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A Construct Validity Study of A Measure of Pre-Service Teachers' Micro-Teaching Performance

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Abstract: The purpose of the present study was to examine the construct validity of an instrument used to measure the micro-teaching performance of teacher candidates by their supervisor teachers. To serve this purpose, this study employed an exploratory factor analysis and a parallel analysis in addition to a final confirmatory factor analysis conducted with two different samples of supervisor teachers who rated pre-service teachers' performance. Overall, 477 mentor teachers participated in this study. The current results revealed a strong one-factor structure accompanied by high reliability statistics, which is in line with earlier research and theoretical insights. The identified one factor can be named as teaching effectiveness as measured by the participating mentor teachers.

Keywords: Construct Validity, Micro-teaching, Teaching Effectiveness, Pre-Service Teachers

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INTRODUCTION

Teaching to teach (effectively) is not easy. Besides, approaches used in teacher education programs (TEP) are often criticized because TEPs often times fail to close the gap between theory and practice (Broekkamp & Van Hout-Wolters, 2007; Darling-Hammond, Holtzman, Jin Gatlin, & Vasquez Heilig, 2005; Hennissen, Beckers, Moerkerke, 2017). Theory is and should be part of teacher education, but it is not embedded in teaching practice and not anchored in the actions of pre-service teachers (Hennissen et al., 2017). Ensuring young and inexperienced teachers are prepared to meet the academic and social needs of all students is one of the most significant tasks of TEPs. Teachers should be ready to teach on day one in schools with the necessary skills needed to support student learning because we cannot afford to sacrifice a year or two until a novice teacher feels ready to teach. Nevertheless, most teacher candidates find themselves unready to teach or not prepared to deal with various 'real' obstacles that might come up in a school in their first years (Gaikhorst, Beishuizen, Roosenboom, and Volman, 2017) even though teacher education is a must to become a teacher and teacher candidates complete so many challenging tasks and courses throughout their formal 4-year education.

Teacher candidates also encounter the "problem of complexity," which requires making decisions about students' academic, social, emotional, and behavioral needs simultaneously (Brown, Suh, Parsons, Parker, & Ramirez, 2015, p.36). Hammerness, Darling-Hammond, Grossman, Rust, and Shulman (2005) assert that developing teacher candidates' metacognitive skills can enable them to better manage the complexities of K-12 classroom decision-making. The nature of the teaching occupation requires constant professional development, anyway. Teachers should be able to simultaneously grow understandings of content, pedagogy, and child development and implement these understandings in a multifaceted K-12 context (Brown et al., 2015; Lampert et al., 2013). Effective teaching is cultivated through high-quality opportunities to practice, along with support and feedback (Benedict, Holdheide, Brownell, & Foley, 2016).

The reason some novice teachers feel that they are not ready to teach even after graduation, or first-year teachers face with more problems compared to experienced teachers (Rust, 1994) is because teacher candidates often experience 'theory first', and apply theories they had learnt in class in practicum later which is commonly believed to be unproductive (Emsheimer & Ljunggren de Silva, 2011; Hennissen et al, 2017). A microteaching model with six interrelated stages was introduced by Allen and Eve in 1960s: Planning, teaching, observation (criticism), re-planning, re-teaching, and re-observation (Arsal, 2015). Nevertheless, feedback which is a significant part of becoming an effective teacher, is mostly absent in micro-teaching (Lenihan, 2016).

Teacher education programs have developed alternative ways for pre-service teachers to bridge the gap between theory and practice. Most TEPs at higher education institutions have increased

practicum hours and begun adapting a practice-based approach (McDonald, Kazemi, & Kavanagh, 2013). Practice-based approach in teacher education is not a new trend (Zeichner, 2012). Teacher candidates had been also observed during their micro-teaching and evaluated. For instance, after 1998 legislation required California teacher preparation programs to use performance evaluations in credentialing decisions, "California teacher education programs became leaders in designing and using such evaluations" (Brown et al., 2015, p.36).

