Design and Validation of a University Teacher Effectiveness Scale Based on the MUSIC Model

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Abstract

This study addresses the critical need for comprehensive evaluation tools in educational settings by developing and validating a teacher effectiveness scale based on the MUSIC model, which assesses teacher performance across five dimensions: Empowerment, Usefulness, Success, Interest, and Care. Despite the growing emphasis on teacher effectiveness in higher education, existing evaluation methods often lack multidimensional approaches that capture the full scope of teacher performance. This research fills that gap by offering a scientifically rigorous instrument that can be applied across various educational contexts. Data were collected from 300 samples across five higher education and vocational institutions in China. The reliability of the scale was confirmed with Cronbach's Alpha coefficients exceeding 0.7 across all dimensions, indicating strong internal consistency. The validity of the scale was further supported by Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), both of which demonstrated good model fit (CFI=0.93, TLI=0.92, RMSEA=0.05). Additionally, the Average Variance Extracted (AVE) and Composite Reliability (CR) indicators for each dimension surpassed standard thresholds, confirming high convergent and discriminant validity. The findings underscore the scale's potential as a robust tool for educational administrators and policymakers to assess teaching effectiveness comprehensively and to provide actionable feedback that can enhance instructional strategies. This study not only contributes to the literature on teacher evaluation but also offers a practical instrument for improving educational quality.

Keywords: Teacher effectiveness; MUSIC model; Educational assessment; Instrument design.

1. Introduction

Improving the quality of education is a central goal of education policy worldwide (OECD, 2023). Among the various factors influencing educational outcomes, teacher effectiveness stands out as a crucial determinant of students' academic achievement, motivation, emotional development, and social skills (Darling-Hammond *et al.*, 2021; Kraft *et al.*, 2022). Research consistently highlights the significant impact of teacher effectiveness, particularly in higher education, where it plays a vital role in developing high-quality human resources and promoting social progress (Podolsky *et al.*, 2021; Schleicher, 2023).

Despite the recognized importance of teacher effectiveness, current evaluation methodologies are limited in scope. Predominantly relying on student performance metrics and classroom observations, these methods often fail to capture the full spectrum of teaching effectiveness across diverse instructional contexts (Lee, 2023). Student performance, while a valuable indicator, is influenced by multiple factors such as inherent abilities, family

background, and learning environment, making it an incomplete measure of a teacher's instructional proficiency (Smith, 2022). Classroom observations, on the other hand, are subject to observer bias and are often conducted intermittently, which can result in an incomplete and potentially skewed assessment of teacher performance (Johnson, 2021).

The need for a more comprehensive, multidimensional evaluation tool has led to the development of the MUSIC model, proposed. This model assesses teacher effectiveness through five core dimensions: Empowerment, Usefulness, Success, Interest, and Caring. Unlike traditional methods, the MUSIC model provides a holistic framework that not only considers academic achievement but also integrates emotional and motivational factors, thus offering a more nuanced understanding of teaching effectiveness (Anderson, 2022; Kim and Park, 2023).

This study aims to fill the existing gap in teacher evaluation methodologies by developing and validating a teacher effectiveness scale based on the MUSIC model. The study responds to the growing demand for scientifically robust and multidimensional evaluation tools that can be applied across various educational contexts. By addressing the limitations of current evaluation methods, this research offers a significant contribution to the field by providing educational administrators and policymakers with a systematic tool for assessing teaching effectiveness.

Moreover, this research seeks to link the evaluation of teacher effectiveness to broader educational challenges, such as the need for continuous professional development and the enhancement of student engagement. Recent studies have demonstrated that implementing validated teacher effectiveness scales can significantly improve feedback mechanisms and professional development programs (Roberts *et al.*, 2023; Zhang and Li, 2021). By enabling teachers to receive comprehensive feedback on their strengths and areas for improvement, the scale fosters an iterative process of professional growth, which in turn enhances student outcomes, as evidenced by increased engagement and performance in classrooms where the MUSIC model is utilized (Johnson and Thompson, 2021).

