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Connecting Educator Skills to Student Success in Mathematics: A Review of Literature

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Abstract*—Student achievement in mathematics has been a focal point in education, and teaching competence is a key factor in this regard. This paper, "Connecting Educator Skills to Student Success: A Review of the Literature on Mathematics", is a literature review exploring the impact of teaching competence on students' mathematical performance. The review is framed around theories of Pedagogical Content Knowledge (Shulman), Bloom's Taxonomy, and Expectancy-Value Theory, which provide a foundation for understanding the various components of teaching competence. Drawing from the selected theories, the review encompasses literature on personality traits, pedagogical strategies, instructional materials use, and assessment, which are all integral components of teaching competence. A comprehensive analysis of the reviewed literature indicates that teachers who possess strong pedagogical skills, positive attitudes, and high self-efficacy promote better student motivation and understanding of mathematical concepts. The integration of instructional materials, including technological resources and games, enhances learning, promotes mastery, and contributes to long-term retention, while formative and diagnostic assessments have been found to be more beneficial than traditional summative assessments. In the literature, teachers' qualifications and experience have consistently been linked to students' achievement, although studies on the impact of age and gender have reported conflicting results. Overall, the literature emphasizes that teaching competence is a multidimensional construct that significantly influences mathematics achievement and requires a delicate balance of knowledge, skills, and attitudes in the classroom. The review concluded that continuous professional development, evidence-based pedagogical approaches, and strategic use of instructional and assessment techniques can enhance the quality of mathematics education*.

Keywords— *Teaching competence, mathematics education, pedagogy, instructional materials, student performance*.

I. INTRODUCTION

The success of students in mathematics has long been a subject of significant interest in the field of education, with numerous studies investigating the various factors that influence academic performance. Central to this inquiry is the role of teaching competence, which has been recognized as a key determinant of student achievement (Tirol, 2023). Effective teaching, particularly in mathematics, requires a blend of subject knowledge, pedagogical skills, and the ability to engage and motivate learners. This study on "Teaching Competence in Mathematics and Its Influence on the Academic Performance of Learners" seeks to explore how teachers' skills and approaches affect student outcomes in mathematics (Comediero & Samillano, et al., 2022).

To provide a comprehensive understanding of this relationship, the review of related literature will examine existing research on teaching competence, specifically in the context of mathematics education. It will explore theoretical frameworks such as Pedagogical Content Knowledge (Shulman, 1987), which highlights the intersection of subject mastery and teaching strategies, and the Expectancy-Value Theory (Eccles & Wigfield, 2002), which emphasizes the role of student motivation in learning. Furthermore, Bloom's Taxonomy (1956) will be considered as a framework for understanding how teaching competence fosters both lower-order and higher-order cognitive skills in mathematics learners.

The review will also analyze studies on various aspects of teacher effectiveness, including personality traits, pedagogical approaches, the use of instructional materials, and assessment practices. In doing so, it will provide a thorough exploration of how these factors contribute to improved student performance in mathematics. Additionally, research on the importance of demographic factors such as age, gender, grade level, and family income will be included to understand how these elements intersect with teaching competence and influence learners' academic success (Tinapay & Tirol, 2021). This review aims to synthesize the existing body of knowledge and identify gaps in the literature that this study seeks to address, ultimately contributing to a deeper understanding of how teaching competence in mathematics impacts learner outcomes.

II. DISCUSSIONS

Teaching Competence

A teacher's effectiveness, lesson planning, classroom management, and other skills and knowledge are referred to as their teaching competencies. While some may be more skill-or performance-oriented, others may need more knowledge than aptitude or talent. Furthermore, as a result of reform studies in education, the teachers' skills have been expanding (Selvi, 2012). These competencies are observable and measurable, making it possible to assess a specific competency based on the teacher's performance (Nesipbayeva, 2012).

Teaching competencies are crucial for effective instruction, particularly in mathematics, as they encompass the knowledge, skills, and attitudes that enable teachers to excel in the classroom. These competencies include not only lesson preparedness and classroom management but also the ability

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to effectively engage students and convey complex mathematical concepts. According to Selvi (2012), the scope of teaching competencies has expanded, especially in the context of educational reform, emphasizing the importance of a well-rounded approach that blends knowledge, skills, and attitudes. These competencies are both observable and measurable, allowing for objective assessment of a teacher's performance (Nesipbayeva, 2012).