What is new is adapting teacher evaluations into teacher education. Because most pre-service teachers are not getting the most out of microteaching, adapting teacher performance evaluation systems that are designed for in-service teachers is becoming common (Ata & Kozan, 2018). This approach is believed to provide feedback and prepares students for 'real-life' while assessing teacher candidates' teaching performance. Recently, most State Departments of Education in the United States have adapted some teaching standards for teacher performance assessment recommended by the Interstate Teacher Assessment and Support Consortium, and these standards are also being used/adapted for teacher candidates' performance evaluation. edTPA is one of the examples. Stanford University and the American Association of Colleges for Teacher Education (AACTE) formed a partnership to develop and share edTPA. edTPA is not just a microteaching evaluation program; in-service teachers and teacher educators also evaluate teacher candidates' edTPA submissions (self-recorded microteaching videos, classroom materials, daily plans, etc.) to ascertain their readiness for teaching. edTPA is intended to be used as a summative assessment and claimed to be "transformative for prospective teachers because the process requires candidates to actually demonstrate the knowledge and skills required to help all students learn in real classrooms." (AACTE, 2015).

Teacher candidate evaluations are taking a new shape because TEPs are aligning their regulations with in-service teacher performance evaluation systems. Regarding teacher performance evaluations, Zeichner (2012, p. 379) cautioned that "there is a danger of narrowing the role of teachers to that of technicians who are able to implement a particular set of teaching strategies, but who do not develop the broad professional, and the relational skills." Teacher candidate effectiveness and its assessment should be thought thoroughly because we cannot expect teacher candidates to assume full responsibility of teaching. Hence, using an assessment tool that truly evaluates teacher candidates' instructional performance is essential for teacher education programs. To this end, the main purpose of the present study was to evaluate the construct validity of a comprehensive teacher candidate performance assessment tool through factor analysis and to examine whether the results would align with those of Ata and Kozan (2018) thus increasing generalizability. Accordingly, the current study focused on the following research question:

Does the teacher candidate effectiveness instrument have an interpretable factor structure that is in line with earlier findings and theoretical insights?

METHOD

Research Design

The present study has a correlational research design including a factor analysis that is a statistical technique focusing on relationships (Pallant, 2007). Pallant (2007) stated that factor analysis is "useful in reducing a large number of related variables to a smaller, more manageable, number of dimensions or components" (p. 120). Accordingly, the present study aimed at checking whether the factor structure of the target teaching effectiveness tool aligns with theoretical insights. Further, the research data were collected after pre-service teachers' in-class performance thus having an ex post facto (e.g., Ary, Jacobs, Sorensen, & Razavieh, 2010) research design. Because this study was based on a survey that required cooperating teachers to reflect on and evaluate teacher candidates' previous performance during their school experience, it implemented an ex post facto research design including survey research (Ary et al., 2010).

Participants

The participants were 477 cooperating mentor teachers working at different schools ranging from elementary to high school across the US. Therefore, the target population was all the mentor teachers supervising teacher candidates in the US. Through convenience sampling, the participating mentor teachers were emailed the research survey after the teacher candidates completed their school experience requirement.

INSTRUMENTS

The intern keys teacher candidate assessment.

The teacher candidate effectiveness assessment tool consists of 10 standards (e.g., [1] Professional knowledge) and their corresponding items (e.g., [1] The teacher candidate demonstrates an understanding of the curriculum, subject content, pedagogical knowledge, and the needs of students by providing relevant learning experiences.). Further, under each item, there are performance indicators for the proficiency level gauged based on a scale ranging from 4 (exemplary) to 1 (ineffective). Ata and Kozan (2018) provided factor analytic evidence for the construct validity of the teacher candidate assessment instrument as well as a quite high internal consistency level (Cronbach's alpha = .944). Specifically, the authors found that the tool had a one-factor structure with all the survey items loadings strongly on it, which is in line with theoretical insights.

Data Collection and Analysis

Using Qualtrics, an online version of the teacher candidate effectiveness instrument was created and emailed to mentor cooperating teachers when the teacher candidates finished their final semester in year 2016. Originally, there were 585 surveys collected. Among these 108 were eliminated due to no indication of participant name or any other identifying information as well as a random elimination

of duplicate cases (each supervisor completed the survey for more than one candidate). Only one of such cases was randomly chosen and used for data analysis purposes.

