WEST VISAYAS STATE UNIVERSITY
COLLEGE OF EDUCATION
GRADUATE SCHOOL
Iloilo City

EXPLORING THE LINK AMONG EDUCATIONAL ECOSYSTEM, MATHEMATICS INTEREST, AND ACADEMIC PERFORMANCE OF SCHOLARS

A Dissertation Presented to

the Faculty of the Graduate School

College of Education

West Visayas State University

La Paz, Iloilo City

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy in Science Education

(Mathematics)

by

Charmaigne D. Aguirre

April 2024

WEST VISAYAS STATE UNIVERSITY
COLLEGE OF EDUCATION
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APPROVAL SHEET

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Abstract

This study investigated a model that explores the relationship among grade level, peer influence, school support, parent involvement, mathematics interest, and mathematics academic performance. This study utilized a quantitative research design. Two hundred fifty-one randomly selected scholars of Philippine Science High School Western Visayas Campus participated in the study. Google Forms was used to administer the research instruments which are Mathematics Interest Inventory (MII) and the Educational Ecosystem Inventory (EEI). The scholars' mathematics academic performance was classified as "good" when taken as a whole and when categorized by level of parent involvement, peer influence, school support, mathematics interest, and grade level. The scholars' mathematics interest was classified as "moderately interested" when taken as a whole and categorized by grade level and school support. Regardless of grade level, the level of parent involvement was classified as moderate. As a whole, the level of parent involvement, peer influence, and school support was classified as moderate. Significant and positive correlations between parent involvement and peer influence, parent involvement and school support, peer influence and school support, and school support and mathematics interest were also recorded. The students displaying greater interest in

mathematics were more inclined to attain higher grades within the PSHSWVC grading system. There was a decline in parental engagement as scholars progress through higher grades. The results of path analysis showed that school support and mathematics interest independently contribute to the prediction of mathematics academic performance, while grade level, parent involvement, and peer influence did not significantly contribute when all other variables were considered. Moreover, peer influence and school support were significant predictors of parent involvement. Mathematics interest has a mediating role in the impact of school support on a scholar's mathematics academic performance.

Keywords: mathematics interest, mathematics academic performance, tier levels, parent involvement, peer influence, school support

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Abdulrahman, I. (2020). Influence of peer group on adolescents' academic performance in secondary schools in Ilorin metropolis, Kwara State. *Al-Hikmah Journal of Education, 7*(1), 322. https://alhikmah.edu.ng/ajhir/index.php/aje_path/article/view/127/127

Aguhayon, H. G., Tingson, R. D., & Pentang, J. T. (2023). Addressing students learning gaps in mathematics through differentiated instruction. *International Journal of Educational Management and Development Studies, 4*(1). https://doi.org/10.53378/352967

Amaral, D., Tomé, A, & Da Costa, A., Dos, A., Goncalves, S. (July 2023). Factors affecting student's interest in learning Mathematics. https://www.researchgate.net/publication/376757574_Factors_affecting_student's_interest_in_learning_Mathematics

Anderhag, P., Wickman, P.-O., Bergqvist, K., Jakobson, B., Hamza, K. M., & Säljö, R. (2016). Why Do Secondary School Students Lose Their Interest in Science? Or Does it Never Emerge? A Possible and Overlooked Explanation. *Science Education, 100*(5). https://doi.org/10.1002/sce.21231

Andersen, S. C., & Hjortskov, M. (2022). The unnoticed influence of peers on educational preferences. *Behavioural Public Policy, 6*(4), 530-553.

Anigbo, L. (2016). Factors Affecting Students' Interest in Mathematics in Secondary Schools in Enugu State. *International Journal of Education and Evaluation, 2*(1). www.iiardpub.org

Ansong, D., Okumu, M., Amoako, E. O., Appiah-Kubi, J., Ampomah, A. O., Koomson, I., & Hamilton, E. (2024). The role of teacher support in students' academic performance in low- and high-stakes assessments. *Learning and Individual Differences, 109*, 102396. https://doi.org/10.1016/j.lindif.2023.102396

Antoine, D. R. (2015). The correlation between parental involvement and student academic achievement (Master's thesis). Louisiana State University. https://repository.lsu.edu/gradschool_theses/185

Arhin, D., & Yanney, E. G. (2020, June). Relationship between Students' Interest and Academic Performance in Mathematics: A Study of Agogo State College. *Global Scientific Journals, 8*(6), 389-395.