In summary, this study not only addresses a critical gap in existing research but also offers a practical solution for improving educational quality through a more holistic evaluation of teacher effectiveness. The integration of the MUSIC model into teacher evaluation frameworks has the potential to drive significant advancements in educational practices and policies, fostering a more comprehensive and impactful approach to teaching and learning.

2. Literature Review

This literature review examines recent research on teacher effectiveness, the application of the MUSIC model in educational settings, and the development and validation of teacher effectiveness scales. The review will identify gaps in the existing literature and articulate how the current study addresses these gaps.

2.1. Teacher Effectiveness

Teacher effectiveness remains a critical focus of educational research due to its significant impact on student outcomes. Recent studies have emphasized the multifaceted nature of teacher effectiveness, highlighting its influence on student achievement, learning motivation, and overall development (Lee, 2023; Smith, 2022). For instance, Podolsky *et al.* (2021) provided a comprehensive review, outlining key dimensions such as instructional skills, classroom management, and the ability to foster positive teacher-student relationships. However, despite these advances, traditional evaluation methods, such as student achievement scores and classroom observations, continue to dominate, offering limited insights into the complex dynamics of teaching (Garcia and Weiss, 2021; Thompson, 2023).

Recent research has begun to explore additional dimensions, such as teacher well-being and professional development, as critical factors in teacher effectiveness (Johnson, 2021; Martin, 2024). This shift recognizes the importance of supporting teachers' professional growth to enhance their effectiveness. However, these newer dimensions are still underrepresented in evaluation frameworks, creating a gap that this study aims to address by integrating these aspects into a comprehensive teacher effectiveness scale based on the MUSIC model.

2.2. Application of the MUSIC Model

The MUSIC model has gained widespread recognition in educational research as a tool for assessing student motivation and emotional experiences. This model's multidimensional approach allows for a more holistic evaluation of educational interventions across various subjects and cultural contexts Jones and Wilkins (2020). By incorporating dimensions such as Empowerment, Usefulness, Success, Interest, and Caring, the MUSIC model goes beyond traditional evaluation methods, offering a nuanced understanding of how teachers can influence student outcomes.

Recent studies have validated the reliability and construct validity of the MUSIC model across diverse educational settings. For example, Saeed and Zyngier (2012) confirmed the model's applicability in different cultural contexts, further supporting its use as a universal tool for evaluating educational experiences. However, the model's application in teacher evaluation remains limited, particularly in capturing the full range of teacher behaviors that impact student learning. This study addresses this gap by applying the MUSIC model to the development of a teacher effectiveness scale, thereby extending its use to a broader educational context.

2.3. Linking Teacher Effectiveness to Learning Theories

To fully understand teacher effectiveness, it is essential to ground the discussion in established learning theories. The dimensions of the MUSIC model align closely with several key theories of motivation and learning. For instance, Self-Determination Theory emphasizes the role of autonomy, competence, and relatedness in fostering intrinsic motivation. The Empowerment dimension of the MUSIC model, which reflects the extent to which students

feel in control of their learning, directly ties into the autonomy aspect of Self-Determination Theory. Research has consistently shown that when teachers support students' autonomy, it leads to higher levels of engagement and motivation.

Similarly, the Success dimension of the MUSIC model is closely linked to concept of self-efficacy, where the belief in one's ability to succeed plays a crucial role in motivation and learning outcomes. By setting clear objectives and providing constructive feedback, teachers can significantly enhance students' sense of success, thereby improving their academic performance (Biasutti and Concina, 2021; Kyriakides *et al.*, 2022). These connections between the MUSIC model and established learning theories provide a strong theoretical foundation for the current study, which seeks to develop a teacher effectiveness scale that comprehensively reflects these dimensions.

2.4. Research Questions and the MUSIC Model

The current study aims to address the following research questions:

1. How can the MUSIC model be adapted to develop a comprehensive teacher effectiveness scale?

2. What are the key dimensions of teacher effectiveness that influence student motivation and learning outcomes in higher education?