Due to the factor analytical or correlational nature of the research design and problem, the researchers implemented factor analysis (e.g., Field, 2009; Pallant, 2007; Tabachnick & Fidell, 2013) to gain insights into the construct validity of the teacher candidate effectiveness tool. To run both an exploratory factor analysis (EFA) and a confirmatory factor analysis (CFA), the data were randomly divided into two since it may be easier to confirm a factor structure using the same data set (e.g., Kozan & Richardson, 2014). There were originally 239 cases used for EFA, and 238 for CFA. Then, the researchers completed the following procedures for each data set separately: There were no univariate outliers and missing points. The 5 % trimmed mean values did not indicate any problematic items either. However, the researchers eliminated seven multivariate outliers from the EFA dataset, and 11 multivariate outliers from the CFA dataset. Therefore, there were, finally, 232 cases for EFA and 227 for CFA. Kolmogorov-Smirnov and Shapiro-Wilk statistics (*p's* < .001) revealed that the item scores violated the normality assumption. Relevant data transformations were applied with no significant improvements in the distribution of the data. Tabachnick and Fidell (2013) argued that even though the violation of the normality assumption can weaken the results, they "may still be worthwhile" (p. 618). After all, as long as factor analysis is implemented for descriptive purposes, assumptions of data distribution may not be important (Tabachnick & Fidell, 2013). Additionally, given the number of participants (> 100) for both EFA and CFA, the violation of the normality assumption may not impact the results.

RESULTS

Exploratory Factor Analyses

Table 1 presents the descriptive statistics for each item on the survey ratings used for EFA. Overall, Table 1 shows that the teacher candidates had a high level of performance.

Table 1. Descriptive Statistics (EFA)

	Possible Minimum	**Minimum**	**Possible Maximum**	**Maximum**	**M**	**SD**
Item 1	1	2	4	4	3.07	.460
Item 2	1	2	4	4	3.13	.460
Item 3	1	2	4	4	3.11	.451
Item 4	1	2	4	4	3.06	.500
Item 5	1	2	4	4	3.04	.400
Item 6	1	2	4	4	3.02	.446

Item 7	1	2	4	4	3.25	.566
Item 8	1	2	4	4	3.08	.450
Item 9	1	2	4	4	3.30	.530
Item 10	1	2	4	4	3.12	.460

An initial EFA with oblique rotation and principal axis factoring served checking sampling and data adequacy. The correlation matrix produced large correlation values greater than .30 except for one value of .28, which was adequate for a factor analysis. Bartlett's test of sphericity, $\chi 2$ (45) = 1090.86, $p < .001$, yielded that correlations among the variables were big enough for running an EFA. The Kaiser–Meyer–Olkin (KMO) showed that sampling was suitable with KMO = .90 which is greater than the optimal minimum points of .5 (Field, 2009) and .6 (Tabachnick & Fidell, 2013). Likewise, all KMO values pertaining to each item were higher than .87. The initial EFA revealed two potential factors with eigenvalues larger than one (i.e., 5.258, 1.004) explaining almost 63 % of variance. However, the scree plot suggested one very strong factor.