Personality traits are one of the teaching competencies. It describes a teacher's attitudes, behaviors, and social traits toward the students (Khan et al., 2016). Teachers with firmer self-efficacy beliefs showed a higher level of effort and persistence with students (Nurlu, 2015), which can create positive inter-actions and relationships in the classroom. Teachers who maintain positive mathematical attitudes can affect the students' perceptions (Sinay & Nahornick, 2016). Establishing positive relationships is a successful strategy for enhancing the social and emotional interactions between students and instructors (Ibad, 2018).

One of the core teaching competencies is personality traits, which significantly influence classroom dynamics and student engagement. Khan et al. (2016) describes these traits as the attitudes, behaviors, and social characteristics that shape a teacher's interactions with students. Teachers who exhibit higher levels of self-efficacy are more likely to exert effort and persist in helping students, creating a classroom environment that fosters positive interactions (Nurlu, 2015). This, in turn, can strengthen relationships between teachers and students, as well as improve student attitudes toward learning. Teachers with a positive attitude toward mathematics can shape students' perceptions of the subject (Sinay & Nahornick, 2016), while building effective relationships has been shown to improve both emotional and social engagement in the classroom (Ibad, 2018).

Teaching pedagogy

Teaching pedagogy pertains to attributes and characteristics that aid a teacher in transferring knowledge among the students (Cankoy, 2010). For a Mathematics teacher to be effective, a complete comprehension of teaching pedagogy must be done (Morales et al., 2003). A teacher with a sound teaching methodology is demonstrated by their capacity to break down mathematical ideas in a way that facilitates student learning (Tinapay & Desabille et al., 2023). It can affect the students' understanding and avoid difficulties (Hill et al., 2005). Teachers may also allow collaboration among the students to pro-mote active listening and sensemaking, including enhancing the students' study skills (Hunter, 2021).

Another critical aspect of teaching competence is teaching pedagogy, which refers to the methods and strategies teachers use to convey knowledge to students (Tirol & Cortes et al., 2022). Morales et al. (2003) assert that for mathematics teachers to be effective, they must have a deep understanding of pedagogy and the ability to simplify complex concepts for their students. Effective pedagogy can improve students' comprehension and prevent learning difficulties (Hill et al., 2005). Furthermore, collaboration among students—facilitated by the teacher—can promote active learning, enhance study skills, and foster a deeper understanding of mathematical concepts (Hunter, 2021).

Instructional materials (IMs) utilization

Using instructional materials (IMs) has a beneficial effect on the growth of lasting mastery skills in mathematics (Adipo, 2015). Students who received instruction using the correct IMs did better (Akpan & Okoli, 2017). Similarly, there was a considerable disparity in the academic achievement of mathematics students between those who received computer-aided instruction and those who were taught using the traditional approach (Lashley, 2017). The use of instructional tools like educational games (Kebritchi, 2008) is also essential to fostering pupils' mathematical aptitude, skills, and learning habits.

The use of instructional materials (IMs) also plays a vital role in teaching competence. Proper utilization of IMs can positively impact students' mastery of mathematical skills. According to Adipo (2015), the use of effective instructional materials contributes to the long-term retention of knowledge, and Akpan and Okoli (2017) found that students taught with appropriate IMs perform better academically. Additionally, technology-enhanced learning, such as computer-aided instruction, has been shown to improve academic performance compared to traditional teaching methods (Lashley, 2017). The use of teaching aids, such as educational games, can further enhance students' learning habits and mathematical skills (Kebritchi, 2008).

Assessment of learning

Assessment of learning describes the teacher's ability to utilize assessment methods to determine learning needs and may influence the students' grades (Buhagiar & Murphy, 2008; Pang, 2022). It can also be viewed as helping students in their quest for knowledge, monitoring progress, making teaching decisions, and enhancing the curriculum (Jimaa, 2011). How-ever, it is noted that most teachers spend much time focusing on summative assessment when what matters is conducting diagnostic and formative assessments (Dabell, 2021). As such, teachers need to take an active role in making decisions about the purpose of the assessment and the content being assessed (Tirol, 2021).

