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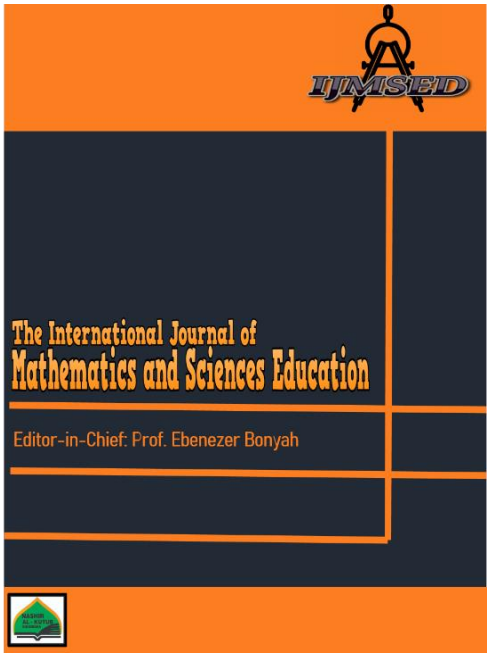

The role of the teach-qual model on Students' mathematics interests: The mediating effects of Students' perception on Mathematics

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Original Article

The role of the teach-qual model on students' mathematics interests: the mediating effects of students' perception on mathematics

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Abstract
This work aimed to examine the role of the Teach-Qual (teacher quality) model on students' mathematics interests as mediated by students' perception of mathematics. The study samples 300 students from three senior high schools found in the Ashanti Region of Ghana using Convenience, stratified sampling, and simple random sampling. The study is purely a quantitative method that employed a questionnaire as a data collection tool. The data was analyzed by using Amos (Ver. 23) to estimate the result for the hypothesis path. The outcome of this study revealed that teacher-student collaboration and teacher empathy yielded a direct positive and statistically improved impact on students' math interests. Student's perception of mathematics partially mediates the association between teacher empathy as well as student's mathematics interest. Moreover, perception in mathematics partially mediates the relationship between teacher-student collaboration and students' math interests. The study recommended mathematics teachers collaborate with students in terms of classroom teaching and learning and work more practical mathematics examples with students in the class to enhance student's mathematics interests.
Keywords: Teacher-Students'-Collaboration, Teacher Empathy, Perception, Interest, Teach-Qual Model.

1. Introduction

Mathematics is the body of science with a significant impact on the development of individual life as well as the nation's development. Mathematics is a branch of science that deals with numbers, calculations, and logical reasoning. It is a fundamental subject that contributes to the advancement of technology, engineering, medicine, economics, and other sciences. According to Maass et al. (2019), mathematics provides the framework for finding solutions to complex real-world problems, from designing bridges and buildings to predicting stock prices. Naganjaneyulu et al. (2020) found that mathematics provides the foundation for modern technology. Computer programming such as robotics, artificial intelligence, and many other technological advancements would not be possible without mathematical principles. Yadav (2019) also points out that, mathematics is instrumental in various scientific fields. It helps scientists understand and predict natural phenomena' behavior and study complex biological systems. Based on the contribution of mathematics to individuals and nations,

mathematics is made a compulsory subject for students to undertake in some West African countries Ghana and Nigeria, etc. Students in Ghana see mathematics as a difficult subject to study due to its complex nature.

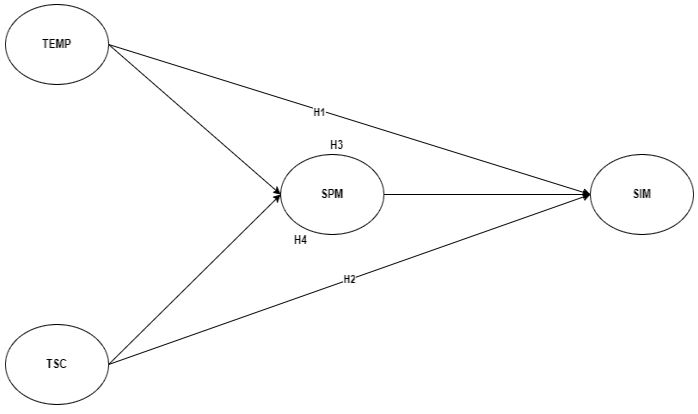
Studies have pointed out some factors that influence students' interest and performance in learning. According to Chand et al. (2021) and , teachers role play effective part in students' interest in maths. He further notices that, if the teacher is skilled and enthusiastic in teaching mathematics, he/she is more likely that students will develop a keen interest in mathematics which in turn has a significant effect on their performance. Parental involvement helps children's interest in maths noticed by Landas et al. (2022). Vaiopoulou et al. (2021) also emphasized that, if the parents provide positive reinforcement and encourage their children to explore mathematics-related activities at home, the child is more likely to develop an interest in mathematics learning. Mokhtar et al. (2012) insisted that students' attitude towards maths impact on students' maths interest and performance. A positive attitude towards mathematics can encourage students to enjoy the subject which can further help to improve their performance. Toropova et al. (2019) their study found that, when students have a teacher who is knowledgeable and enthusiastic, supportive, and well-prepared, they are more likely to develop an interest in studying mathematics.