Arnaiz-Sánchez, P., de Haro, R., Alcaraz, S., & Mirete Ruiz, A. B. (2020). Schools that promote the improvement of academic performance and the success of all students. *Frontiers in Psychology, 10,* 2920. https://doi.org/10.3389/fpsyg.2019.02920

Arthur, Y., Dogbe, C. S., & Asiedu-Addo, S. (2022). Enhancing performance in mathematics through motivation, peer assisted learning, and teaching quality: The

mediating role of student interest. *EURASIA Journal of Mathematics, Science and Technology Education, 18*(2), em2072. https://doi.org/10.29333/ejmste/11509

Ashim, B, & Sahin, A. (2018). Effects of parental involvement on secondary school students' mathematics achievement in Assam, India. R*esearch Review International Journal of Multidisciplinary, 07*(7), ISSN: 2455-3085. https://files.eric.ed.gov/fulltext/ED588191.pdf

Avvisati, F., Besbas, B., & Guyon, N. (2010). Parental involvement in school: A literature review. *Revue d'économie politique, 120*(5), 759.

Azmi, S. (2011). *Anxiety and academic performance as a function of self-concept and perceived school environment.* Doctoral Dissertation. Aligarh Muslim University, Aligarh. http://hdl.handle.net/10603/183786

Baafi, R. (2020). School Physical Environment and Student Academic Performance. *Advances in Physical Education*, 10, 121-137. doi: 10.4236/ape.2020.102012

Bakar, N. A., Mamat, I., & Ibrahim, M. (2017). Influence of Parental Education on Academic Performance of Secondary School Students in Kuala Terengganu. *International Journal of Academic Research in Business and Social Sciences, 7*(8), 296. doi: http://dx.doi.org/10.6007/IJARBSS/v7-i8/3230.

Balolong, C. C., & Docejo, E. A. (n.d.). Mathematics interest and the scholastic performance of the Grade 7 students. https://research-manila.letran.edu.ph/read/140

Bandala, M. (2023). Factors affecting students' academic performance in Mathematics: Basis for development of guidance intervention program. *International Journal of Advance Research And Innovative Ideas In Education 9*(4). https://www.researchgate.net/publication/373137474_FACTORS_AFFECTING_STUDENTS'_ACADEMIC_PERFORMANCE_IN_MATHEMATICS_BASIS_FOR_DEVELOPMENT_OF_GUIDANCE_INTERVENTION_PROGRAM

Barnard, W. M. (2004). Parent involvement in elementary school and educational attainment. *Children and youth services review, 26*(1), 39-62.

Bartolome, M., Mamat, N., Masnan, Abdul, H. (2017). Parent involvement in the Philippines: A Review of literatures. *International Journal of Early Childhood Education and Care*, 6, 41-50. https://eric.ed.gov/?id=EJ1207994

Bassey, I. (2020). Peer Group Influence and Academic Performance of Secondary School Students in English Language. http://dx.doi.org/10.2139/ssrn.3606183

Berman, J. D., McCormack, M. C., Koehler, K. A., Connolly, F., Clemons-Erby, D., Davis, M. F., Gummerson, C., Leaf, P. J., Jones, T. D., & Curriero, F. C. (2018). School environmental conditions and links to academic performance and absenteeism in urban, mid-Atlantic public schools. *International Journal of Hygiene and Environmental Health, 221*(5), 800–808. https://doi.org/10.1016/j.ijheh.2018.04.015

Berthelon, M., Bettinger, E., Kruger, D. I., & Montecinos-Pearce, A. (2019). The structure of peers: The impact of peer networks on academic achievement. *Research in Higher Education, 60*, 931-959. https://www.semanticscholar.org/paper/The-Structure-of-Peers%3A-The-Impact-of-Peer-Networks-Berthelon-Bettinger/8466fa7609985367f22cf132ee574967a8359f28

Bertolini, K., Stremmel, A., & Thorngren, J. (2012). Student Achievement Factors. Online Submission. https://eric.ed.gov/?id=ED568687

Boonk, L., Gijselaers, H., Ritzen, H., & Brand-Gruwel, S. (2018). A review of the relationship between parental involvement indicators and academic achievement. *Educational Research Review, 24*, 10-30. https://doi.org/10.1016/j.edurev.2018.02.001

Brannick, M. T. (1995). Critical Comments on Applying Covariance Structure Modeling. *Journal of Organizational Behavior, 16*(3), 201–213. http://www.jstor.org/stable/2488508

Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. Handbook of child psychology, 1-26.