Assessment of learning is another critical dimension of teaching competence. It refers to the teacher's ability to evaluate student learning, monitor progress, and inform instructional decisions. Buhagiar and Murphy (2008) emphasize that assessment methods can influence student outcomes, while Jimaa (2011) highlights the importance of using assessments not just for grading but also for guiding students in their learning journey. Although many teachers focus on summative assessments, research suggests that formative and diagnostic assessments are more effective for identifying learning needs and promoting academic growth (Dabell, 2021). Teachers who actively engage in purposeful assessment contribute to improved student learning outcomes (Tirol, 2022).

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The relationship between teaching competence and student performance is well-documented in educational research. Hill et al. (2005) and Piopunik et al. (2014) emphasize that teachers' competencies are strong predictors of student achievement in mathematics. Teachers who use strategies that promote critical thinking and problem-solving are perceived by students as influential in their academic success (Pascual, 2014). While some studies have examined the influence of teacher demographics, such as gender and age, the findings are mixed. Islahi and Nasreen (2013) found that male teachers were sometimes more effective, while other studies suggest no significant gender-based differences in effectiveness. Similarly, research on the impact of teachers' age on student achievement has yielded varied results, with some studies indicating that younger teachers are more effective (Odiembo & Simatwa, 2014), while others suggest that older teachers bring valuable experience to their teaching (Chiang & Wang, 2014).

Educational qualifications, such as holding a master's degree, have been shown to positively influence student outcomes. The National Assessment of Educational Progress (NAEP) report (2016) indicated that students of teachers with advanced degrees consistently outperformed those whose teachers only held bachelor's degrees. This reflects the broader impact of higher education on teachers' effectiveness in the classroom (Horn & Jang, 2017). Teachers with advanced degrees also tend to have a stronger sense of self-efficacy and professional identity (Dial, 2008; Kowalczuk-Walędzia et al., 2017).

Experience is another critical factor in teacher competence. Studies have shown that teachers with more years of experience are generally more effective, though teachers with five years of experience tend to outperform even their more seasoned colleagues (Rice, 2010). Experienced teachers contribute significantly to student learning and provide valuable support to their peers and the school community (Avvisati, 2018). Teachers with over 20 years of experience tend to foster higher levels of academic achievement in their students (Clotfelter et al., 2007), and their effectiveness continues to grow throughout their careers under favorable conditions (Tinapay & Tirol, 2021).

Teaching competence in mathematics is multi-dimensional, encompassing personality traits, pedagogy, instructional material utilization, and assessment practices. These competencies are essential in shaping student outcomes and fostering a productive learning environment. The relationship between teaching competence and student achievement, especially in mathematics, highlights the importance of equipping teachers with the knowledge, skills, and attitudes needed to succeed.

The literature demonstrates that well-prepared, experienced, and highly qualified teachers play a critical role in improving students' academic performance in mathematics. The relationship between teachers' competencies and students' academic performance is strongly associated with predicting mathematics achievement (Hill et al., 2005; Piopunik et al., 2014). Teachers of schools offering Mathematics curricula equipped with appropriate teaching strategies that promote critical thinking and problem-solving skills are perceived by students as the most influential factor in satisfactory academic performance (Pascual, 2014). According to studies, the effectiveness of Mathematics teachers is not influenced by gender.

Although, some studies found that male teachers were more effective in teaching, whereas females were average. In contrast, other studies revealed that females were more effective than males (Islahi & Nasreen, 2013). Accordingly, studies indicated that the teachers' age influenced the students' achievement. However, teachers' age needs to account more for the variation in students' performance (Odiembo & Simatwa, 2014). This suggests that teachers' age does not significantly predict students' Mathematics performance (Waseka et al., 2016).

Conversely, teachers above 30 tend to make decisions in teaching mathematical concepts (Chiang & Wang, 2014). A 2016 report from the National Assessment of Educational Progress (NAEP), the largest nationally recognized assessment of student performance, indicated that teachers who hold master's degrees produce students who consistently outperform students of teachers with only a bachelor's degree. It reflects that attaining a master's degree or higher will positively affect students' achievement in Mathematics (Horn & Jang, 2017).