Deducing from above indicates that several studies have been conducted in this direction but very little has been done on the actual teacher quality that have effect on student's mathematics interest. The researcher found that, several studies limit their views on student's interest without looking at impact of teacher characteristics on student's perception of maths learning. To close the gap, the researcher emphasizes on teacher empathy and teacher-student's-collaboration as a teacher quality to determine its effect on student's mathematics interest as mediated by student's perception in mathematics.

This work therefore, attempts to exploy the role Tech-Qual (teacher quality) model on students' mathematics interests. Further, we explore the mediating role of how students perceive mathematics in the relationship between the Tech-Qual model and students' maths interests. Although the research considers two teacher quality for this study which includes teacher-students collaboration and teacher empathy which serve as an independent variable for the study.

Figure 1

Conceptual Framework



Research Question

1) What is the effect of teacher's empathy on student's maths interest?
2) What is the effect of teacher-student's-collaboration on students' maths interests?
3) What is the mediating effect of how students perceive maths on the relationship between teacher empathy and student's mathematics interest?
4) What is the mediating effect of student's mathematics perception on the relationship between teacher-student's-collaboration and student's mathematics interest?

Literature review

The Effect of Teacher Empathy on Students' Mathematics Interest

From Ali et al. (2021) research conducted indicates that empathy has good effect on students' mathematical interests. When teachers show empathy to their students, they yield a positive learning environment where students feel respected and valued (Ali et al., 2021). This in turn improves students' self-esteem and confidence level to increase interest in maths (Arthur, 2022; Mishra et al., 2022). Empathy allows the teacher to better understand their students' strengths and weaknesses to enable them to vary their teaching methods to meet the needs of every student (Hridaya & Sah, 2017) . When students get to know that their teacher is interested in their progress and success, they are automatically motivated and well-engaged in the learning process (Wolff et al., 2021). Therefore, by showing empathy towards your students, they inspire a great interest in mathematics and create a positive classroom experience for them (Mishra et al., 2022) . According to the study conducted by Arthur et al. (2022) upon determining the effect of teaching quality of a teacher using SERVQUAL perspectives on students' mathematics interest performance, the findings from their study present that, mathematics teaching empathy has a significant positive impact on students' mathematics interest and performance. This proposed that;

H_1: Teacher empathy has a direct positive effect on student's mathematics interest.

The Effect of Teacher-Student's-Collaboration on Students' Mathematics Interest.

Studies suggest that collaboration has a positive turn on students' maths interests (Arthur, 2022). According to Dahal et al. (2022) collaborative learning allows students to work together and share ideas which helps them acquire conceptual skills of maths. When they work together, they are more likely to feel at ease asking questions and taking risks which can increase their mathematics interest (Jahnke et al., 2022). Collaboration also assists students to see a clear picture of the real-world application of mathematics which can make the subject more meaningful and engaging to them (Lo & Hew, 2021). This proposed that;

H_2: Teacher-Student's-Collaboration has direct positive effects on student's mathematics interest.

Mediating role of students' mathematics perceptions.

Perception in maths is defined as how students personally view and react to mathematics as a course and how they see and think about learning mathematics

(Otoo et al., 2018). Kusumawati et al. (2020) insisted that students' perception of maths refers to their beliefs, attitudes, and feeling toward mathematics. This can involve their perceived abilities, confidence levels, and overall enjoyment of the subject Klassen (2002). When students have positive perceptions of mathematics, they are more likely to be interested in the subject. They become motivated to learn and engage in mathematics problem-solving tasks Cetin-Dindar (2016). In this scenario, students' mathematics perception act as a mediator between collaboration as teacher quality and students' mathematics interest. The teacher's collaborative approach creates a positive environment for students, which increases their perception of mathematics, and subsequently, sparks their interest in the subject. This can be done when teacher focuses on creating a positive classroom environment that promotes collaboration, they can not only improve mathematical learning outcomes but also fosters alone lasting interest in mathematics.

