

ZIBELINE INTERNATIONAL™
PUBLISHING

ISSN: 2521-0831 (Print)

ISSN: 2521-084X(Online)

CODEN: MSMAD



RESEARCH ARTICLE

EFFECTS OF TEACHING QUALITY, TEACHING COMPETENCE, AND MATHEMATICS CONNECTION ON MATHEMATICS ACHIEVEMENT MOTIVATION AMONG SENIOR HIGH SCHOOL STUDENTS IN GHANA

Gyasi Alfred Bannor*, Samuel Kwaku Boadu, Yarhands Dissou Arthur

Department of Mathematics Education, Akonte Appiah-Menka University of Skills Training and Entrepreneurial Development, Kumasi, Ghana
*Corresponding Author Email: gyasibannor87@gmail.com*This is an open access article distributed under the Creative Commons Attribution License CC BY 4.0, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.*

ARTICLE DETAILS

Article History:

Received 09 April 2023

Revised 12 May 2023

Accepted 19 June 2023

Available online 22 June 2023

ABSTRACT

This survey assessed the direct effects of teaching quality, teaching competence and mathematics connection on mathematics achievement motivation in Senior high School students in Ghana. A descriptive survey was used in the study, which included 329 senior high school students from Barekese Senior High School. Prior to the main model estimation, preliminary studies such as Confirmatory Factor Analysis, convergent validity, discriminant validity, and internal consistency (Cronbach's Alpha) were computed. Amos (v.23) was used to do structural equation modeling (SEM) in order to assess the various assumptions. The results of path estimations revealed that mathematics connection positively and significantly influenced mathematics achievement motivation. However, teaching quality and teaching competence has no significant impact on mathematics achievement motivation.

KEYWORDS

Ghana, mathematics achievement motivation, mathematics connection, teaching competence, teaching quality

1. INTRODUCTION

For the past decades, nations have paid much attention to the advancements in teacher practice and students mathematics learning. Long term policies, expert training programs and professional developments were necessary. For example, in Ghana, four-years Bachelor of education degree (BED) in basic education replaced the initial three-years Diploma. This approach was analogous to UNESCO suggestions for improving teacher education. Later, licensure and promotion examinations were introduced to provide firm grounds for raising the standards of teaching (NTC, 2020). NTC (2020) view, that reforms of this nature are geared towards enhancing the professional, psychological, as well as affective practice of teachers in general, and mathematics teachers in particular. A study describes such policies to target and initiate programs that build certain qualities peculiar to teachers. Darling-Hammond (2000) noted, that licensing teachers by criteria such as degrees, examinations and content area expertise are the initial stages of quality and competence growth (Darling-hammond, 2000; Donkor and Amadu, 2014). Literatures revealed teaching quality, teaching competence and mathematics connection affect, to greater extent, students' performance, interest or self-efficacy in mathematics (Authors, 2019b; Authors, 2017; Boyd et al., 2007.; Goe, 2007; Goldhaber et al., 2015; Hanushek & Rivkin, 2006; Koomson et al., 2005; Ochieng et al., 2016; Sirait, 2016). These revelations can be noticed in one study in Germany (Blömeke et al., 2020).

The results showed competent teachers are capable of designing and implementing quality instructions that promote students' mathematics interest (Authors, 2019). Similarly, in Ghana, Authors (2019) found that instructor quality accounted for variations in students' interest in mathematics. Researchers examined the correlation between teacher

quality and students' achievement (Bonney et al., 2015). Teachers depicted good academic and professional qualities but the achievement of students remained poor. Teacher quality was not seen to lead to higher performance as witnessed in other studies. Therefore, other understudied factors such as students' motivation shadowed the positive impact of teaching quality on students' achievement. In addition, from 1993 – 1994 schools and staffing surveys (SASS) and the national assessment in education policies, Darling-hammond (2000) argued that, be it in teacher preparation or certification, teacher quality determines the amount of students' achievement.

Similarly, some argued that teacher quality determines the quality of instruction and results in educational outcomes (Blömeke et al., 2020; Annan, 2020). The impact of teacher quality on students' performance leads to greater improvement (Authors, 2022; Blomeke et al., 2020).