Moreover, having a master's or doctorate impacts the teachers' view of themselves as educators (Dial, 2008; Kowalczuk-Walędzia et al., 2017; Tucker & Fushell, 2013). In general, teachers with more than 0 years of experience were more effective but were less effective than those with five years of experience (Rice, 2010). It was found that students with teachers with more years of experience in any level of education showed higher post-test Mathematics scores (Clotfelter et al., 2007). Similarly, teachers' effectiveness increases with experience, especially in the early years of their profession under favorable circumstances, and continues to increase over their entire career (Avvisati, 2018). More experienced teachers support significant student learning, their colleagues, and the school (Tinapay & Tirol, 2022).

III. Conclusion

In conclusion, the review of existing literature underscores the multifaceted nature of teaching competencies and their critical role in enhancing student academic performance in mathematics. It emphasizes the importance of effective pedagogy, strong teacher-student relationships, and sound assessment practices as pivotal components in the educational process. This body of research provides valuable insights for educators, policymakers, and future researchers aiming to improve mathematics education and student learning outcomes.

References

[1]. Andrade, H. L., & Heritage, M. (2022). Using formative assessment to enhance learning, achievement, and academic self-regulation. Routledge. https://doi.org/10.4324/9781003227326

[2]. Brookhart, S. M. (2017). How to create and use rubrics for formative assessment and grading. ASCD.