H_3: Students' perception of mathematics mediates the relationship between teacher student's collaboration and students' mathematics interests.

Perception is the way students interpret and make meaning out of their experiences. Perception affects their interest and proficiency. It decreases students' interest in learning mathematics. Also, if students perceived mathematics as a fun and useful subject, their interest in learning may increase. Empathy is one of the critical qualities of an effective teacher. A teacher who shows empathy can understand their student's perspectives, feelings, and needs. They can create a supportive learning environment where the student feels safe to take risks, ask questions, and share their ideas. Students who perceived that their teachers are empathetic towards them may have a positive attitude towards teachers and maths. Therefore, we proposed that students' perception of mathematics could mediate the relationship between empathy and their maths interest. If students perceive that their teachers are empathetic towards them, it can lead to positive attitudes towards teachers, increasing their interest in learning mathematics. However, if students perceived that, their teacher lacks empathy, it will result in negative attitudes and decreased interest in learning mathematics.

H_4: Students' perception of mathematics mediates the association between empathy as teacher quality and students' maths interests.

2. Method

2.1 Design, sample characteristics, data collection and survey method

Quantitative research method was adapted by this study which uses questionnaire for the collection of data and it was processed using statistical analysis. The population was 1,200. The study sampled 300 students from three selected SHS Ashanti region of Ghana. 100 questionnaires were given to each school and 300 datasets acquired. 3-weeks were used for the data collection. 300 questionnaires were valid for the data analysis of data. There were no questionnaires that were rejected on the basis of some being incompletely filled and others with multiple responses. The response rate was 100%, thus [(300/300x100)] which was good for the study. Two sampling techniques were used in the study. Convenience sampling was used to select the three SHS and simple random sampling with later employed to select respondents (students) from the selected three SHS.

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Permission was sought from the headship of the selected SHS before the research was conducted. Upon granted permission, the questionnaires were distributed to the schools and were during class hours.

2.2 Questionnaires and Measures

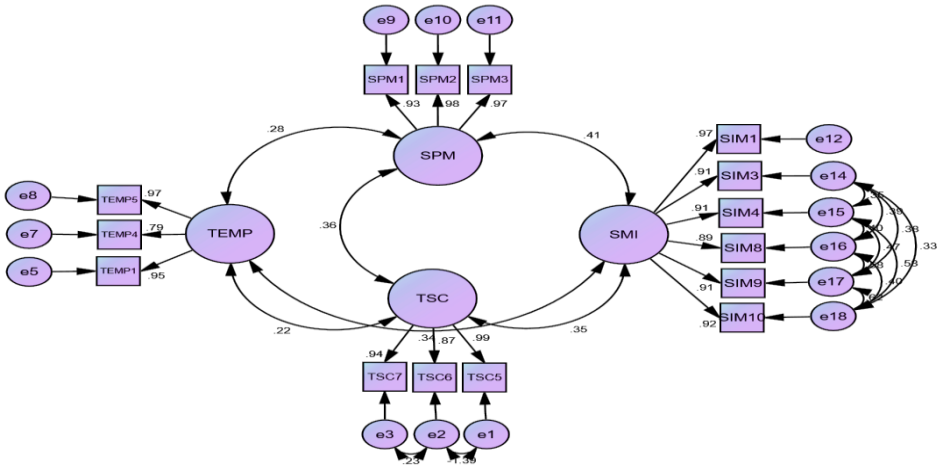
Four variables were used in the study. Where two variables serve as independent variable (teacher empathy and teacher-students collaboration), one variable as mediator (students' perception in mathematics), and one variable as independent variables (students' interest in mathematics). Each variable under the four (4) main constructs were measured on 5-Likert scale response as (*1 strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree*). The study also controlled age, gender (*1=male and 2=female*) and programmed of study. The measurements for teacher empathy were adapted form Arthur et al. (2022), that of teacher-students collaboration were also adapted from Saka (2021), moreover, students perception in mathematics were adapted from Hagan et al. (2020), and students interest in math's taken from Azmidar et al. (2017). This study adapted pre-existed scale for the study because, existing scales have usually been thoroughly validated and tested for reliability. As a result, they are likely to measure validity and yield consistent results over time, or reliability, which offers a strong basis for further research. This will help the researchers to develop and check their validity of the on their own.

