop a measuring tool, a literature study on the construct of teacher involvement was carried out by reviewing its definition, dimensions and indicators. Based on the results of the review of definitions, dimensions and indicators, a number of items were created that represent the content of the teacher involvement construct.

Ferreira et al., (2016) stated that teacher involvement in child care and early childhood education (PAUD) environments is very important in encouraging social and emotional development. Meanwhile, there is another opinion which also refers to the social and emotional nature of early childhood, that if teachers understand their own socio-emotional capacities, then teacher involvement will create a PAUD environment that is considered as supportive, sensitive, responsive and nurturing (Buettner et al., 2016; Zinsser et al., 2013). According to (Pedler et al., 2020), teacher involvement means that teachers have a clear

understanding of the things that will make students engage behaviorally, emotionally and in thought, and are able to implement effective pedagogy that supports student involvement at the level of teaching and learning practices in the classroom.

From several definitions of teacher involvement, the author chose the teacher involvement definition by (Pedler et al., 2020). It was chosen because the theory was based on the student engagement theory by (Fredricks et al., 2004b) which looks at involvement more holistically, namely from behavior, emotions and cognition. Behavioral engagement, defined as positive behavior, involvement in learning & academic tasks, and participation in school-related activities. Emotional involvement is defined as the affective reaction felt by the child when they are in the classroom or in the school environment. Cognitive engagement, defined as involvement that includes investment in learning, self-regulation, and learning using strategies.

Behavioral Involvement dimension's indicators are, respectively: carrying out activities according to planning (class routine), enforcing fair and consistent class rules, recognizing-identifying causes-solving problems, modeling positive behavior, appreciating appropriate behavior (Pedler et al., 2020). Indicators of the Emotional Involvement Dimension are: paying attention to students and their needs, respecting students' views and opinions, being enthusiastic in teaching, being calm in teaching, and being approachable by students so that students do not hesitate towards the teacher (Pedler et al., 2020).

Indicators of the Cognitive Engagement Dimension are: creating learning subjects using materials and activities that are fun and interest children, giving children opportunities to think critically, analyzing and solving problems, giving students the opportunity to choose their own learning activities, encouraging collaboration in learning, applying practical learning and hands-on engagement that is relevant to students' lives and experiences, and provides appropriate, task-focused, and specific feedback (Pedler et al., 2020).

Based on each indicator of the Behavioral Involvement Dimension, 7 items were created: 1) I carry out daily teaching activities according to plan, 2) I apply class rules that are fair to all students, 3) I recognize the problems faced by students, 4) I accompany students overcome the problems they face, 5) I use the word help when asking for help from each student, 6) I give appreciation when students help friends, 7) I express gratitude when receiving help from students (Pedler et al., 2020).

Based on each indicator of the Emotional Involvement Dimension, 8 items were created, namely: 1) I understand when students are sad/happy/angry/scared, 2) I give students the opportunity to express their opinions, 3) Students must have the same opinion as others. I teach, 4) I feel happy when teaching, 5) I enjoy joking with students, 6) Students who don't follow activities according to procedures make me give up, 7) I panic when I encounter problems while teaching, 8) My students like to tell me about their experiences to me (Pedler et al., 2020).

Based on each indicator of the Cognitive Engagement Dimension, 8 items were created: 1) The teaching tools and materials that I use are liked by the students, 2) The students are interested in the activities that I have prepared, 3) I ask 'what' questions, 'why', and 'how' to students when studying, 4) I immediately help if students have difficulty doing assignments, 5) I provide a variety of activities that students can choose, 6) I encourage each student to play an active role in their group, 7) I ensure that learning activities are related to students' daily lives. 8) I provide specific feedback for the assignments that students complete (Pedler et al., 2020)

Thus, the Teacher Engagement Scale consists of 3 dimensions with a total of 23 items. Through a confirmatory factor analysis procedure, we want to obtain a teacher involvement scale that has good construct validity with an optimal number of items and also has good internal reliability.

RESEARCH METHOD

Participants

The subjects of this research were PAUD teachers who taught kindergarten students aged four to six years, with at least 1 year of teaching experience (n=230). Researchers used convenience sampling techniques, which are also known as haphazard sampling or accidental sampling. This is a type of non-probability or non-random sampling in which the researcher selects a target population based on practical criteria such as ease of access, geographic location, availability at a particular time, or willingness to participate (Etikan et al., 2017).