"Teaching competence is an instructor characteristic which in the form of professional knowledge as well as affective and motivational skills" determines students' level of mathematics achievement. In a study, teaching competence significantly affected the reading skills of African-Americans (McRae, 2012). Teaching competence as testified by Annan (2020) is a key ingredient to the quality of instruction and students' performance in teaching and learning activities. Others agreed that teacher competence influences students' mathematics improvements. Ochieng et al., (2016) further went on to add that competent teachers are those who meet the professional standards of quality practice (Ochieng et al., 2016; Phin, 2014).

Mathematics connection involves the ability of teachers to relate mathematical concepts to real life applications and other subjects. Authors pointed that mathematics connection to the real world enables students explore the role mathematics play in explaining real life phenomena.

Quick Response Code



Access this article online

Website:

www.matrixsmathematic.com

DOI:

10.26480/msmk.02.2023.50.55

to measure mathematics achievement motivation of students (Lim and Chapman, 2014). The researcher sought the consent of the school authority, and participants to ensure data protection, and secrecy.

2.3 Reliability and Validity of the Measures

Reliability analysis was conducted using SPSS (version 20) to determine the internal consistency of the instrument. The study computed confirmatory factor analysis by AMOS (version 23) to assess the fitness of the measurement model. During the confirmatory factor analysis, factor loadings were assessed for each measurement item on the scale. Items with factor loadings below 0.50 exited iteratively.

Measure	Estimate	Threshold	Interpretation
CMIN/DF	2.331	Between 1 and 3	Excellent
GFI	.901	>.90	Excellent
CFI	.962	>.95	Excellent
TLI	.952	>.90	Excellent
RMSEA	.064	<.06	Acceptable
SRMR	.071	<.08	Excellent

Due to lower factor loadings, 8 items were eliminated for further analysis. To enhance the fitness of the measurement model, modification indices were used. The model fitness was ensured using the model fit measures according to a study, criterion for CMIN/DF, GFI, CFI, TLI, SRMR, and RMSEA (Hu and Bentler, 1999). The confirmatory factor analysis ensured that CMIN/DF=2.331, GFI=.901, CFI=.962, TLI=.952, SRMR=.071, and RMSEA=0.64.

Constructs	Composite Reliability	Average Variance Explained	Cronbach Alpha
Teacher Quality	.909	.715	.927
Teacher Competence	.756	.884	.923
Mathematics Connection	.887	.617	.914
Mathematics Achievement Motivation	.911	.503	.924

The Cronbach's alpha (CA) was calculated by SPSS (v.23) using the retained items. Cronbach alpha of teaching quality (TQ), teaching competence (TC), mathematics connection (MC), and students' mathematics achievement motivation (SMAM) constructs were .927, .923, .914 and .924 respectively. The study ensured that Cronbach's alpha for each construct is maintained at the required threshold of 0.70 (Taber, 2018). Convergent validity is obtained when the Average Variance Extracted (AVE) of the observed variables is greater than or equal to 0.5 and the Composite reliability (CR) is greater than or equal to 0.7 (Bornmann et al., 2009; Carlson & Herdman, 2012). The results indicate that 0.503 of mathematics achievement motivation was the least Average Variance Extracted (AVE), while 0.756 of mathematics achievement motivation was the least Composite Reliability (CR), indicating this study attained convergent validity. The average variance extracted were above the minimum benchmark of 0.50 (Dos Santos & Cirillo, 2021). Hence, the instrument used in the study has the required convergent validity as shown on Table 2.

	TQ	TC	MC	SMAM
TQ				
TC	.66			
MC	.22	.26		
SMAM	.04	.10	.54	

Earlier studies considered the assessment of discriminant validity using Fornell and Larker Criterion (Hamid et al., 2017). However, recent criticisms of the Fornell and Larker Criterion had caused rapid utilization of the Heterotriat-Monotrait (HTMT) ratio. The present study utilized

Heterotriat-Monotrait ratio to determine the discriminant validity. In using HTMT ratio, all values were ensured to be less than 0.85 (Henseler et al., 2015; Roemer et al., 2021). Therefore, discriminant validity was achieved on the dataset. Table 3 displays the results of the discriminant validity.