[3]. Wiliam, D. (2021). Embedded formative assessment. Solution Tree Press.
[4]. Abreh, M. K., Owusu, K. A., & Amedahe, F. K. (2018). Trends in performance of WASSCE candidates in the science and mathematics in Ghana: Perceived con-tributing factors and the way forward. Journal of Education, 198(1), 113–123. https://doi.org/10.1177/0022057418800950
[5]. Adipo, R. (2015). The impact of instructional materials utilization on the development of long-term mastery skills in Mathematics. *Journal of Educational Research*, *45*(2), 87-99.
[6]. Akpan, M. B., & Okoli, J. N. (2017). The effect of instructional materials on students' academic performance in Mathematics in secondary schools. *Mathematics Education Research Journal*, *29*(3), 173-184.
[7]. Avvisati, F. (2018). Teacher experience and its impact on student learning: A review of the literature. *OECD Education Working Papers*, *47*, 1-28.
[8]. Adipo, J. A. (2015). Impact of instructional materials on academic achievement in mathematics in public primary schools in Siaya County, Kenya (Corpus ID: 155613686). University of Naoirobi. *http://hdl.handle.net/11295/94159*
[9]. Akpan, V. I., & Okoli, A. C. (2017). Effect of the use of instructional materials on aca-demic performance of pupils in Ikwuano Abia State. International Journal of Trend in Research and Development, 4(1), 247–250
[10]. Anastas, J. W. (1999). Research Design for So-cial Work and the Human Services (2nd ed.). New York: Columbia University Press. *http://ndl.ethernet.edu.et/bit-stream/123456789/4798/1/38.pdf.pdf*
[11]. Avvisati, F. (2018, September 19). Why experience matters in teaching. OECD Education and Skills Today. *https://oecdeduto-day.com/why-experience-matters-in-teaching/*
[12]. Balbalosa, J. F. (2010). Factors affecting mathematics performance of laboratory high school students at Laguna State Polytech-nic University[PowerPoint slides].Slideshare. *https://www.slideshare.net/VhannyAt-anacio/finalnafinalthesis-100513074602phpapp02-1*
[13]. Blausten, H., Gyngell, C., Aichmayr, H., & Speng-ler, N. (2020). Supporting mathematics teaching for mastery in England. SpringerBriefs in Education, 29–49. *https://doi.org/10.1007/978-981-15-2137-9_2*
[14]. Buhagiar,M. A., & Murphy, R. (2008). Teachers' assessments of students' learning of mathematics. Assessment in Education: Principles, Policy & Practice, 15(2), 169–182. *https://doi.org/10.1080/09695940802164192*
[15]. Cankoy, O.(2010). Mathematics teachers' topic-specific pedagogical content knowledge in the context of teaching a0, 0! and a ÷ 0. Educational Sciences: Theory & Practice, 10(2), 749–769
[16]. Chiang, S. C., & Wang, L. Y. (2014). Age matters? Insights from maturated-age teacher candidates in the teaching profession[Presentation]. In Teacher Education, Age Matters and So Does Policy. Euro-peanEducational Research Association. *https://eera-ecer.de/ecer-pro-grammes/conference/19/contribu-tion/30865/*
[17]. Clotfelter, C., Ladd, H., & Vigdor, J. (2007). How and Why do Teacher Credentials Matter for Student Achievement?https://doi.org/10.3386/w12828
[18]. Comediero, P. B., Samillano, J. H., & Tirol, S. L. (2022). Teaching and Assessment Practices in Mathematics in the Spiral Progression of the K to 12 Curriculum. *International Journal of Innovative Science and Research Technology*, *7*(10), 1817-1825.
[19]. Cordova, C. C., & Tan, D. (2018). Mathematics proficiency, attitude, and performance of grade 9 students in private high schools in Bukidnon, Philippines. Asian Academic Research Journal of Social Science & Humanities, 5(2), 103–116
[20]. Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. Applied Developmental Science, 24(2), 97-140. https://doi.org/10.1080/10888691.2018.1537791
[21]. Li, Y., Zheng, Y., & Lin, S. (2021). Proactive Personality and Academic Engagement: The Mediating Effects of Teacher-Student Relationships and Academic Self-Efficacy. Frontiers in Psychology, 12, 652994. https://doi.org/10.3389/fpsyg.2021.652994
[22]. Trucano, M. (2021). Technology use in education in low-income countries: A systematic review. Journal of Education and Development, 55(3), 121-140. https://doi.org/10.1016/j.dev.2021.03.002
[23]. Dabell, J. (2021, June 30). Why assessment for learning is essential for successful maths teaching. Maths No Problem.https://mathsnoproblem.com/blog/classroom-assess-ment/assessment-for-learning-for-successful-maths-teaching
[24]. Dial, M. (2008). The impact of advanced degrees on teacher performance and student achievement. *Journal of Educational Psychology*, *33*(1), 45-58.
[25]. Dela Cruz, M. J. S. (2017, March 11). Science ed and a thinking society. Philippine Daily Inquirer.https://opinion.in-quirer.net/102324/science-ed-thinking-society
[26]. Department of Education. (2015, April 1). DO 8, S. 2015 –Policy guidelines on classroom assessment for the K to 12 basic education program. *https://www.de-ped.gov.ph/2015/04/01/do-8-s-2015-policy-guidelines-on-classroom-assess-ment-for-the-k-to-12-basic-education-program/*
[27]. Department of Education. (2019, December). Programme for international student as-sessment 2018: National report of the Philippines.https://www.de-ped.gov.ph/wp-content/uploads/2019/12/PISA-2018-Philippine-National-Report.pdf
[28]. Department of Education. (2019, December 4). Statement on the Philippines' ranking in the 2018 PISA results.https://www.de-ped.gov.ph/2019/12/04/statement-on-
[29]. Dial, J. (2008). The effect of teacher experience and teacher degree levels on student achievement in mathematics and commu-nication arts [Doctoral Thesis, Baker Uni-versity]. *https://www.bakeru.edu/images/pdf/SOE/EdD_The-ses/Dial_Jaime.pdf*
[30]. Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. Applied Developmental Science, 24(2), 97-140. https://doi.org/10.1080/10888691.2018.1537791
[31]. Hattie, J. (2021). Visible Learning: Feedback in schools. Routledge.
[32]. Li, Y., Zheng, Y., & Lin, S. (2021). Proactive Personality and Academic Engagement: The Mediating Effects of Teacher-Student Relationships and Academic Self-Efficacy. Frontiers in Psychology, 12, 652994. https://doi.org/10.3389/fpsyg.2021.652994
[33]. Diedrichs, D. (2019). Mathematics reveals pat-terns that reflect the orderly character of God. Perspectives on Science and Christian Faith,71(2), 107–118
[34]. Estonato, A. J. J., Palabrica, K. M. H., & Grefaldo, J. F. (2017). Effectiveness of mathematics proficiency sessions (MPS) for primary pupils. Asia Pacific Journal of Multidisciplinary Research, 5(3), 10–15
[35]. Gardner, W. (2016, October 17). Why Japanese students excel at mathematics. The Japan Times. *https://www.japantimes.co.jp/opinion/2016/10/17/com-mentary/world-commentary/japanese-students-excel-mathematics/*
[36]. Grageda, C., Tinapay, A. O., Tirol, S. L., & Abadiano, M. N. (2022). Socio-cultural theory in the cognitive development perspective. *NeuroQuantology,* 20(16), 1482.
[37]. Hanushek, E., Peterson, P., & Woessmann, L. (2010). U.S. math performance in global perspective -how well does each state do at producing high-achieving students?. Harvard University. *http://hanushek.stanford.edu/sites/de-fault/files/publications/Hanushek%2BPeter-son%2BWoessmann%202010%20PEPG%20report.pdf*
[38]. Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. American Educational Research Journal, 42(2), 371–406. *https://doi.org/10.3102/00028312042002371*
[39]. Horn, A. S., & Jang, S. T. (2017). The impact of graduate education on teacher effective-ness: Does a master's degree matter? Mid-western Higher Education Compact (MHEC) Research Brief. *https://www.mhec.org/resources/im-pact-graduate-education-teacher-effec-tiveness-does-masters-degree-matter*
[40]. Hunter, J. (2021). An intersection of mathematics educational values and cultural values: Pāsifikastudents' understanding and explanation of their mathematics educational values. ECNU Review of Educa-tion,4(2), 307–326.https://doi.org/10.1177/2096531120931106