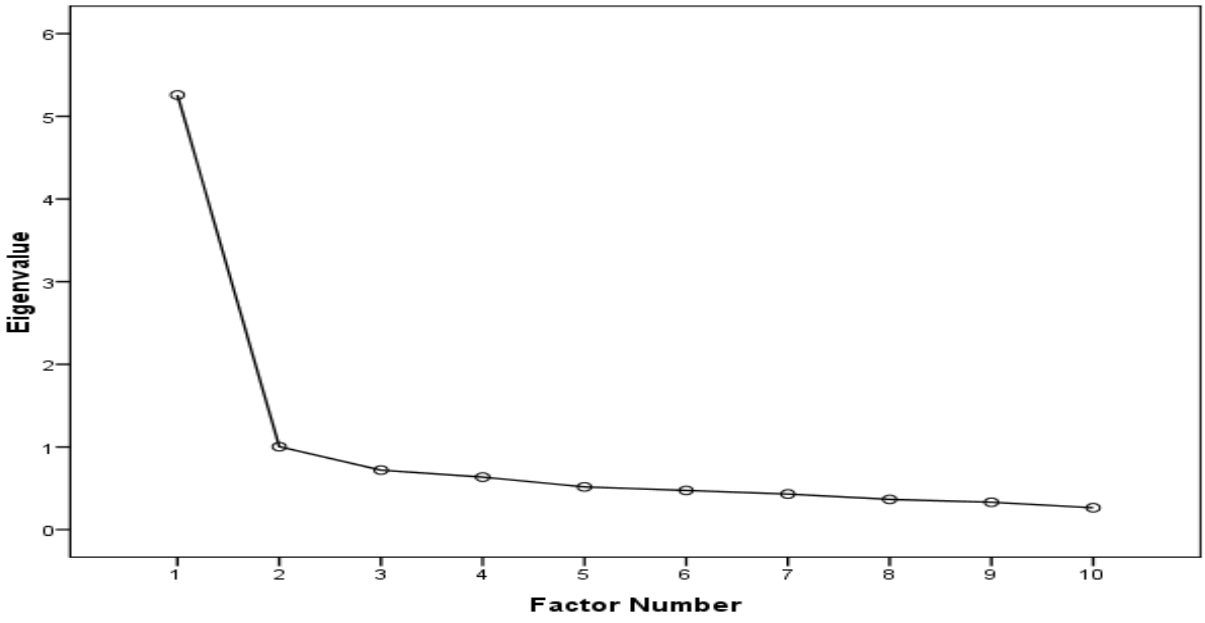

Figure 1. The Scree Plot

Consequently, a parallel analysis (Watkins, 2000) consisting of 10 variables, 232 participants and 100 replications suggested one factor only whose measured eigenvalue (5.258) was bigger than its random eigenvalue (1.33). However, the second factor's random eigenvalue (1.23) was higher than its measured eigenvalue (1.004) suggesting that this factor can be eliminated from the factor solution. Likewise, all the other eight potential factors had random eigenvalues (1.14 to .69) bigger than their measured eigenvalues (.72 to .26). These results led to a second and final EFA with no rotations and

one factor extracted. This factor explained almost 53 % of variance. Table 2 shows the final item loadings on the one factor identified.

Table 2. Final Factor Loadings

Items	**Loadings**
Item 2	.760
Item 6	.710
Item 10	.704
Item 8	.693
Item 1	.684
Item 3	.680
Item 9	.679
Item 5	.667
Item 4	.654
Item 7	.644

Finally, the Cronbach's alpha for the one-factor solution was .897 and if-item-deleted statistics did not show any problematic items whose deletion would increase the internal reliability.

Confirmatory Factor Analysis

Table 3 provides quite high descriptive statistics for the CFA dataset as well.

Table 3. Descriptive Statistics (CFA)

	Possible Min.	Minimum	Possible Max.	Maximum	M	SD
Item 1	1	2	4	4	3.07	.440
Item 2	1	2	4	4	3.10	.430
Item 3	1	2	4	4	3.10	.450
Item 4	1	2	4	4	3.07	.500
Item 5	1	1	4	4	3.04	.400
Item 6	1	2	4	4	3.01	.456
Item 7	1	2	4	4	3.22	.536
Item 8	1	2	4	4	3.07	.461
Item 9	1	2	4	4	3.25	.500
Item 10	1	2	4	4	3.13	.440

The current study included a CFA done through Lisrel 8.80 (Jöreskog & Sörbom, 2007). Due to the parallel analysis rejecting a second factor, the CFA focused on one factor. The CFA produced a relatively adequate fit ($\chi 2$ = 118.06; df = 35; p = .00) based on fit indices (goodness of fit index [GFI]= 0.90; non-normed fit index [NNFI] = 0.96; root mean square error of approximation [RMSEA] = 0.102; comparative fit index [CFI] = 0.97; incremental fit index [IFI] = 0.97). CFI, IFI, and GFI indices are generally acceptable when they are .90 or above it (Levesque, Stanek, Zuehlke, & Ryan, 2004). An RMSEA index of .05 or smaller indicates a very good fit, an index between .05 and .08 suggests a reasonable fit, and an index bigger than .10 highlights a poor fit (Levesque et al., 2004). Consequently, even though the RMSEA seems to be slightly high, the other indices refer to a good enough fit. Finally, all *t* values ranging from 9.38 to 11.75 revealed that all factor loadings were significant ($p < .001$). Figure 2 displays the final CFA model.