3. RESULTS

A structural equation model was generated by Analysis of Moment Structure (AMOS) (Barnidge & Zúñiga, 2017; Mustafa et al., 2020). The structural equation model was used to test the relationships between the constructs under study. Another key factor to consider when running CFA is the model's fitness. The CMIN / DF should be less than 3, CFI and TLI should be at least 0.9, RMR and RMSEA should be at least 0.8, while P-close should also be greater than 0.05 (Hair et al., 2010). CMIN measures minimal inconsistency in the model; RMSEA represent perfectly identical indices by evaluating the deviation of the hypothesis model from the perfect model; while CFI and TLI represent incremental agreement indices by comparing how well the hypothesis model fits the baseline model (evaluating least agreement) (Xia & Yang, 2019). The limit values for CFI and TLI are based on the maximum probabilities of normal continuous data theory. P-close is also expected to be statistically insignificant at 5% (above 0.05).

Measures	Estimate	Threshold	Interpretation
CMIN/DF	2.331	Between 1 and 3	Excellent
GFI	.910	>.90	Excellent
CFI	.965	>.95	Excellent
TLI	.956	>.90	Excellent
RMSEA	.061	<.06	Acceptable
SRMR	.056	<.08	Excellent

The value generated by the Confirmatory Fit Index (CFI) was equal to 0.965, which was greater than 0.90, which means that this model is valid and has a high correlation between the model and the data. The resulting Goodness-of-Fit Indices (GFI) value was 0.910. This means that the resulting model is good. In addition, the resulting Root Mean Square Error Approximation (RMSEA) value was 0.061; this is less than 0.08, which means an acceptable value for RMSEA. This shows that the basic factors of the four constructs are valid and acceptable. The Tucker and Lewis Index (TLI), value was 0.956 and Standard Root Mean Square (SRMR) was 0.056 which were all ensured within their tolerable range (Hu & Bentler, 1999). Table 4 shows that the fitness indices are at their suitable thresholds. As part of the fitness assessments, CMIN / DF value was 2.331 which was less than 3.

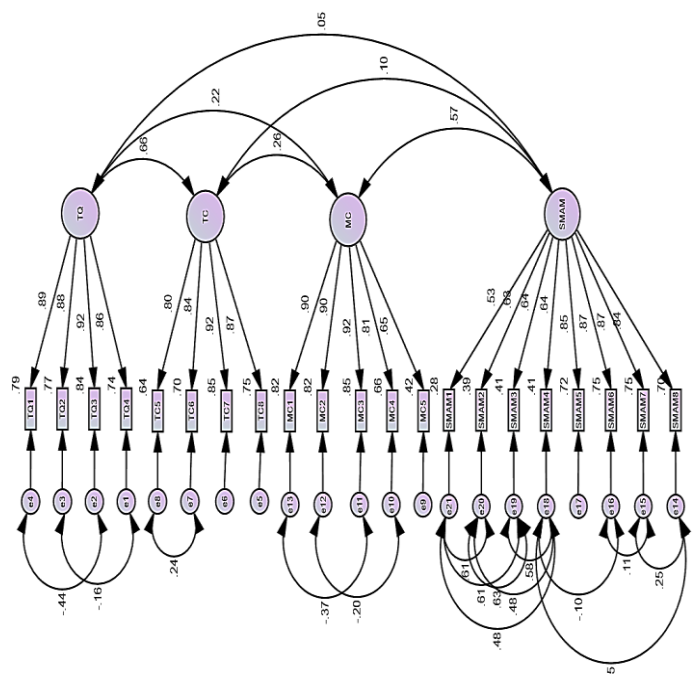


Figure 1: Confirmatory Factor Analysis Model (Source: Field Survey, 2023)

Table 4: Hypotheses Testing				
Hypothesized Relationship	Unstandardized Estimates	t-value	p-value	Decision
TQ-->SMAM	-.054	-.807	.420	Reject H1
MC-->SMAM	.681	10.698	<.001	Accept H3
TC-->SMAM	-.105	.681	.124	Reject H2

The study explored the influence of teaching quality, teaching competence and mathematics connection on students' mathematics achievement motivation. The impact of teaching quality on mathematics achievement motivation was negative and insignificant ($b=-.054, t=-.807, p=.420$), thus H1 was rejected meaning teaching quality had no impact on mathematics achievement motivation. The impact of teaching competence on mathematics achievement motivation was negative and insignificant ($b=-.105, t=-1.539, p=.124$), H2: *Teaching competence has a direct positive effect on mathematics achievement motivation among senior high school students was thus rejected.* However, the impact of mathematics connection on mathematics achievement motivation was positive and significant ($b=.681, t=10.698, p<.001$), H3: *Mathematics connection has a direct positive effect on mathematics achievement motivation among senior high school students was thus confirmed.* Table 5 reports the results of the hypothesized relationships.