3. How do the dimensions of Empowerment, Usefulness, Success, Interest, and Caring correlate with traditional measures of teacher effectiveness?

By framing the literature review around these specific research questions, the study builds a clear connection between the existing research and the objectives of the current work. Each section of the literature review addresses these questions, linking the theoretical discussion to the practical implications of developing a new evaluation tool.

2.5. Recent Studies and Expanded Content

In response to the call for more recent sources, this review incorporates studies published between 2020 and 2023, focusing on the latest developments in teacher effectiveness and the application of the MUSIC model. For instance, Karakose *et al.* (2023) explored the relationships between teacher characteristics and student outcomes using structural equation modeling, providing a contemporary perspective on the factors that influence educational effectiveness. Additionally, Tülübaş *et al.* (2023) examined the impact of digital addiction on academic achievement, highlighting the relevance of incorporating modern challenges into teacher evaluation frameworks.

These recent studies not only update the literature review but also expand its scope to include the latest challenges and opportunities in education. By integrating these findings into the discussion, the review provides a more comprehensive and up-to-date foundation for the current study.

2.6. Conclusion

In conclusion, this literature review identifies significant gaps in the existing research on teacher effectiveness, particularly in the application of multidimensional evaluation tools like the MUSIC model. By addressing these gaps and incorporating recent studies, the current research aims to develop a robust teacher effectiveness scale that reflects the complexities of modern educational environments. The integration of learning theories and recent empirical findings ensures that the new scale is both theoretically sound and practically relevant, offering valuable insights for educators and policymakers alike.

This section outlines the methodology used in developing and validating the teacher effectiveness scale based on the MUSIC model. The methodology is structured into distinct subsections: participants, instruments, data collection procedures, and data analysis. Each subsection is designed to ensure clarity and provide a detailed account of the research process.

3. Methodology

This section outlines the methodology used in developing and validating the teacher effectiveness scale based on the MUSIC model. The methodology is structured into distinct subsections: participants, instruments, data collection procedures, and data analysis. Each subsection is designed to ensure clarity and provide a detailed account of the research process.

3.1. Participants

The study was conducted with a sample of 300 participants drawn from five higher education and vocational institutions in China. The sample included a diverse mix of faculty members and students to ensure the robustness and generalizability of the findings. Demographic information such as age, gender, academic rank, and teaching experience was collected to control for potential confounding variables. The sample size was determined based on the need for sufficient statistical power to perform exploratory and confirmatory factor analyses, as well as to ensure the reliability and validity of the scale.

3.2. Instruments

The primary instrument used in this study was a newly designed questionnaire based on the MUSIC model, which evaluates teacher effectiveness across five dimensions: Empowerment, Usefulness, Success, Interest, and Caring. Each dimension was measured using several items on a five-point Likert scale, with responses ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire contained a total of 27 items, with 5 to 7 items dedicated to each dimension.

The questionnaire was developed through a rigorous process involving a literature review and consultation with educational experts. Each item was carefully crafted to align with the theoretical constructs of the MUSIC model, ensuring that the instrument accurately captures the multifaceted nature of teacher effectiveness.

3.3. Data Collection Procedures

Data collection was carried out over a period of three months. Participants were recruited through direct invitations and informed about the purpose and significance of the study. Ethical considerations, including informed consent and confidentiality, were strictly adhered to throughout the data collection process.

Participants completed the questionnaire either online or in paper format, depending on their preference and accessibility. The data collection process was standardized to minimize any potential bias or inconsistencies.

3.4. Data Analysis

Data analysis was conducted using both SPSS and AMOS software, chosen for their robust capabilities in handling complex statistical analyses required for this study.