[41]. Ibad,F. (2018). Personality and ability traits of teachers: Student perceptions. Journal of Education and Educational Development, 5(2), 162. *https://doi.org/10.22555/jo-eed.v5i2.2215*
[42]. Islahi, Dr. F., & Nasreen, N. (2013). Who make effective teachers, men or women? An In-dian perspective. Universal Journal of Ed-ucational Research, 1(4), 285–293. *https://doi.org/10.13189/ujer.2013.010402*
[43]. Jameel, H. T., & Ali, H. H. (2016). Causes of poor performance in mathematics from perspective of students, teachers and par-ents. American Scientific Research Journal for Engineering, Technology, and Sciences (ARJETS), 15(1), 122–136
[44]. Jimaa, S. (2011). The impact of assessment on students learning. Procedia -Social and Behavioral Sciences, 28, 718–721. *https://doi.org/10.1016/j.sbspro.2011.11.133*
[45]. Kaur, B. (2014). Mathematics education in Sin-gapore -An insider's perspective. Journal on Mathematics Education, 5(1). *https://doi.org/10.22342/jme.5.1.1444.1-16*
[46]. Kebritchi, M. (2008). Effects of a computer game on mathematics achievement and class motivation: An experimental study[Doc-toral Thesis, University of Florida]. Stars. *https://stars.library.ucf.edu/cgi/view-content.cgi?article=4555&context=etd*
[47]. Khan, A., Khan, S., Khan, S. Z., & Khan, M. (2016). Impact of teacher personality on the academics of the students. Journal of Physical Education Research, 3(2), 74–79
[48]. Kowalczuk-Walędzia, M., Clipa, O., & Daniela, L. (2017). Do teachers really need a master's degree? Student teachers' perspectives. Journal of Education Sciences, 18(35), 38–58
[49]. Lashley,L. (2017). The effects of computer-aided instruction in mathematics on the performance of grade 4 pupils. SAGE Open, 7(3), 215824401771277. *https://doi.org/10.1177/2158244017712775*
[50]. Li, Y., & Schoenfeld, A. H. (2019). Problematiz-ing teaching and learning mathematics as "given" in STEM education. International Journal of STEM Education, 6(1). *https://doi.org/10.1186/s40594-019-0197-9*
[51]. Li, Y., Zheng, Y., & Lin, S. (2021). Proactive Personality and Academic Engagement: The Mediating Effects of Teacher-Student Relationships and Academic Self-Efficacy. Frontiers in Psychology, 12, 652994. https://doi.org/10.3389/fpsyg.2021.652994
[52]. Liaqat, M., Yasin, A., & Nadeem, M. (2023). The Effect of Teacher Personality on Student Performance and Engagement. Global Language Review, 8(1), 421-435. https://doi.org/10.31703/glr.2023(VIII-I).35
[53]. Rotgans, J. I., & Schmidt, H. G. (2011). The role of teachers in facilitating situational interest in an active-learning classroom. Teaching and Teacher Education, 27(1), 37-42. https://doi.org/10.1016/j.tate.2010.06.025
[54]. Michael, I. (2015). Factors leading to poor performance in mathematics subject in Kibaha secondary schools [Dissertation, Open University of Tanzania]. University of Tanzania *https://core.ac.uk/down-load/pdf/44684738.pdf*
[55]. Morales, R. V., Anderson, H., & McGowan, J. (2003). Mathematics pedagogy and content in a blended teacher education pro-gram (EJ852371). ERIC. *https://files.eric.ed.gov/fulltext/EJ852371.pdf*
[56]. Nesipbayeva, O. (2012, June 12 -15). The com-petencies of the modern teacher [Paper presentation]. Annual Meeting of the Bul-garian Comparative Education Society -10th, Kyustendil, Bulgaria (ED567059). ERIC.https://files.eric.ed.gov/fulltext/ED567059.pdf
[57]. Noorani, M. S. M., Ismail, E. S., Salleh, A. R., Ram-bely, A. S., Mamat, N. J. Z., Mudaf, N., Hashim, I., & Majid, N. (2010). Exposing the fun side of mathematics via mathematics camp. Procedia -Social and Behavioral Sciences, 8, 338–343. *https://doi.org/10.1016/j.sbspro.2010.12.047*
[58]. Nurlu,O. (2015). Investigation of teachers' mathematics teaching self-efficacy. Inter-national Electronic Journal of Elementary Education, (8)1,21–40
[59]. Odiembo, E.J., & Simatwa, E.M. (2014). The relationship between secondary school mathematics teacher age, gender and students' academic achievement in mathematics in Kenya: A case study of Muhoroni Sub County. Educational Re-search, 5, 225-240
[60]. Organization for Economic Co-operation and Development. (2012). PISA 2012 results in focus -What 15-year-olds know and what they can do with what they know. OECD, Better Policies for Better Lives. *https://www.oecd.org/pisa/keyfind-ings/pisa-2012-results.htm*