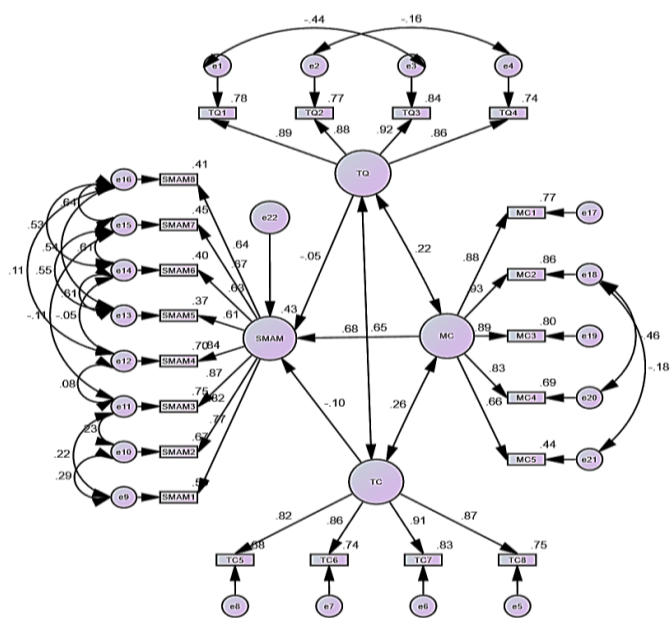


Figure 2: Structural paths (Source: Field Survey, 2023)

4. DISCUSSION

Researchers agreed that teaching quality had a significant influence on student motivation in mathematics learning (Dahl, 2011; Ruiz-alfonso et al., 2021). When mathematics lessons are presented by teachers who had sufficient degree of comprehension of concept, students acquire fully meaningful motivation and interests. Quality instructors also use their motivating skills to enhance student self-control, preparedness, and endurance in difficult mathematical circumstances (Sirait, 2016). The current study discovered a negative association between teaching quality and mathematics achievement motivation; however, the relationship was minor. This finding contradicted the findings of other researchers, who discovered a direct positive and significant influence of teaching quality on students' motivation (Dahl, 2011; Ekmekci & Serrano, 2022; Johnson, 2017; Ruiz-alfonso et al., 2021).

Teaching competence has been identified as an effective teacher-factor of consideration by studies researchers (Fauth et al., 2019; Lillvist et al., 2013; Richards, 2009; Sulaiman & Ismail, 2020). Previous research found that teaching competence has a beneficial impact on student motivation in mathematics learning and accomplishment. It has been observed that highly skilled and devoted teachers increase student interest and motivation to study mathematics; however, the findings of the current study contradict this result. In contrast to the findings of earlier investigations, a negative and insignificant relationship was discovered (Stipek et al., 1998; Tambunan et al., 2021). However, the current findings are consistent with the notion that different students have diverse perspectives on the nature of teaching competence and mathematics

motivation, as evidenced by cultural diversity, age, or gender (Eccles & Wigfield, 2020). The ability of teachers to relate mathematics principles to other disciplines and students' daily lives is referred to as mathematics connection (Authors, 2017).

Mathematics connection assists students in identifying links between mathematics ideas and real-life events in order to solve problems (Selvianiresa & Prabawanto, 2017). The present study found that mathematics connection is positively and strongly correlated with learners' mathematics achievement motivation. The conclusion was consistent and it adds to the body of research on the influence of mathematics connections on student motivation in mathematics learning (Clair, 2018; Rodionov & Dedovets, 2017).

5. CONCLUSION

From the results of the data analysis, the study concluded that teaching quality and teaching competence had no effect on mathematics achievement motivation of students. However, mathematics connection had positive direct effect on mathematics achievement motivation.

RECOMMENDATIONS

The study recommends that mathematics teachers should use pedagogical approaches which allow them to relate mathematics taught in class to real life problems and other disciplines. This will arouse students' motivation to achieve in mathematics. The study also recommends to teachers to adopt techniques to motivate students in mathematics teaching and learning since achievement motivation is principal variable in students' mathematics learning and performance.