Confirmatory Factor Analysis

CFA is a statistical method for evaluating how well an assumed factor structure fits actual data. Confirmatory factor analysis was done after the EFA analysis using Amos (ver. 23) software. According Dodge et al. (2022), the CFA model is fit if CMIN/DF is less than 3, TLI and CFI is at least 0.9, RMSEA and RMR is less than 0.6 and PClose should be statistically insignificant at 5%. According to the CFA results in Table 1, the measurement model fits the data rather well as recommended by Dodge et al. (2022), and the variables that are observed accurately represent the corresponding latent structures. The measuring model used in this study's validity and is supported by.

Figure 2

Confirmatory Factor Analysis diagram



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Discriminant Validity

The study discriminant validity is accepted when the highest intercorrelation result is less than the least result of the squares root of average variance extract (AVE). From the table 1, the study discriminant validity has been achieved since the least the result for the square root of the AVE is greater (TEMP) than the highest value of the intercorrelated result (SMP and SMI). Table 1 presents the results for the discriminant validity.

Table 1

Discriminant Validity

Variables	TSC	TEMP	SMI	SPM
TSC	.933			
TEMP	.218***	.909		
SMI	.350***	.336***	.918	
SPM	.362***	.282***	.406***	.959

3. Results and Discussion

The hypothesis path was examined with the used of Amos (ver. 23) software, a plug-in tool from SPSS (ver.23) software. The hypothesis results are presented in Table 2.

Table 2

Path Analysis Results

Direct Paths	Std. Estimates	S. E	C. R	P -Value
Gender → SIM	-.147	.107	-.377	.754
Age → SIM	.096	.124	.775	.438
Program→ SIM	-.012	.038	-.314	.754
TSC → SPM	.247	.041	6.086	.000
TEMP → SPM	.201	.047	4.302	.000
TEMP → SIM	.223	.053	4.176	.000
TSC → SIM	.201	.047	4.327	.000
SPM → SIM	.307	.062	4.970	.000
Indirect Effect	Std. Estimate	Lower Bound	Upper Bound	P-Value
TSC → SPM → SIM	.095	.037	.149	.010
TEMP → SPM → SIM	.072	.034	.127	.000

Form the path analysis results in Table 3, the connection between gender and students' interest in mathematics has a standardized estimate of -.147. The critical ratio (C.R.) is -.377, and the standard error (S.E.) is .107. This relationship's p-value of .754 indicates that gender has no statistically significant direct influence on students' interest in maths. The association linking age and students' interest in mathematics has a standardized estimate of .096. The critical ratio (C.R.) is .775, while the standard error (S.E.) is .124. The statistical significance of the association between age and students' interest in mathematics is not found, as indicated by the p-value of 0.438. The usual estimate of the correlation between the program and students' interest in mathematics is -.012. The critical ratio (C.R.) is -.314 and the standard error (S.E.) is .038. There is no statistically significant direct impact of the program on SIM, as indicated by the p-value of 0.754 for this association. The conventional estimate of the correlation

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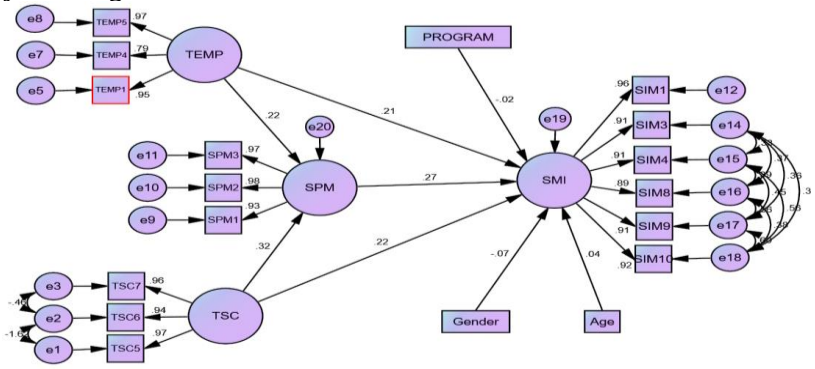
between teacher-students' collaboration and students' perception in mathematics is 0.247. The critical ratio (C.R.) is 6.086 and the standard error (S.E.) is .041. There is a clear and statistically significant direct impact of teacher/students' collaboration on perception in maths, as evidenced by the extremely low p-value ($p < .001$) for this association. The association between "SPM" and "SIM" has a standardized estimate of .307. The critical ratio (C.R.) is 4.970, and the standard error (S.E.) is .062. This relationship's p-value is extremely low ($p < .001$), suggesting that students' perception in mathematics has a direct impact on students' interest in maths that is both statistically significant and substantial.