3.4.1. Reliability Analysis

The reliability of the teacher effectiveness scale was assessed using Cronbach's Alpha coefficient, which measures internal consistency. A Cronbach's Alpha value greater than 0.7 was considered indicative of good reliability. In this study, the analysis revealed high internal consistency across all five dimensions: Empowerment (0.816), Usefulness (0.873), Success (0.902), Interest (0.842), and Caring (0.863). These results indicate that the scale consistently measures the intended constructs and meets the reliability standards commonly accepted in educational research.

3.4.2. Validity Analysis

The validity of the scale was evaluated through a multi-step process involving both content and construct validity assessments:

Content Validity: Content validity was assessed through expert reviews and student feedback. Educational experts reviewed the items to ensure they comprehensively covered the five dimensions of the MUSIC model. Feedback from students further confirmed that the items were clear, understandable, and practical for assessing teacher effectiveness.

Construct Validity: Construct validity was examined using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). EFA, conducted through Principal Component Analysis (PCA), identified the underlying factor structure of the scale. The results showed strong factor loadings across all five dimensions, with a KMO value of 0.823, well above the baseline value of 0.6, confirming the scale's alignment with the theoretical model.

Convergent and Discriminant Validity: Convergent validity was assessed by calculating the Average Variance Extracted (AVE) for each dimension, with values exceeding the recommended threshold of 0.5. Discriminant validity was confirmed through Composite Reliability (CR) indices, all of which surpassed the standard value of 0.7, indicating that the scale effectively distinguishes between the different dimensions.

3.4.3. Justification for the Methodology

The chosen methodology, including the use of EFA and CFA, was deemed the most appropriate for addressing the research questions. EFA was used to explore the underlying factor structure without imposing a preconceived model, ensuring an unbiased understanding of the data. CFA was subsequently employed to confirm the fit of the theoretical model to the observed data, providing a robust validation of the scale.

The use of Cronbach's Alpha for reliability testing and the detailed validity assessments were justified by the need to ensure that the scale is both reliable and valid across different educational contexts. The combination of these methodologies provides a comprehensive evaluation of the scale's effectiveness in measuring teacher performance according to the MUSIC model.

4. Results and Discussion

4.1. Research Findings

This study aimed to develop and validate a teacher effectiveness scale based on the MUSIC model, focusing on three key research questions: (1) How can the MUSIC model be adapted into a comprehensive teacher effectiveness scale? (2) Which critical dimensions of teacher effectiveness have the most significant impact on student motivation and learning outcomes in higher education? (3) What is the relationship between the dimensions of empowerment, usefulness, success, interest, and caring, and traditional measures of teacher effectiveness?

The findings indicate that the newly developed scale is both reliable and valid, demonstrating high internal consistency across all five dimensions: empowerment (0.816), usefulness (0.873), success (0.902), interest (0.842), and caring (0.863), as indicated by Cronbach's alpha coefficients. These results confirm the robustness of the scale in consistently measuring teacher effectiveness across different samples, making it a reliable tool for various educational settings.

In terms of validity, expert reviews and student feedback supported the content validity of the scale, affirming that the items comprehensively cover the five dimensions of the MUSIC model. Exploratory factor analysis (EFA)

revealed high factor loadings for each item, further confirming the construct validity of the scale. Additionally, confirmatory factor analysis (CFA) demonstrated good model fit (CFI=0.93, TLI=0.92, RMSEA=0.05), indicating a strong alignment between the theoretical model and empirical data.

The scale also exhibited strong convergent and discriminant validity, with the average variance extracted (AVE) and composite reliability (CR) values for each dimension exceeding standard thresholds. This supports the scale's effectiveness in distinguishing between different dimensions of teacher effectiveness, ensuring its applicability across diverse educational contexts.

Value to Academia and Practitioners: The findings of this study offer significant value to both academia and practitioners. For academia, the study contributes to the literature on teacher effectiveness by providing a validated tool that captures the multifaceted nature of teaching. By integrating affective and motivational factors into the evaluation of teacher performance, it addresses a critical gap in existing research. For practitioners, particularly educational administrators and policymakers, the scale offers a systematic and scientifically grounded tool for evaluating teacher effectiveness, which can be used to provide actionable feedback and guide professional development programs, ultimately enhancing teaching quality and improving student outcomes.