Instrument

Teacher involvement was measured using self-report with a Likert scale of 1 to 4. The teacher involvement construct was obtained from (Fredricks et al., 2004b) student involvement theory, which consists of 3 dimensions: 1) behavioral involvement, defined as positive behavior, involvement in learning & academic assignments, as well as participating in school-related activities; 2) emotional involvement, defined as the affective reactions felt by the child when they are in the classroom or in the school environment, and 3) cognitive involvement, defined as involvement that includes investment in learning, self-regulation, and learning using strategies.

The total items in this study were 23. The 23 items consists of 7 items each in the behavioral involvement dimension, 8 items in the emotional involvement dimension, and 8 items in the cognitive involvement dimension. Items are divided into favorable (i.e., items that support the research objectives) and unfavorable (i.e., items that do not support the research objectives) so that subjects pay close attention to the items (Widhiarso, 2016). Participants' responses were then recorded using a Likert scale with a four-point scale containing the answer options Strongly Disagree (STS), Disagree (TS), Agree (S), Strongly Agree (SS).

Participants assess the suitability of items based on their condition during questionnaire filling out. For the

favorable item, the STS answer will be scored with one and the SS answer will be scored with four. On the other hand, for unfavorable items, the STS answer will be scored with four and the SS answer will be scored with one.

Procedure

The procedure of measuring instruments preparation starts from the preparation stage, testing the readability of measuring instruments, and the data collection stage in the field. In the preparation stage, creating a measuring instrument would be involving literature study about teacher involvement, selecting definitions from various relevant theories, determining dimensions of teacher involvement, selecting definitions for each dimension, determining indicators for each dimension, formulating items for each indicator, peer review to check suitability items, and revision of inappropriate items based on the results of peer review. After peer review, the number of items was reduced to 23 (19 favorable and 4 unfavorable).

At the stage of testing the readability of the measuring instrument, researchers carried out the test on 11 early childhood teachers who had at least 1 year of teaching experience. The discussion of the readability test results is divided into input into 1) Introductory section; 2) Clarity of the meaning of the statement; 3) Grammar; 4) Number of items; and 5) Others. At the data collection stage, the researcher compiled a questionnaire in an online form format (Google Form). Participants can access the form by clicking on the link provided. The data obtained from this stage was then analyzed using Confirmatory Factor Analysis to test construct validation and Cronbach's Alpha reliability analysis.

Data analysis technique

Data were analyzed using confirmatory factor analysis techniques with STATA version 13 software. Factor analysis is a technique to investigate whether a series of observed variables can be summarized into several latent variables called factors. Confirmatory factor analysis is factor analysis that is based on the researcher's assumptions are quite strong regarding the structure of the concept being researched (Hox, 2021). The purpose of using this technique is to estimate whether the proposed model is suitable or not, and estimate factor loadings, variances, covariance, and residual error of observed variables (Hox, 2021).

Model fit was estimated using Chi-Square ($p > 0.05$): this technique has weaknesses i.e. weak to sample size. On the condition when sample were considerably too large, the Chi-Square value tends to be significant and illustrative model mismatch. Therefore, another parameter is needed, namely CFI (comparative fit index) > 0.90; TLI > 0.90, and RMSEA < 0.08 (Hox, 2021).

RESEARCH RESULT

The results of fit model testing in confirmatory factor analysis of the Teacher Engagement Scale showed an estimated result of $\chi 2(227) = 722.62$; $p < 0.001$. This shows that the model does not fit the data. Since the chi-square estimation results are greatly influenced by the number of participants, it is necessary to check other model fit indicators, namely by looking at the CFI, TLI, RMSEA, and SRMR indices.

The estimation results obtained were CFI = 0.81; TLI =0.79; RMSEA = 0.093 (90% CI: 0.086 – 0.101); and SRMR = 0.08. Based on the criteria that the fit model is CFI = 0.95, TLI = 0.95, RMSEA = 0.05 and SRMR = 0.05, it can be concluded that the Teacher Involvement Scale model does not fit the data.