The association between teacher empathy and students' interest in mathematics has a standardized estimate of .223. The critical ratio (C.R.) is 4.176, and the standard error (S.E.) is .053. A strong and statistically significant direct effect of teacher empathy on students' interest in mathematics, as indicated by the extremely low p-value ($p < .001$) associated with this relationship. The association between teacher-students' collaboration and students' interest in mathematics has a standardized estimate of .201. The critical ratio (C.R.) is 4.327, and the standard error (S.E.) is .047. This relationship's p-value is extremely low ($p < .001$), suggesting that TSC has a substantial and statistically significant direct impact on SIM. The predicted indirect impact of teacher empathy on students' interest in mathematics via students' perception in mathematics is .072. For this effect, the confidence interval's lower and upper bounds are .034 and .127, respectively. Strong and statistically significant indirect influence of teacher empathy on students' interest in mathematics through students' perception in mathematics is indicated by the very low p-value ($p < .001$) for this indirect effect. The calculated indirect impact of teacher-students' collaboration on students' interest in mathematics via students' perception in mathematics is .095. The confidence interval for this effect has an upper bound of .149 and a lower bound of .037. There is a statistically significant indirect effect of teacher-students' collaboration on students' interest in mathematics through students' perception in mathematics, as indicated by the p-value of .010 for this indirect effect.

Figure 3

Path Analysis Diagram



Discussions

The influence of teacher empathy was assessed to determine its impact on students' interest in mathematics. There was a positive and statistically significant impact on teacher empathy on students' mathematics interest. This connotes that,

when teachers are empathetic towards their students, there is a direct positive impact on their mathematics interest, which in turn boosts their mathematics engagement and achievement. When students' interest in mathematics increases, there is a proportional and corresponding increase in their desire to learn, solve mathematical problem even in the face of challenges, and always wants to do more and to know more. How empathetic a teacher is will determine how his/her students will be drawn to him/her and how much interest his/her students will invest in the learning process. Students are so much motivated to learn when their teacher is empathetic and have their interest at heart. Teachers must as a result of this cultivate the character of empathy in them and among their students to enhance effective classroom engagement and collaboration. The result of the current study confirmed with a study of Oppermann and Lazarides (2021). They conducted the study has a sample of (2082) and (133) teachers in third and fourth grade to examine the effect of teacher empathy on students' interest in mathematics. Result confirmed that, teacher empathy significantly impacted students' interest in maths. Moreover, Arthur et al. (2022), examine the 320 first years undergraduate students mathematics interest and mathematics performance with the use of SERVQUAL perspective. The results from their study confirmed that, mathematics teaching empathy has a significant positive direct effect on students' mathematics performance (.414****).

In addition, the significance of teacher student collaboration was evaluated to find out the effect of it on students' mathematics interest and per the results obtained it was achievement. Teacher students' collaboration creates teamwork spirit and students learn to share mathematical concepts learnt, learn communication skills as they converse and consult each other, and learn from the cultures of their peers. Thus, in effect teacher student collaboration improves students' mathematics interest. The current study connects with the study of Ayuwanti et al. (2021). The result from their study confirmed that, teacher-students collaboration has a significant effect on mathematics learning and students' interest in maths.

Moreover, the mediation results of how students perceive maths in the network between teacher empathy and student's interest in maths was partially statistically significant with p-value less than 1%. The results further explain that, without students' perception in mathematics, teacher empathy still has a significant direct effect on students' interest in maths.

Finally, perception in maths partially mediated the relationship with teacher students' collaboration and students' interest in maths. Here, teacher students' collaboration directly significantly positively impacts perception in maths. The results conform to the study of Appiah et al. (2023), what states that teacher-students collaboration has a significant effect on students interest and performance in maths perception in mathematics had a strong significant effect on student interest in maths. In addition, teacher students' collaboration had a strong positive statistically significant effect on students' interest.