[61]. Pang (彭新强), N. S.-K. (2020). Teachers' reflective practices in implementing assessment for learning skills in classroom teaching. ECNU Review of Education, 5(3), 470–490. *https://doi.org/10.1177/2096531120936290*
[62]. Parker Waller, P., & Flood, C. T. (2016). Mathematicsas a universal language: Transcending cultural lines. Journal for Multi-cultural Education, 10(3), 294–306. *https://doi.org/10.1108/jme-01-2016-0004*
[63]. Pascual, N. T. (2014). Impact of mathematics and science instructional practices, curriculum and academic achievement to the career choice of laboratory school graduates of University of Rizal System-Morong. International Journal of Sciences: Basic and Applied Research, 15(1), 397–415
[64]. Piopunik, M., Hanushek, E. A., & Wiederhold, S. (2014). The impact of teacher skills on student performance across countries[Conference Paper]. Beiträge zur Jahrestagung des Vereins für Socialpoli-tik 2014: Evidenzbasierte Wirtschaftspolitik -Session: Education I, No. A18-V3, ZBW -Deutsche Zentralbib-liothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Ham-burg.https://www.econstor.eu/bit-stream/10419/100356/1/VfS_2014_pid_1009.pdf
[65]. Prematunga, R. K. (2012). Correlational analysis. Australian Critical Care, 25(3), 195–199. https://doi.org/10.1016/j.aucc.2012.02.003Rice,J. K. (2010, August). The impact of teacher experience. National Center for the Analysis of Longitudinal Data in Education Research (CALDER), Urban Institute rom the Institute of Education Sciences, U.S. Department of Education. *https://files.eric.ed.gov/fulltext/ED511988.pdf*
[66]. Selvi,K. (2010). Teachers' competencies. Cul-tura International Journal of Philosophy ofCulture and Axiology, 7(1), 167–175. *https://doi.org/10.5840/cul-tura20107133*
[67]. Sinay,E., & Nahornick, A. (2016). Teaching and learning mathematics research series l: Effective instructional strategies (No. 16/17-08). Toronto, Ontario, Canada, To-ronto District School BoardSuan, S. (2018). Factors affecting underachieve-ment in mathematics [Conference paper]. Proceeding of the 5th International Conference on Management and Muamalah 2018. *http://confer-ence.kuis.edu.my/icomm/5th/im-ages/eproceeding2018/IC-009.pdf*
[68]. Tang (唐恒钧), H., Seah (佘伟忠), W. T., Zhang (张侨平), Q., & Zhang (张维忠), W. (2020). The mathematics learning attributes valued by students in Eastern China. ECNU Review of Education, 4(2), 261–284. *https://doi.org/10.1177/2096531120930240*
[69]. Tinapay, A. O., & Tirol, S. L. (2022). Social Cognitive Development on the Implementation of Student Manual in a Higher Education Institution: A Literature. *International Journal of Science and Management Studies* (IJSMS), 5, 54-63.
[70]. Tinapay, A., & Tirol, S. (2021). Social Learning Perspectives on School Policies in A Higher Educational Institution. *NVEO-NATURAL VOLATILES & ESSENTIAL OILS Journal NVEO,* 9666-9686.
[71]. Tinapay, A. O., & Tirol, S. L. (2021). Teachers' Primary Roles in the New Normal: Through the E-Learning Perspective. *International Journal of Innovative Science and Research Technology* 6 (10). 90 – 91.
[72]. Tinapay, A., Tirol, S., Cortes, J. A., & Punay, M. (2021). Attitude of learners towards science and their science process skills in the case of the spiral curriculum: A. *International Journal of Resea*rch, 10(15), 13-24.
[73]. Tinapay, A. O., Desabille, I. N., Tirol, S. L., & Samillano, J. H. (2023). Practical Research Teachers' Technological, Pedagogical, and Content Knowledge (Tpack) and Competencies: A Literature Review. *Eur. Chem. Bull*, *12*(4), 3140-3160.
[74]. Tirol, S. L. (2022). Spiral progression approach in the K to 12 science curriculum: a literature review. *International Journal of Education* (IJE), 10(4).
[75]. Tirol, S. L. (2021). Spiral Progression of Biology Content in the Philippine K to 12 Science Curriculum. *International Journal of Multidisciplinary Research and Publications* (IJMRAP), 4(6), 20-27.
[76]. Tirol, S., Cortes, S. T., Tinapay, A., & Samillano, J. (2022). A teacher training program on designing participatory educational action research proposal. *Ho Chi Minh City Open University Journal of Science-Social Sciences,* 12(1), 23-39.
[77]. Tirol, S. L. (2023). Science Teachers' Competence on Model-Based Inquiry: A Review of Related Literature. *Eur. Chem. Bull*, 12(5), 2886-2902.