ACKNOWLEDGEMENTS

The authors would like to thank the anonymous reviewers for their comments and suggestions. We really appreciated their efforts to improve the quality and presentation of this work.

ETHICAL APPROVAL

A letter was issued to the selected SHS school requesting permission to perform the study. The privacy and anonymity of the participants were respected.

DATA SHARING STATEMENT

Data supporting the findings and conclusions are available upon request from the corresponding author.

REFERENCES

Akpan, I. D., & Umobong, M. E. U. 2013. Analysis of Achievement Motivation and Academic Engagement of Students in the Nigerian Classroom. *Academic Journal of Interdisciplinary Studies MCSER Publishing, Rome-Italy*, 2(3), 385-390. <https://doi.org/10.5901/ajis.2013.v2n3p385>

Annan, J. K. 2020. Preparing Globally Competent Teachers : A Paradigm Shift for Teacher Education in Ghana. 2020(10).

Barnidge, M., & Zúñiga, H. G. I. L. D. E. 2017. Amos (Software). In *The International Encyclopedia of Communication Research Methods* (Issue Mcmc). John Wiley & Sons, Inc. <https://doi.org/10.1207/S15327574IJT0101>

Blömeke, S., Kaiser, G., König, J., & Jentsch, A. 2020. Profiles of mathematics teachers' competence and their relation to instructional quality. *ZDM*, 52(2), 329-342. <https://doi.org/10.1007/s11858-020-01128-y>

Bonney, E. A., Amoah, D. F., Micah, S. A., Ahiameny, C., & Lemaire, M. B. 2015. The Relationship between the Quality of Teachers and Pupils Academic Performance in the STMA Junior High Schools of the Western Region of Ghana. 6(24).

Bornmann, L., Marx, W., Schier, H., Rahm, E., Thor, A., & Daniel, H. D. 2009. Convergent validity of bibliometric Google Scholar data in the field of chemistry-Citation counts for papers that were accepted by *Angewandte Chemie International Edition* or rejected but published elsewhere, using Google Scholar, Science Citation Index, Scopus, and Chemical Abstracts. *Journal of Informetrics*, 3(1), 27-35. <https://doi.org/10.1016/j.joi.2008.11.001>