Cabuquin, J., & Abocejo, F. (2023). Mathematics learners' performance and academic achievement at a public high school institution in Leyte, Philippines. *Jurnal Ilmiah Pendidikan MIPA, 13*(2), 123-136. https://www.researchgate.net/publication/376807986_Mathematics_Learners'_Perf

ormance_and_Academic_Achievement_at_a_Public_High_School_Institution_in_Leyte_Philippines

Capinding, A. T. (2022). Impact of Modular Distance Learning on High School Students Mathematics Motivation, Interest/Attitude, Anxiety and Achievement during the COVID-19 Pandemic. *European Journal of Educational Research*, *11*(2), 917-934.

Carnegie Mellon University. (n.d.). Strategies: Lack of motivation. Eberly Center for Teaching Excellence & Educational Innovation. https://www.cmu.edu/teaching/solveproblem/strat-lackmotivation/index.html

Ceka, A., & Murati, R. (2016). The Role of Parents in the Education of Children. *Journal of Education and practice*, *7*(5), 61-64.

Central Unified School District. (n.d.). Parent Involvement. https://tk.cusd.com/ParentInvolvement.aspx

Chigbu, B., Ngwevu, V., Jojo, A.. (2023). The effectiveness of innovative pedagogy in the industry 4.0: Educational ecosystem perspective. *Social Sciences & Humanities Open*, *7*(1). doi: https://doi.org/10.1016/j.ssaho.2023.100419

Colgate, O., & Ginns, P. (March 2016). The Effects of Peer Influence on Parents' Reading Behavior at Home With Their Children. https://archive.globalfrp.org/family-involvement/publications-resources/the-effects-of-peer-influence-on-parents-reading-behavior-at-home-with-their-children

College Board. (n.d.). *Why do students lose interest in high school? BigFuture.* https://bigfuture.collegeboard.org/help-center/why-do-students-lose-interest-high-school

Comer, J. P., & Haynes, N. (1997, July 1). *The home-school team: An emphasis on parent involvement. Students thrive when their parents become part of the classroom.* Edutopia. https://www.edutopia.org/home-school-team

Council for Children's Rights. (2019, July 18). *The effects of a positive school environment.* https://www.cfcrights.org/the-effects-of-a-positive-school-environment/

Clearinghouse Technical Assistance Team. (2020, January 6). *Parents' educational levels influence on child educational outcomes: Rapid literature review.*

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches.* Sage Publications.

Department of Education. (n.d.). MATATAG Curriculum: Mathematics Grades 1, 4, and 7. https://www.deped.gov.ph/wp-content/uploads/MATATAG-Mathematics-CG-Grades1-4-and-7.pdf

Dohner-Chávez, A. (2011). Connections between parental involvement and academic achievement among hispanic and non-hispanic students. ENTRIES, 43.

Dumapias, A., & Tabuzo, V. T. (2018). *Interest and confidence in mathematics and science: Precursors in choosing the stem strand.*

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3359091#paper-citations-widget

Durisic, M. & Bunijevac, M. (2017). Parental Involvement as a Important Factor for Successful Education. *CEPS Journal, 7*(3), 137 - 153. DOI: https://doi.org/10.26529/cepsj.291

Dwyer, D. J., & Hecht, J. B. (n.d.). Minimal Parental Involvement. https://www.adi.org/journal/ss01/chapters/chapter20-dwyer&hecht.pdf

Ediningrum, W. R. (2015). A*ccelerated Learning Berbantuan Software Maple Sebagai Upaya Meningkatkan Kemampuan Komunikasi Matematis Dan Minat Belajar Siswa SMA* (Doctoral dissertation, Universitas Pendidikan Indonesia).