The estimated factor loading of each item in the Teacher Engagement Scale is presented in Table 1 below.:

Tabel 1. Factor Loading of Teacher Involvement Scale Items 23 items

Number	Code	Statement	coef.
Behavioral Factor			
1	b1	I carry out daily teaching activities according to plan	1
2	b2	I apply fair class rules to all students	1.13
3	b3	I recognize the problems students face	0.86
4	b4	I accompany students to overcome the problems they face	0.98
5	b5	I use the word help when asking for help from each student	1.38
6	b6	I express my gratitude when receiving help from students	1.37
7	b7		1.23
Emotional Factor			
8	e1	I understand when students are sad/happy/angry/scared	1
9	e2	I give students the opportunity to express their opinions	1.08
10	e3	Students must have the same opinions as those I teach	0.33
11	e4	I feel happy when teaching	1.07
12	e5	I enjoy joking with students	0.97
13	e6	Students who do not follow activities according to procedures make me give up	0.67
14	e7	I panic when I encounter problems while teaching	0.49
15	e8	My students love to tell me about their experiences	0.84
Cognivitive Factor			
16	c1	The tools and teaching materials that I use are liked by the students	1
17	c2	The students were interested in the activities that I had prepared	0.97
18	c3	I ask 'what', 'why' and 'how' questions to students when learning	0.97

19	c4	I immediately help if students have difficulty doing assignments	-0.47
20	c5	Saya menyediakan beragam aktivitas yang dapat dipilih murid	1.06
21	c6	I encourage each student to play an active role in their group	1.26
22	c7	I ensure that learning activities relate to students' daily lives	1.25
23	c8	I provide specific feedback on the work students do	1.12

Note: items marked with gray shading or in boxes are not included in the final questionnaire.

To improve the model, researchers conducted an analysis of modification indices. Model improvements were carried out repeatedly by removing items with the largest modification index sequentially based on the modification index ranking. Firstly, by deleting items with a factor loading < 0.70 in each round of factor loading estimation for the model, namely deleting a total of 8 items marked with gray shading. In the Behavioral Factor, 2 items were deleted, namely items b1 and b3. In the Emotional Factor, 4 items were deleted, namely items e3, e6, e7, and e8. In the Cognitive Factor, 2 items were deleted, namely items c3 and c4.

Furthermore, improvements are made by eliminating items that are redundant or highly correlated with items in the same factor, which are marked with items in the box. Three items were deleted: item b5 because it was redundant with item b6, item c2 because it was redundant with item c1, and item c6 because it was redundant with item c5.

After improvements were made based on suggestions from the modification indices, the Teacher Engagement Scale was obtained which consists of 3 factors, each factor containing 4 items for a total of 12 items, which can be seen in Table 2. The Behavioral Factor consists of items b2, b4, b6, and b7. The Emotional Factor consists of items e1, e2, e4, and e5. The Cognitive Factor consists of items c1, c5, c7 and c8. Estimated Factor Loadings for each item on the Teacher Involvement Scale can be seen in Table 2 and Figure 1.

Tabel 2. Factor Loading Items of the 12-item Teacher Engagement Scale

Number	Code	Statement	coef.
Behavioral Factor			
1	b2	I apply fair class rules to all students	1
2	b4	I accompany students to overcome the problems they face	0.87
3	b6	I express my gratitude when receiving help from students	0.91
4	b7	I appreciate it when students help their friends	1.05
Emotional Factor			
5	e1	I understand when students are sad/happy/angry/scared	1
6	e2	I give students the opportunity to express their opinions	1.01
7	e4	I feel happy when teaching	1.06
8	e5	I enjoy joking with students	0.96
Cognitive Factor			
9	c1	The tools and teaching materials that I use are liked by the students	1
10	c5	I provide a variety of activities for students to choose from	1.06
11	c7	I ensure that learning activities relate to students' daily lives	1.45
12	c8	I provide specific feedback on the work students do	1.29

After improvements to the model were made, the goodness of fit index estimates were obtained as follows: $\chi 2(51) = 93.58$; $p < 0.001$. CFI = 0.96; TLI =0.95; RMSEA = 0.058 (CI 90%: 0.038 – 0.076); and SRMR = 0.04. Based on the criteria that the fit model is CFI = 0.95, TLI = 0.95, RMSEA = 0.05 and SRMR = 0.05, it can be concluded that the Teacher Engagement Scale model fits the data.