- Boyd, D., Goldhaber, D., & Lankford, H. 2007. The Effect of Certification and Preparation on Teacher Quality. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55. <https://doi.org/10.1080/10705519909540118>
- Carlson, K. D., & Herdman, A. O. 2012. Understanding the impact of convergent validity on research results. *Organizational Research Methods*, 15(1), 17-32. <https://doi.org/10.1177/1094428110392383>
- Clair, J. S. 2018. Using Cartoons to Make Connections and Enrich Mathematics. 2. <https://doi.org/10.20429/stem.2018.020112>
- Cohen, L., Manion, L., & Morrison, K. 2018. *Research Methods in Education* (8th ed.). Routledge.
- Dahl, D. W. 2011. Does motivation matter? quality of teaching and students' motivational orientations. 37(7), 582-609. <https://doi.org/10.1108/03074351111140243>
- Darling-hammond, L. 2000. Teacher Quality and Student Achievement : A Review of State Policy Evidence Previous Research. 8(1), 1-44.
- De Clercq, F. 2008. Teacher quality , appraisal and development : The flaws in the IQMS 1. 26(March), 7-18.
- Donkor, A. K., & Amadu, M. A. 2014. The In-In-Out Programme of Teacher Education in Ghana: The Perception of Implementers. 2(February), 32-48.
- dos Santos, P. M., & Cirillo, M. Â. 2021. Construction of the average variance extracted index for construct validation in structural equation models with adaptive regressions. *Communications in Statistics: Simulation and Computation*. <https://doi.org/10.1080/03610918.2021.1888122>
- Eccles, J. S., & Wigfield, A. 2020. From Expectancy-Value theory to Situated Expectancy-Value Theory: A Developmental, Social Cognitive, and Sociocultural Perspective on Motivation. *Contemporary Educational Psychology*, 6(101859), 0-60.
- Ekmekci, A., & Serrano, D. M. 2022. education sciences The Impact of Teacher Quality on Student Motivation , Achievement , and Persistence in Science and Mathematics. *Education Sciences*, 12(649).
- Fauth, B., Decristan, J., Decker, A. T., Büttner, G., Hardy, I., Klieme, E., & Kunter, M. 2019. The effects of teacher competence on student outcomes in elementary science education: The mediating role of teaching quality. *Teaching and Teacher Education*, 86(2019). <https://doi.org/10.1016/j.tate.2019.102882>
- Fleming, L., Motamedi, V., & May, L. 2007. Predicting Preservice Teacher Competence in Computer Technology : Modeling and Application in Training Environments. 15, 207-231.
- Goe, L. 2007. *The Link Between Teacher Quality and Student Outcomes : A Research Synthesis*. October.
- Goldhaber, D., Lavery, L., & Theobald, R. 2015. Uneven Playing Field? Assessing the Teacher Quality Gap Between Advantaged and Disadvantaged Students. *Educational Researcher*, 44(5), 293-307. <https://doi.org/10.3102/0013189X15592622>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. 2010. *Multivariate data analysis: A global perspective* (7th Ed.). Pearson Education. <https://www.pearson.com/uk/educators/higher-education/educators/program/Hair-Multivariate-DataAnalysis-Global-Edition-7thEdition/PGM916641.htm>
- Hamid, M. R. A., Sami, W., & Sidek, M. H. M. 2017. Discriminant Validity Assessment: Use of Fornell & Larcker criterion versus HTMT Criterion. *Journal of Physics: Conference Series*, 890(1). <https://doi.org/10.1088/1742-6596/890/1/012163>
- Hanushek, E. A., & Rivkin, S. G. 2006. Teacher quality. 2(06). [https://doi.org/10.1016/S1574-0692\(06\)02018-6](https://doi.org/10.1016/S1574-0692(06)02018-6)
- Henseler, J., Ringle, C. M., & Sarstedt, M. 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135. <https://doi.org/10.1007/s11747-014-0403-8>
- Hu, L. T., & Bentler, P. M. 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55. <https://doi.org/10.1080/10705519909540118>
- Johnson, D. 2017. The Role of Teachers in Motivating Students To Learn Davion Johnson. *Journal of Graduate Studies in Education*, 9(1), 46-49.
- Kenedi, A. K., Helsa, Y., Ariani, Y., Zainil, M., & Hendri, S. 2019. Mathematical connection of elementary school students to solve mathematical problems. *Journal on Mathematics Education*, 10(1), 69-79. <https://doi.org/10.22342/jme.10.1.5416.69-80>
- Koomson, J. A., Bosu, R. S., Oduro, G. K. T., & Ankomah, Y. A. 2005. A Review On The Concept Of Quality In Education : Perspectives From Ghana EdQual Working Paper No . 1. 1.
- Lillvist, A., Sandberg, A., Sheridan, S., & Williams, P. 2013. *Journal of Education for Teaching: International research and pedagogy* Preschool teacher competence viewed from the perspective of students in early childhood teacher education. December 2014, 37-41. <https://doi.org/10.1080/02607476.2013.864014>
- Lim, S. Y., & Chapman, E. 2014. Adapting the academic motivation scale for use in pre-tertiary mathematics classrooms. <https://doi.org/10.1007/s13394-014-0140-9>
- McRae, A. 2012. *Teacher Competence Support For Reading In Middle School*. University of Maryland.
- Mustafa, M. Z. Bin, Nordin, M. N. Bin, & Razzaq, A. R. B. A. 2020. Structural equation modelling using AMOS: Confirmatory factor analysis for taskload of special education integration program teachers. *Universal Journal of Educational Research*, 8(1), 127-133. <https://doi.org/10.13189/ujer.2020.080115>
- NTC. 2020. *National Teaching Council a Framework for Professional Development of Teachers Guidelines for Point Based - System (Inset and Portfolio)*.
- Ochieng, K. R., Kiplagat, P., & Nyongesa, S. 2016. Influence of Teacher Competence on Mathematics Performance in KCSE Examinations Among Public Schools in Nyatike Subcounty , Migori County Kenya. 4(5), 44-57. <https://doi.org/10.11648/j.ijssedu.20160405.11>
- Pantić, N., Wubbels, T., & Mainhard, T. 2011. Teacher competence as a basis for teacher education: Comparing views of teachers and teacher educators in Five Western Balkan countries. *Comparative Education Review*, 55(2), 165-188. <https://doi.org/10.1086/657154>
- Phillips, P. P., & Phillips, J. J. 2013. *Survey Basics*. ASTD press.
- Phin, C. 2014. of Administration and Policy Studies Teacher competence and teacher quality in Cambodia's educational context linked to in-service teacher training: an examination based on a questionnaire survey. 6(April), 62-69. <https://doi.org/10.5897/IJEAPS2013.0326>
- Retnawati, H. 2022. Empirical Study of Factors Affecting the Students' Mathematics Learning Achievement. 15(2), 417-434.
- Richards, J. C. 2009. Exploring teacher competence in language teaching*. 3-7.
- Rodionov, M., & Dedovets, Z. 2017. Practical Problems as Tools for the Development of Secondary School Students' Motivation to Learn Mathematics. 11(10), 22-23.
- Roemer, E., Schuberth, F., & Henseler, J. 2021. HTMT2—an improved criterion for assessing discriminant validity in structural equation modeling. *Industrial Management and Data Systems*, 121(12), 2637-2650. <https://doi.org/10.1108/IMDS-02-2021-0082>
- Ruiz-alfonso, Z., León, J., Santana-vega, L. E., & González, C. 2021. Teaching Quality: An Explanatory Model of Learning in Secondary Education. *Psicología Educativa* (2021), 27(1), 67-76.
- Selvianiresa, D., & Prabawanto, S. 2017. Contextual Teaching and Learning Approach of Mathematics in Primary Schools. *Journal of Physics: Conference Series*, 895(1). <https://doi.org/10.1088/1742-6596/895/1/012171>