Egara, F. O., & Mosimege, M. (2023). Effect of flipped classroom learning approach on mathematics achievement and interest among secondary school students. *Education and Information Technologies.* https://doi.org/10.1007/s10639-023-12145-1

El Nokali, N. E., Bachman, H. J., & Votruba-Drzal, E. (2010). Parent involvement and children's academic and social development in elementary school. *Child development, 81*(3), 988–1005. https://doi.org/10.1111/j.1467-8624.2010.01447.x

Erdem, C., & Kaya, M. (2020). A Meta-Analysis of the Effect of Parental Involvement on Students' Academic Achievement. *Journal of Learning for Development, 7*(3), 367-383.

Evans, A. (2023, June 9). Bronfenbrenner's Ecological Systems Theory. Simply Psychology. https://www.simplypsychology.org/bronfenbrenner.html

Ezike, B. U. (2018). Classroom environment and academic interest as correlates of achievement in senior secondary school chemistry in Ibadan South West Local Government Area, Oyo State, Nigeria. *Global Journal of Educational Research, 17*(1), 61-71.

Ezyschooling. (n.d.). School Environment and Its Effects on Students. https://ezyschooling.com/parenting/expert/School-environment-and-its-effects-on-students

Fadare, A.., Zarma, H., Fadare, M., Bademosi, T., Amanum, O. (2021). The Impact of Peer Group Pressure on Academic Performance of Adolescent Students: An Intervention Program to Resist Peer Pressure. *International Journal of Science and Management Studies (IJSMS), 4*(6), 130-141. DOI: 10.51386/25815946/ijsms-v4i6p114

Fan, Y., Chen, J., Shirkey, G. et al. (2016). Applications of structural equation modeling (SEM) in ecological studies: an updated review. *Ecol Process, 5*, 19 https://doi.org/10.1186/s13717-016-0063-3

Fantuzzo, J., Tighe, E., McWayne, C., Davis, G., & Childs, S. (2003). Parent involvement in early childhood education and children's peer-play competencies: An

examination of multivariate relationships. *NHSA Dialog, 6*(1), 3-21. https://doi.org/10.1207/s19309325nhsa0601_2

Filade, B. A., Bello, A. A., Uwaoma, C. O., Anwanane, B. B., & Nwangburka, K. (2019). Peer group influence on academic performance of undergraduate students in Babcock University, Ogun State. *African Educational Research Journal, 7*(2), 81-87. https://eric.ed.gov/?id=EJ1221210

Frenzel, A., Goetz, T., Pekrun, R., & Watt, H. (2010). Development of mathematics interest in adolescence: influences of gender, family, and school context. *Journal of Research on Adolescence, 20(2), 507–537.* DOI: 10.1111/j.1532-7795.2010.00645.x

Froiland, J. M., & Davison, M. L. (2016). The longitudinal influences of peers, parents, motivation, and mathematics course-taking on high school math achievement. *Learning and Individual Differences, 50,* 252-259. https://www.sciencedirect.com/science/article/abs/pii/S1041608016301352

Golsteyn, B. H. H., Non, A., & Zölitz, U. (2021). The impact of peer personality on academic achievement. *The Journal of Human Resources, 56*(4), 1052-1099. https://doi.org/10.1086/712638

González-Zamar, M. D., & Abad-Segura, E. (2021). Visual arts in the university educational ecosystem: Analysis of schools of knowledge. *Education Sciences, 11*(4), 184. https://www.mdpi.com/2227-7102/11/4/184

Grace, A., Jethro, O., Aina, F. (2012). Roles of parent on the academic performance of pupils in elementary schools. *International Journal of Academic Research in Business and Social Sciences, 2*(1), 196 – 201.

Ha, Y. (2011). *Perceived teachers' competence, and students' interest in Mathematics: Their influence on performance in Mathematics of Filipino high school students in Iloilo City* (Unpublished Master's thesis). Central Philippine University, Jaro, Iloilo City.