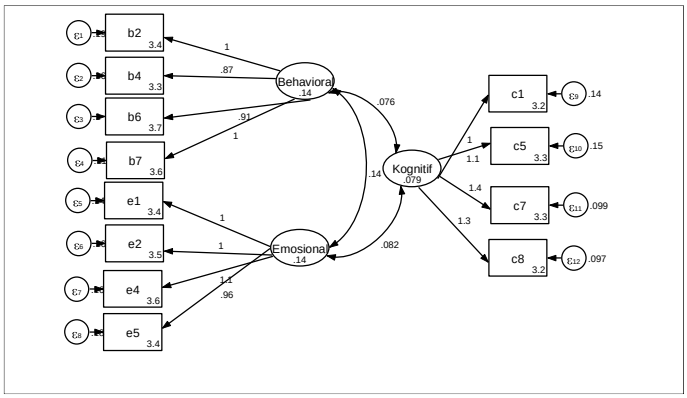

Figure 1. Estimation of Factor Loadings of the Teacher Engagement Scale

In terms of reliability, the overall internal reliability index of the Teacher Engagement Scale is alpha = 0.90. Meanwhile, if we look at each factor, the Internal Reliability Index for Behavioral Factors is alpha = 0.78, Reliability Index Internal Emotional Factors are alpha = 0.75, and Reliability Index Internal Cognitive Factor is alpha = 0.78. Thus it could be concluded that the Teacher Engagement Scale was a reliable measuring tool.

DISCUSSION

The Teacher engagement Scale was originally developed with 23 items, consisting of 3 factors: Behavioral Factor (7 items), Emotional Factor(8 items), and the Cognitive Factor(8 items). Through the confirmatory factor analysis procedure, a measuring instrument with a shorter

number of items was obtained but still had good internal reliability. By eliminating items with the lowest factor loading values that indicate that the items do not measure their dimensions or factors well, the items that could measure better for each factor were obtained. Also by eliminating items that are redundant with other items, it indicates that the items can replace each other so that one of them is not needed, an efficient and short number of items was obtained.

The confirmatory analysis factor in this research was set to investigate the possibility of observed variables to be merged to numerous latent variable. This measurement tools were developed based on the student engagement construct in the(Fredricks et al., 2004b)Fredirck, that has three dimensions: behavioral engagement; emotional engagement, and cognitive engagement.

By reliability, the internal reability index Teacher Engagement scale is α = 0.90. If we take a look by each factor,the reliability index behavioral Factor is α = 0.75; the realibility index for Internal Emotion Factor is α = 0.78. Thus, it can be concluded that the Teacher Involvement Scale is a reliable measuring tool. Fredricks et al., (2004b) in their research stated that the student engagement is multidimensional, with the potentials to connect various research about behavior, feeling, and the thought of the students. Similar idea on the multidimensional aspects of student engagement is also stated by (Larson et al., 2021; Xu et al., 2023)

Although it was started with interest or participation, engagement could be developed into commitment (Borja-Gil et al., 2022), which might be the key to reducing student apathy and improving learning. Engagement is also inclusive, as it combines aspects that are usually studied separately (Kelman, 2023), providing a more complete view. Furthermore, engagement can be changed more easily than individual traits, as it is influenced by the social and academic contexts, both at school and in the classroom(Borja-Gil et al., 2022), allowing for a variety of interventions.

Given the importance of student engagement to learning outcomes, including lifelong learning, the research conducted by (Pedler et al., 2020) is highly relevant and significant. The findings can be used to inform professional learning programs as well as initial teacher education programs, to prepare pre-service and practicing teachers to have a positive impact on student engagement in the classroom, both in Australia and overseas (Pedler et al., 2020).

CONCLUSION AND SUGGESTIONS

Through a confirmatory factor analysis procedure, a shorter Teacher Engagement Scale was obtained, consists of 12 items, with of 3 factors that consists of 4 items for each factor. The Teacher Engagement Scale also has good internal reliability, overall and for each factor or dimension. Thus, the Teacher Involvement Scale can be used to measure teacher involvement in teaching students in class so that the measurement results are expected to predict student learning achievement. In future, research needs to be carried out regarding the predictive validity of the Teacher Engagement Scale.

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