- Sirait, S. 2016. Does Teacher Quality Affect Student Achievement? An Empirical Study in Indonesia. *Journal of Education and Practice*, 7(27), 34–41.
- Siri, A., Supartha, I. W. G., Sukaatmadja, I. P. G., & Ganesha, A. 2020. Does teacher competence and commitment improve teacher ' s professionalism Does teacher competence and commitment improve teacher ' s professionalism. *Cogent Business & Management*, 7(1). <https://doi.org/10.1080/23311975.2020.1781993>
- Stipek, D., Givvin, K. B., Salmon, J. M., & Macgyvers, V. L. 1998. Can a teacher intervention improve classroom practices and student motivation in mathematics? *Journal of Experimental Education*, 66(4), 319–337. <https://doi.org/10.1080/00220979809601404>
- Sulaiman, J., & Ismail, S. N. 2020. Teacher competence and 21st century skills in transformation schools 2025 (TS25). *Universal Journal of Educational Research*, 8(8), 3536–3544. <https://doi.org/10.13189/ujer.2020.080829>
- Sulistiyo, U. 2016. English Language Teaching And EFL Teacher. 1994, 396–406.
- Taber, K. S. 2018. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, 48(6), 1273–1296. <https://doi.org/10.1007/s11165-016-9602-2>
- Tambunan, H., Sinaga, B., & Widada, W. 2021. Analysis of teacher performance to build student interest and motivation towards mathematics achievement. *International Journal of Evaluation and Research in Education*, 10(1), 42–47. <https://doi.org/10.11591/ijere.v10i1.20711>
- Wahyuddin, W. 2016. The Relationship between of Teacher Competence , Emotional Intelligence and Teacher Performance Madrasah Tsanawiyah at District of Serang Banten. 6(1), 128–135. <https://doi.org/10.5539/hes.v6n1p128>
- Wahyuddin, W. 2017. Headmaster Leadership and Teacher Competence in Increasing Student Achievement in School. 10(3), 215–226. <https://doi.org/10.5539/ies.v10n3p215>
- Wenglinsky, H. 2000. How Teaching Matters Bringing the Classroom Back Into Discussions of Teacher Quality.
- Wijayanti, I. K., & Abadi, A. M. 2019. Analysis of the Difficulty of VIIIth Grade Junior High School Students in Circle Material Reviewed from the Mathematics Connection Ability. *Journal of Physics: Conference Series*, 1397(1). <https://doi.org/10.1088/1742-6596/1397/1/012086>
- Xia, Y., & Yang, Y. 2019. RMSEA, CFI, and TLI in structural equation modelling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior Research Methods*, 51(1), 409–428. <https://doi.org/10.3758/s13428-018-1055-2>