Recommendation

Teacher qualities are such as collaboration and empathy essential characteristics that the teacher cannot do without in order to enhance and promote students'

mathematics interest and perception. They motivational tools for effective classroom activities. This enables policymaker, stakeholders, institutions and colleges to develop appropriate strategies and channel resources to this effect. This study can be carried out with different problem outlook, different teacher qualities assessment, sample determination, approach, and data analysis method.

4. Conclusion

In conclusion, teacher-students' collaboration, teacher empathy, and students' perception in mathematics have a substantial direct impact on students' interest in mathematics in addition to indirect effects that teacher-students' collaboration and students' perception in mathematics have on students' interest in mathematics via the mediation of students' perception in mathematics. Based on the available data, however, the direct impacts of program, age, and gender on students' interest in mathematics are not statistically significant. Management of education and teachers need to address learners' perception of maths promotes and embraces teacher qualities effectively during instructional processes. Fostering a supportive learning environment, providing opportunities for collaborative problem-solving and implementing learner-centered learning practices; teachers can assist learners to develop a positive perception of mathematics to improve their interest through their teacher qualities.

5. References

Ali, B. J., Gardi, B., Othman, B. J., Ahmed, S. A., Ismael, N. B., Hamza, P. A., Aziz, H. M., Sabir, B. Y., Sorguli, S., & Anwar, G. (2021). Hotel Service Quality: The Impact of Service Quality on Customer Satisfaction in Hospitality. *International Journal of Engineering, Business and Management*, *5*(3), 14–28. https://doi.org/10.22161/ijebm.5.3.2

Appiah, J. B., Arthur, Y. D., Boateng, F. O., & Akweittey, E. (2023). Teacher-student relationship and students' mathematics achievement: Mediating roles of students' perception of mathematics, students' self-efficacy, and cooperative learning strategies. *Journal of Mathematics and Science Teacher*, *3*(2), em041. https://doi.org/10.29333/mathsciteacher/13193

Arthur, Y. D. (2022). *Modeling student ' s interest in mathematics : Role of history of mathematics , peer- assisted learning , and student ' s perception*. *18*(10).

Arthur, Y. D., Dogbe, C. S. K., & Asiedu-Addo, S. K. (2022). Modeling students' mathematics achievement and performance through teaching quality: SERVQUAL perspective. *Journal of Applied Research in Higher Education*, *14*(4), 1509–1523. https://doi.org/10.1108/JARHE-06-2021-0243

Ayuwanti, I., Marsigit, & Siswoyo, D. (2021). Teacher-student interaction in mathematics learning. *International Journal of Evaluation and Research in Education*, *10*(2), 660–667. https://doi.org/10.11591/ijere.v10i2.21184

Azmidar, A., Darhim, D., & Dahlan, J. A. (2017). Enhancing Students' Interest through Mathematics Learning. *Journal of Physics: Conference Series*, *895*(1). https://doi.org/10.1088/1742-6596/895/1/012072

Original Article

Cetin-Dindar, A. (2016). Student motivation in constructivist learning environment. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(2), 233–247. https://doi.org/10.12973/eurasia.2016.1399a

Chand, S., Chaudhary, K., Prasad, A., & Chand, V. (2021). Perceived Causes of Students' Poor Performance in Mathematics: A Case Study at Ba and Tavua Secondary Schools. *Frontiers in Applied Mathematics and Statistics*, *7*(April), 1–13. https://doi.org/10.3389/fams.2021.614408

Dahal, N., Pant, B. P., Shrestha, I. M., & Manandhar, N. K. (2022). Use of GeoGebra in Teaching and Learning Geometric Transformation in School Mathematics. *International Journal of Interactive Mobile Technologies*, *16*(8), 65–78. https://doi.org/10.3991/ijim.v16i08.29575

Hagan, J. E., Amoaddai, S., Lawer, V. T., & Atteh, E. (2020). Students' Perception towards Mathematics and Its Effects on Academic Performance. *Asian Journal of Education and Social Studies*, *May*, 8–14. https://doi.org/10.9734/ajess/2020/v8i130210

Hridaya, D. R., & Sah, N. (2017). *Journal of Emerging Technologies and Innovative Research*. *4*, 1211. www.jetir.org