Hakimzadeh, R., Besharat, M. A., Khaleghinezhad, S. A., & Ghorban Jahromi, R. (2016). Peers' perceived support, student engagement in academic activities and life satisfaction: A structural equation modeling approach. *School psychology international, 37*(3), 240-254.

Hanushek, E.A., Kain, J.F., Markman, J.M. and Rivkin, S.G. (2003), Does peer ability affect student achievement?. *Journal Applied Economics, 18*, 527-544. https://doi.org/10.1002/jae.741

Harackiewicz, J. M., Smith, J. L., & Priniski, S. J. (2016). Interest Matters: The importance of promoting interest in education. *Policy Insights from the Behavioral and Brain Sciences, 3*(2), 220–227. https://doi.org/10.1177/2372732216655542

Harel, G. (2008). *What is mathematics? A pedagogical answer to a philosophical question* (pp. 1-26). chrome-

extension://efaidnbmnnnibpcajpcglclefindmkaj/https://mathweb.ucsd.edu/~harel/What%20Is%20Mathematics.pdf

Heinze, A., Reiss, K., & Franziska, R. (2005). Mathematics achievement and interest in mathematics from a differential perspective. *ZDM, 37*, 212-220.

Hoy, W. (n.d.). School conditions that promote achievement. https://www.waynekhoy.com/school-conditions-that-promote-achievement/

Huang, F., Huang, Z., Li, Z., and Zhang, M. (2021). Relationship between parental involvement and mathematics achievement of Chinese early adolescents: Multiple mediating roles of mental health and mathematics self-efficacy. *International Journal of Environmental Research and Public Health, 18*(18), 9565. https://doi.org/10.3390/ijerph18189565

Idris, M., Hussain, S., & Ahmad, N. (2020). Relationship between parents' education and their children's academic achievement. *Journal of Arts & Social Sciences (JASS), 7*(2), 82-92. https://doi.org/10.46662/jass-vol7-iss2-2020(82-92)

International Commission on Mathematical Instruction. (n.d.). *The role of mathematics in the overall curriculum.* https://www.mathunion.org/icmi/role-mathematics-overall-curriculum#:~:text=Mathematics%20provides%20an%20effective%20way,and%20even%20music%20and%20art.

Jayanthi, R. (2019). Mathematics in society development: A Study. *Iconic Research and Engineering Journals, 3*(3), 59-64.

Johnson, M. (2014, November 4). Parent Engagement and Grade Level [LinkedIn post].https://www.linkedin.com/pulse/20141104003701-30661853-parent-engagement-and-grade-level/

Jones, J. M. (2010). Culturally diverse families: Enhancing home-school relationships. *NASP Communique Handout, 38*(6), 1-6.

Juguilon, I. D. (2023). Impact of family support system in the academic performance of grade 3 pupils at a public elementary school in Rizal, Philippines. *International Journal of Multidisciplinary: Applied Business and Education Research, 4*(1), 174-187. https://doi.org/10.11594/ijmaber.04.01.16

Kamaruddin, R., Zainal, N. R., Aminuddin, Z. M., & Jusoff, K. (2009). The quality of learning environment and academic performance from a student's perception. *International Journal of Business and Management, 4*(4), 171-175.

Kaur, T., McLoughlin, E. & Grimes, P. (2022). Mathematics and science across the transition from primary to secondary school: a systematic literature review. *IJ STEM Ed 9*, 13. https://doi.org/10.1186/s40594-022-00328-0

Khayati, S., & Payan, A. (2014). Effective factors increasing the students interest in mathematics in the opinion of mathematic teachers of Zahedan. *World Academy of*

Science, Engineering and Technology - International Journal of Educational and Pedagogical Sciences, 8(9).

Kim, E. M., & Sheridan, S. M. (2015). *Foundational aspects of family–school connections: Definitions, conceptual frameworks, and research needs.* Foundational aspects of family-school partnership research, 1-14.

King, R. B., & Trinidad, J. E. (2021). Growth mindset predicts achievement only among rich students: Examining the interplay between mindset and socioeconomic status. *Social Psychology of Education, 24*, 635-652.

Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health, 74*, 262-273.

Koller, O., Baumert, J., & Schnabel, K. (2001). Does interest matter? The relationship between academic interest and achievement in mathematics. *Journal for Research in Mathematics Education, 32*(5), 448.