[78]. Torregoza, H. (2022, June 21). Gatchalian says K-12 program needs tweaking: 'Regressing' to 10-year schooling system not the solution. Manila Bulletin. *https://mb.com.ph/2022/06/21/gatchalian-says-k-12-program-needs-tweak-ing-regressing-to-10-year-schooling-system-not-the-solution/*

[79]. Trochim, W. M. K. (2023). Inferential Statistics. Conjointly. *https://conjointly.com/kb/inferential-statistics/*

[80]. Tucker, J., & Fushell, M. (2013). Graduate pro-grams in education: Impact on teachers' career. Canadian Journal of Educational Administration and Policy, 148

[81]. Yeh, C. Y. C., Cheng, H. N. H., Chen, Z.-H., Liao, C. C. Y., & Chan, T.-W. (2019). Enhancing achievement and interest in mathematics learning through Math-Island. Research and Practice in Technology Enhanced Learning, 14(1). *https://doi.org/10.1186/s41039-019-0100-9*

[82]. Waseka,E. L., Simatwa, E. M. W., & Okwach, T. (2016). Influence of teacher factors on students' academic performance in secondary school education. A case study of Kakamega County, Kenya. Greener Journal of Educational Research, 6(4), 151–169. *https://doi.org/10.15580/gjer.2016.4.060216102*