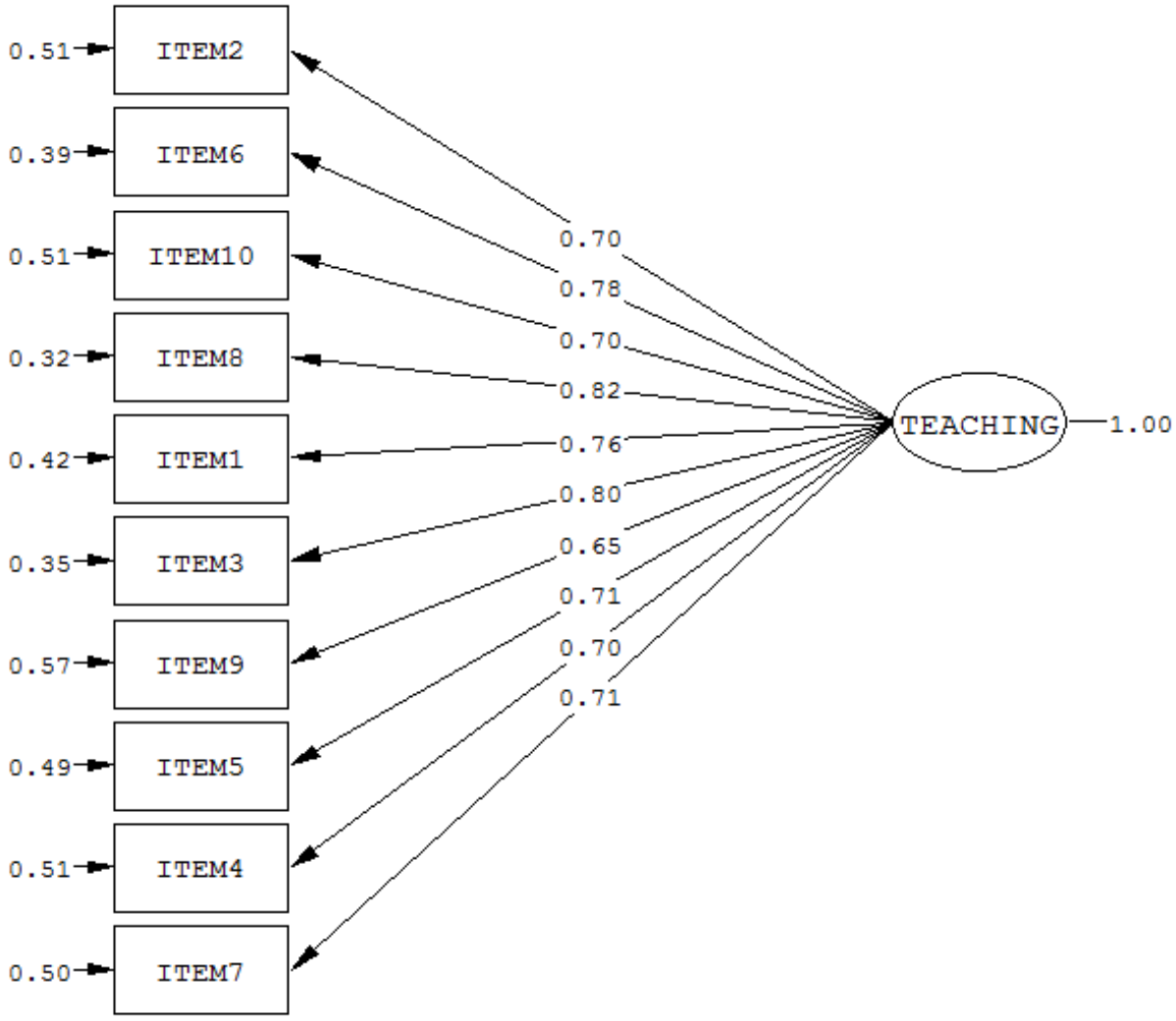

Figure 2. CFA model

DISCUSSION, CONCLUSIONS AND IMPLICATIONS

The present study examined whether the interns key assessment survey used to measure teaching effectiveness of teacher candidates has a clear factor structure. To this end, two exploratory factor analyses (EFA) and a confirmatory factor analysis (CFA) were run using two different data sets. Descriptive statistics emanating from both data sets revealed quite high performance ratings, thus suggesting that the teacher candidates were quite successful in their student teaching. Even though the initial EFA suggested a possible second factor, a following parallel analysis did not confirm the existence of this factor. Therefore, the final EFA and CFA focused on a one-factor model. Their results yielded a reasonable and good fit of the one-factor structure in which the factor can be named as teaching effectiveness.