Korir, D. K., & Kipkemboi, F. (2014). The impact of school environment and peer influences on students' academic performance in Vihiga County, Kenya. *International Journal of Humanities and Social Science, 4*(5).

Kozyreva, L. D., Kotov, A. I., Morozova, N. D., Alexandrova, N. V., & Migunova, E. V. (2022, February). *Formation of educational ecosystem as a key priority of the russian education development strategy.* In International Scientific and Practical

Conference Strategy of Development of Regional Ecosystems "Education-Science-Industry"(ISPCR 2021) (pp. 251-256). Atlantis Press.

Kpolovie, P., Joe, A., and Okoto, T. (2014). Academic achievement prediction: Role of interest in learning and attitude towards school. *International Journal of Humanities Social Sciences and Education (IJHSSE), 1 (11).* www.arcjournals.org.

Kumar, V. V., & Tankha, G. (2021). *Nurturing spiritual intelligence in the classroom.* In Leading Schools With Social, Emotional, and Academic Development (SEAD), 15. DOI: 10.4018/978-1-7998-6728-9.ch010. https://igi-global.com/dictionary/academic-performance/42383.

Lamas, H. (2015). School Performance. *Propósitos y Representaciones, 3*(1), 313-386. dx.doi.org/10.20511/pyr2015.v3n1.74

Lara, L., & Saracostti, M. (2019). Effect of parental involvement on children's academic achievement in Chile. *Frontiers in Psychology, 10*, 1464. https://doi.org/10.3389/fpsyg.2019.01464

Law Insider. (n.d.). Tier Levels. https://www.lawinsider.com/dictionary/tier-levels

Leander, J. & Fabella, F. (2020). *Parental involvement and academic performances of Grade 7 students.* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3630178

Lee, J. S., & Bowen, N. K. (2006). *Parent involvement, cultural capital, and the achievement gap among elementary school children.* University of North Carolina at Chapel Hill.

https://eaop.ucsd.edu/198/parents/Parent%20Involvement,%20Cultural%20Capital,%20and%20the%20Achievement%20Gap%20among%20Elementary%20School%20Children.pdf

Levina, E., & Prokofieva, E. (2021). *Educational ecosystem development based on quality management standards.* In SHS Web of Conferences, 99, 01017). EDP Sciences. https://www.shs-conferences.org/articles/shsconf/abs/2021/10/shsconf_dihelt2021_01017/shsconf_dihelt2021_01017.html

Li, Z., Qiu, Z. (2018). How does family background affect children's educational achievement? Evidence from Contemporary China. *Journal of Chinese Sociology, 5,* 13. https://doi.org/10.1186/s40711-018-0083-8

Liu, L., Jones, B.F., Uzzi, B. et al. (2023). Data, measurement and empirical methods in the science of science. *Nature Human Behaviour, 7,* 1046–1058. https://doi.org/10.1038/s41562-023-01562-4

Lorijn, S. J., Engels, M. C., Huisman, M., & Veenstra, R. (2022). Long-term effects of acceptance and rejection by parents and peers on educational attainment: A study from pre-adolescence to early adulthood. *Journal of Youth and Adolescence, 51*(3):540-555. doi: 10.1007/s10964-021-01506-z

Mahmoud, A. T. (2014). *The impact of peer group influence on academic performance of undergraduate students in Federal College of Education, Kano.*

https://www.researchgate.net/publication/358719332_THE_IMPACT_OF_PEER_GROUP_INFLUENCE_ON_ACADEMIC_PERFORMANCE_OF_UNDERGRADUATES_STUDENTS_IN_FEDERAL_COLLEGE_OF_EDUCATION_KANO

Malczyk, B. R., & Lawson, H. A. (2019). Family focused strategies for student engagement. *Preventing School Failure: Alternative Education for Children and Youth, 63*(3), 211-219.