Generalizability: While the study's findings are robust, the generalizability of the results needs to be considered. The sample was drawn from higher education and vocational institutions in China, which may limit the applicability of the results to other educational settings or cultural contexts. Future research should aim to replicate this study across different regions and educational levels to verify the broader applicability of the scale.

4.2. Discussion

Unique Contributions and Innovation: This study makes several unique contributions to the field of educational research. First, by adapting the MUSIC model into a teacher effectiveness scale, it provides an innovative tool that integrates both traditional and contemporary dimensions of teaching performance. The scale addresses the limitations of existing evaluation methods, which often overlook the affective and motivational aspects of teaching, offering a more comprehensive approach to assessing teacher effectiveness.

The study also highlights the importance of introducing multidimensional evaluation tools into educational practice. The five dimensions of the MUSIC model—empowerment, usefulness, success, interest, and caring—provide a holistic framework that aligns with key motivational and learning theories, such as self-determination theory and Bandura's concept of self-efficacy. By grounding the scale in these established theoretical foundations, the study not only contributes new knowledge to the field but also enhances the practical relevance of teacher evaluation tools.

Contribution to New Knowledge: By developing and validating this scale, the study makes a significant contribution to the ongoing discourse on teacher effectiveness. The scale provides a more comprehensive picture of teacher effectiveness by integrating cognitive and affective dimensions, which can inform more targeted interventions and improvements in teaching practices. Moreover, the study offers new resources for educational policy and practice, aiding in the global effort to enhance educational quality.

Directions for Future Research: To build on these findings, future research should explore the specific mechanisms through which various teacher characteristics impact student academic performance and motivation. Additionally, expanding the sample size and scope of the study to include diverse educational backgrounds and cultural settings will help verify the scale's applicability and ensure its relevance in a broader educational context. Future research should also consider longitudinal designs to explore the causal relationships between teacher effectiveness and student outcomes, providing deeper theoretical and practical insights that could further improve teacher evaluation systems.

5. Conclusion

This study successfully developed and validated a teacher effectiveness scale based on the MUSIC model, addressing a significant gap in the existing literature by integrating both cognitive and affective dimensions of teaching performance. The results demonstrate that the scale is highly reliable and valid across the five dimensions of empowerment, usefulness, success, interest, and caring, effectively measuring teacher performance. These findings underscore the potential of the scale as a powerful tool for assessing teacher effectiveness, providing valuable insights for educational administrators and policymakers.

Key Theoretical Contribution: By adapting the MUSIC model into a teacher effectiveness scale, this study makes a significant theoretical contribution to the field of educational research. The scale offers a new framework for capturing the multidimensional nature of teaching, including affective and motivational factors that are often overlooked in traditional evaluation methods. This integrated approach aligns with established learning theories, such as self-determination theory and Bandura's concept of self-efficacy, advancing our understanding of how these dimensions interact to influence teacher effectiveness.

Study Limitations and Future Research Prospects: While the results of this study are robust, certain limitations must be acknowledged. The sample was drawn from higher education and vocational institutions in China, which may limit the generalizability of the results to other educational settings or cultural contexts. Moreover, the cross-sectional design of the study limits the ability to infer causality between dimensions of teacher effectiveness and student outcomes.

Future research should aim to replicate this study across different educational settings and cultural contexts to verify the broader applicability of the scale. Longitudinal studies could also be conducted to explore the mechanisms of causality between teacher characteristics and student performance. Additionally, expanding the scope of research

to include other dimensions of teacher effectiveness, such as technological competence or adaptability, may provide new insights into the demands of modern education.

Summary of Key Findings and Significance: The key findings of this study emphasize the reliability and validity of the scale, confirming its effectiveness in measuring teacher performance across multiple dimensions. The high internal consistency and strong construct validity indicate that the scale is a reliable tool for both academic research and practical application in educational management. By providing a systematic and scientifically grounded evaluation tool, the scale has the potential to enhance educational quality by offering actionable feedback to teachers, thereby improving their teaching strategies and fostering student development.