The one-factor model explored and confirmed above aligns with Ata and Kozan's (2018) factor analytic results on the interns key assessment tool. Specifically speaking, using faculty members' ratings on the interns key assessment tool, Ata and Kozan (2018) found one factor through an EFA too. In other words, the current results cross-validated Ata and Kozan's (2018) findings using a different sample: mentor teachers. However, even though Ata and Kozan's (2018) EFA results suggested one factor only, the present EFA results produced a potential second factor based on eigenvalues. The results of the parallel analysis employed eliminated this possible second factor, which is a result that is the same as the parallel analysis run by Ata and Kozan (2018). Accordingly, suggesting a one-factor structure for the interns key survey, the present study functions as a cross-validation for Ata and Kozan (2018).

As for the survey items or questions, the second one (i.e., instructional planning) had the strongest loading. In other words, the instructional planning item was the most important one representing teaching effectiveness according to mentor teachers. Interestingly enough, the same item was again the strongest one in Ata and Kozan (2018), which suggests that instructional planning component of teacher candidate performance is crucial for both faculty members and supervisor teachers. Likewise, the sixth item (i.e., assessment uses) was the second strongest item for both faculty members and mentor teachers. The other items, on the other hand, had different orders (10, 8, 1, 3, 9, 5, 4, 7 in the present study; 7, 5, 8, 10, 1, 9, 3, 4 in Ata & Kozan, 2018) even though items eight (i.e., academically challenging environment), nine (i.e., professionalism) and four (i.e., differentiated instruction) had very similar orders. Among these, the fourth item focusing on differentiated instruction is among the weakest last three ones. This might suggest that differentiated instruction is a higher level skill emanating from experience for mentor teachers, which may exactly be the case for faculty or teacher educators as well (e.g., Ata & Kozan, 2018). Given that both faculty members and mentor teachers themselves have teaching experiences, the similarities above are reasonable. When it comes to the differences, the nature of teaching at the higher education level and secondary school level may also explain them.

The present results provided further theoretical and practical insights as well. To begin with, the survey has construct validity based on one strong factor entitled teaching effectiveness as well as a high internal consistency or reliability. This is also in line with the results of Ata and Kozan (2018). These findings strongly suggest that the teacher candidate effectiveness instrument can be used to evaluate internship performance of pre-service teachers. Likewise, the validity and reliability of the instrument suggests that its components or competences that range from instructional planning to assessment uses and that constitute a comprehensive factor of teaching effectiveness may strongly contribute to meaningful learning experiences during pre-service teaching internship. Similarly, the competences included in the instrument can guide undergraduate courses of teacher education programs even before their internship starts to prepare teachers better.

All these conclusions and implications should be approached carefully due to few limitations and delimitations. Firstly, the research data were collected in one single country thereby limiting the results to its context. Consequently, cross-validation of the results require us to collect such data in other countries as well to see whether the insights gained through the survey can be generalized to teacher education in other countries. Further, the survey covered specific competences or performance indicators under more general standards such as instructional planning. Therefore, while rating each general standard, the participants need to think of several competences simultaneously. Another way would be to rate each specific performance competence or indicator separately thus constituting the overall relevant standard. Finally, it is assumed that the participating mentor teachers completed the survey as accurately and willingly as possible under suitable environmental conditions.

All in all, the current study indicated that the teacher candidate key assessment tool has a valid and reliable one-factor structure as well as the main conclusion that the instrument can be used during teacher internship training. This study provided significant practical implications as well including the use of the intern key assessment in both teaching internship training and undergraduate teacher education programs. In other words, both the instrument itself and the conceptual competences it provides can help teacher education programs to meet accountability requirements due to their high levels of validity and reliability. All these insights would strengthen teacher education efforts thereby contributing to the ultimate purpose of enhancing learning on the part of learners.

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