Mappadang, A., Khusaini, K., Sinaga, M., & Elizabeth, E. (2022). Academic interest determines the academic performance of undergraduate accounting students: Multinomial logit evidence. *Cogent Business & Management, 9*(1). https://doi.org/10.1080/23311975.2022.2101326

Masud, S., Mufarrih, S. H., Qureshi, N. Q., Khan, F., Khan, S., & Khan, M. N. (2019). Academic performance in adolescent students: The role of parenting styles and socio-demographic factors – A Cross-Sectional Study From Peshawar, Pakistan. *Frontiers in Psychology, 10.* https://doi.org/10.3389/fpsyg.2019.02497

Meenu, D. (2016). Factors Affecting the Academic Achievement: A Study of Elementary School Students of NCR Delhi, India. *Journal of Education and Practice, 7*(4), 71-74. https://files.eric.ed.gov/fulltext/EJ1092343.pdf

Miesner, E. (2023, July 7). *Boosting interest in learning by focusing on both content and students' needs.* Edutopia. https://www.edutopia.org/article/increasing-student-interest-learning/

Mijares, B. F. III. (2022). Factors affecting the academic performance of learners in mathematics amidst pandemic. *Psychology and Education Journal, 5*(1), 624-637. doi: 10.5281/zenodo.7337795.

Moldes, V. M., Biton, C. L., Gonzaga, D. J., & Moneva, J. C. (2019). Students, peer pressure and their academic performance in school. *International Journal of Scientific and Research Publications, 9*(1), 300-312. https://www.ijsrp.org/research-paper-0119/ijsrp-p8541.pdf

Moneva, J.C., Legaspino, F. (2020). Peer influence and performance task of senior high school students. *IRA International Journal of Education and Multidisciplinary Studies (ISSN 2455-2526), 16*(1), 76-83. doi: http://dx.doi.org/10.21013/jems.v16.n1.p11

Moreira, P. A. S., Dias, A., Matias, C., Castro, J., Gaspar, T., Oliveira, J. (2018). School effects on students' engagement with school: Academic performance moderates the effect of school support for learning on students' engagement. *Learning and Individual Differences, 67*, 67-77. https://doi.org/10.1016/j.lindif.2018.07.007.

Mounts, N.S., Walters, T., Hinkle, H. (2014). Peer Influence(s). In: Michalos, A.C. (eds) *Encyclopedia of quality of life and well-being research.* Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0753-5_2117

Mullis, I. V. S., Martin, M. O., & Foy, P. (2019). TIMSS 2019 *Encyclopedia: Education policy and curriculum in mathematics and science - Philippines.* TIMSS & PIRLS

International Study Center, Boston College. https://timssandpirls.bc.edu/timss2019/encyclopedia/pdf/Philippines.pdf

Myers-Young, S. (2018). *Understanding parental involvement.* Integrated Studies. 178. https://digitalcommons.murraystate.edu/bis437/178

Nam, K. (2014). Until when does the effect of age on academic achievement persist? Evidence from Korean data. *Economics of Education Review, 40*, 106-122. https://doi.org/10.1016/j.econedurev.2014.02.002

Nambuya, O. (2013). *School based factors influencing student's academic performance at Kenya certificate of secondary education in Teso South District.* https://eap.uonbi.ac.ke/sites/default/files/cees/education/eap/ONYARA%20PROJECT%20.pdf

National Center for Family and Community Connections With Schools. (2002). *A new wave of evidence: The impact of school, family, and community connections on student achievement.* Southwest Educational Development Laboratory. www.sedl.org/connections/resources/evidence.pdf

Newsom, J. (2015). *Goodness of fit in structural equation models.* https://web.pdx.edu/~newsomj/semclass/ho_fit.pdf

Niemi, H. (2016). Building partnerships in an educational ecosystem. *Center for Educational Policy Studies Journal, 6*(3), 5-15.

Nora'asikin Abu Bakar, A. F., Ayub, M., Ahmad, N. A., & Abdullah, S. I. S. S. (2021). Mathematics achievement: The relationship between student engagement, parental involvement, and peer influence. *International Journal of Academic Research in Business and Social Sciences, 11*(5), 496-513. https://www.researchgate.net/profile/Sharifah-Syed-Abdullah-3/publication/355100446_Mathematics_Achievement_The_Relationship_between_Student_Engagement_Parental_Involvement_and_Peer_Influence/links/62fb4784aa4b1206fab59559/Mathematics-Achievement-The-Relationship-between-Student-Engagement-Parental-Involvement-and-Peer-Influence.pdf

Norwood Public Schools. (n.d.). Parent involvement. https://www.norwood.k12.ma.us/curriculum/parent-involvement

Notre Dame University. (n.d.). *How school environment affects learning.* https://ndasd.org/how-school-environment-affects-learning/

Nyman, R. (2017). *Interest and engagement: Perspectives on mathematics in the classroom.* Gothenburg Studies in Educational Sciences.