In conclusion, the teacher effectiveness scale developed in this study offers a comprehensive, reliable, and valid tool for assessing the multidimensional nature of teaching. By combining theoretical insights with practical applications, this study contributes to the ongoing efforts to enhance educational quality and supports the continuous improvement of teaching practices in diverse educational settings.

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Table-1. Instrument for Teacher Effectiveness

Dimensions	Items	5 Strongly Agree	4 Agree	3 Somewhat Agree	2 Disagree	1 Strongly Agree
Empowerment	1. My teacher gives me significant options for the learning tasks I do. 2. I am encouraged to think for myself and take charge of my education by my teacher. 3. My teacher helps me comprehend the significance of assignments and tasks by providing explanations for them. 4. During class, my teacher respects and appreciates my opinions. 5. My teacher fosters an atmosphere in the classroom where I feel more in charge and less under pressure.					
Usefulness	1. The teacher's guidance in knowledge and abilities gives me further confidence to handle potential professional challenges。 2. The teacher clearly explains how the course content relates to my future career development. 3. I find the content taught by the teacher to be very useful for my future career and personal development. 4. The teacher enables me to see the practical applications of course content in daily life. 5. The teacher has taught me how to use the knowledge from the course to solve real-life problems.					
Success	1. The teacher sets clear and achievable learning goals for us. 2. The teacher provides timely and constructive feedback, which boosts my learning confidence. 3. The teacher encourages me to set and achieve personal goals during the learning process. 4. The teacher's instruction makes me more confident in completing learning tasks, thereby increasing my motivation. 5. The goals set and support provided by the teacher help me achieve better academic performance. 6. With the teacher's help, I have learned how to overcome learning difficulties more effectively. 7. The teacher's support makes me more resilient when facing learning challenges					
Interest	1. The teacher's demonstration of professional knowledge and enthusiasm enhances my interest in the learning content. 2. The teacher creates a supportive and positive learning environment where I feel valued and understood. 3. In class, the teacher's support and encouragement make me more willing to participate in discussions and activities. 4. The teacher's use of diverse teaching strategies stimulates my interest in the learning content. 5. The teacher uses real-world projects and case studies to make the learning content more engaging. 6. The teacher's interactive teaching methods capture my attention. 7. The teacher's use of modern teaching technologies (e.g., online tools, interactive software) makes the class					

	more engaging. 8. The learning activities designed by the teacher are very interesting to me					
Caring	1. The teacher creates a safe and supportive classroom atmosphere that makes me feel valued. 2. The emotional support provided by the teacher boosts my confidence in tackling learning tasks. 3. The teacher gives positive and constructive feedback on my learning outcomes. 4. The teacher understands and responds to my individual learning needs. 5. The teacher's caring actions inspire my interest and motivation for learning. 6. The teacher's supportive environment makes me feel comfortable and welcome in class. 7. The teacher's encouragement makes me more actively participate in class activities and discussions.					

Table-2. Reliability and Validity Analysis Results

Dimension	Cronbach's Alpha	KMO	CFI	TLI	RMSEA	Bartlett
Empowerment	0.816					
Usefulness	0.873					P=0.000[***]
Success	0.902	0.823	0.93	0.92	0.05	CMIN=44208.645
Interest	0.842					DF=136
Caring	0.863					

Convergent and discriminant validity were assessed by calculating the Average Variance Extracted (AVE) and Composite Reliability (CR) indices for each dimension, evaluating the scale's convergent and discriminant validity. These indicators (Table 3) demonstrate that each dimension possesses high convergent and discriminant validity.

Table-3. Validity Results (EFA Loadings, AVE, CR)

Dimension	AVE	CR
Empowerment	0.68	0.87
Usefulness	0.72	0.89
Success	0.65	0.85
Interest	0.7	0.88
Caring	0.74	0.9