Jahnke, H.-N., Jankvist, U. T., & Kjeldsen, T. H. (2022). Three past mathematicians' views on history in mathematics teaching and learning: Poincaré, Klein, and Freudenthal. *ZDM – Mathematics Education*, *0123456789*. https://doi.org/10.1007/s11858-022-01376-0

Klassen, R. (2002). Writing in early adolescence: A review of the role of self-efficacy beliefs. *Educational Psychology Review*, *14*(2), 173–203. https://doi.org/10.1023/A:1014626805572

Kusumawati, I. B., Fachrudin, A. D., Kohar, A. W., & Widadah, S. (2020). History of Mathematics for Teaching Mathematics: The Case of Indonesian Prospective Teachers' Beliefs and Attitudes. *Universal Journal of Educational Research*, *8*(6), 2305–2314. https://doi.org/10.13189/ujer.2020.080614

Landas, E. C., Aye, C., & Alova, R. (2022). *Effect of localized lesson plans to the interest and performance of pupils in mathematics Effect of localized lesson plans to the interest and performance of pupils in mathematics*. *August*. https://doi.org/10.29333/mathsciteacher/12368

Lo, C. K., & Hew, K. F. (2021). Student Engagement in Mathematics Flipped Classrooms: Implications of Journal Publications From 2011 to 2020. *Frontiers in Psychology*, *12*, 1–24. https://doi.org/10.3389/fpsyg.2021.672610

Maass, K., Geiger, V., Romero, M., & Merrilyn, A. (2019). The Role of Mathematics in interdisciplinary STEM education. *ZDM*, *51*(6), 869–884. https://doi.org/10.1007/s11858-019-01100-5

Mishra, M., Gorakhnath, I., Lata, P., Rani, R., & Chopra, P. (2022). Integration of technological pedagogical content knowledge (TPACK) in classrooms through a teacher's lens. *International Journal of Health Sciences*, *6*(June), 12505–12512. https://doi.org/10.53730/ijhs.v6ns3.9536

Mokhtar, S. F., Yusof, Z. M., & Misiran, M. (2012). Factors affecting students' performance in mathematics. *Journal of Applied Sciences Research*, *8*(8),

4133–4137.

Naganjaneyulu, V., Ali, S. M., Ali, M. I., Jabeen, M., & Naseeruddin, S. (2020). Microsoft Mathematics as a Teaching and Learning Tool for Mathematics. *International Journal of Management and Humanities*, *5*(4), 55–59. https://doi.org/10.35940/ijmh.b1140.125420

Oppermann, E., & Lazarides, R. (2021). Elementary school teachers' self-efficacy, student-perceived support and students' mathematics interest. *Teaching and Teacher Education*, *103*, 103351. https://doi.org/10.1016/j.tate.2021.103351

Otoo, D., Iddrisu, W. A., Kessie, J. A., & Larbi, E. (2018). Structural Model of Students' Interest and Self-Motivation to Learning Mathematics. *Education Research International*, *2018*. https://doi.org/10.1155/2018/9417109

Saka, A. O. (2021). Can Teacher Collaboration Improve Students' Academic Achievement in Junior Secondary Mathematics? *Asian Journal of University Education*, *17*(1), 33–46. https://doi.org/10.24191/ajue.v17i1.8727

Toropova, A., Johansson, S., Myrberg, E., Toropova, A., Johansson, S., & Myrberg, E. (2019). The role of teacher characteristics for student achievement in mathematics and student perceptions of instructional quality quality. *Education Inquiry*, *10*(4), 275–299. https://doi.org/10.1080/20004508.2019.1591844

Vaiopoulou, J., Papadakis, S., Sifaki, E., Stamovlasis, D., & Kalogiannakis, M. (2021). Parents' perceptions of educational apps use for kindergarten children: Development and validation of a new instrument (peau-p) and exploration of parents' profiles. *Behavioral Sciences*, *11*(6). https://doi.org/10.3390/bs11060082

Wolff, C. E., Jarodzka, H., & Boshuizen, H. P. A. (2021). *Classroom Management Scripts : a Theoretical Model Contrasting Expert and Novice Teachers ' Knowledge and Awareness of Classroom Events*. 131–148.

Yadav, S. (2019). Role of Mathematics in the. *International Journal of Research and Analytical Reviews (IJRAR)*, *6*(4), 295–298.