Obico, K. (2013). *The impact of parental involvement on student achievement.* https://www.nwmissouri.edu/library/researchpapers/2015/Obico,%20Kent.pdf

Oke, A. E. et al.(2012). Establishing a common ground for the use of structural equation modelling for construction related research studies. *Australasian Journal of Construction Economics and Building, 12* (3) 89-94.

Okwuduba, E., Zulnaidi, H., Abd Rauf, R, & Nwosu, K. (2022). Impact of perceived learning support and student engagement on remedial student science success in the university placement examination during COVID-19 pandemic. *Education Research International, 2022*. https://doi.org/10.1155/2022/3485498

Organisation for Economic Cooperation and Development. (2023). PISA 2022 Results (Volume I): The State of Learning and Equity in Education, PISA, OECD Publishing, Paris, https://doi.org/10.1787/53f23881-en

Onyedikachim, E. N., & Ezekiel-Hart, J. (2021). Educational Level of parents on students' academic achievement in secondary schools in Abia State. *African Scholars Journal of Contemporary Education Research, 21* (8).

Ormrod, J. (2012) . *Human Learning*. 6th Edition. University of North Colorado.

Otto, B., & Karbach, J. (2020). Parental involvement. *The Oxford Encyclopedia of Psychology and Education*. Oxford University Press. https://doi.org/10.1093/acrefore/9780190264093.013.946

Philippine Science High School. *Quality Manual, PSHSS*. www.pshs.edu.ph

Philippine Science High School Main Campus. (n.d.). *Mission And Vision.* https://mc.pshs.edu.ph/mission-and-vision/

Philippine Science High School System. (n.d.). *About PSHS*. https://pshs.edu.ph/the-pshs-

system/#:~:text=In%201963%2C%20the%20Republic%20Act,operated%20in%20Diliman%2C%20Quezon%20City.

Philippine Science High School System. (n.d.). *The PSHS System*. https://pshs.edu.ph/the-pshs-system/#:~:text=In%201963%2C%20the%20Republic%20Act,operated%20in%20Diliman%2C%20Quezon%20City

Philippine Science High School System. (n.d.). *PSHS Six-Year Curriculum Subject Matrix*. https://pshs.edu.ph/curriculum/

Philippine Science High School Western Visayas Campus. (n.d.) History. http://wvc.pshs.edu.ph/transparency-seal/about-us/history

Philippine Science High School SOCCSKSARGEN Region Campus. (2015, July 29) Financial Aid. https://src.pshs.edu.ph/2014-12-05-01-05-32/finance-aid#:~:text=There%20are%20four%20types%20of,can%20be%20amended%20every%20year

Pinto, C., Baines, E., & Bakopoulou, I. (2019). The peer relations of pupils with special educational needs in mainstream primary schools: The importance of meaningful contact and interaction with peers. *British Journal of Educational Psychology, 89*(4), 818-837.

Positive Action. (n.d.). *Parental involvement in education: Why it matters and how to encourage it.* https://www.positiveaction.net/blog/parental-involvement-education-schools

Potvin, P., Hasni, A. (2014). Analysis of the decline in interest towards school science and technology from Grades 5 Through 11. *Journal Science Education and Technology, 23*, 784–802. https://doi.org/10.1007/s10956-014-9512-x

Puentespina, J. J. S., Decatoria, J. B., & Alave, A. D. (2023). Pandemic emotional impact, resilience, stigma, help-seeking, and mental health condition of college students: A path analysis. *Globus Journal of Progressive Education, 13*(1), 2231-1335. https://globusedujournal.in/wp-content/uploads/2023/06/GPE-131-JJ23-17.-Jose-Jeffrey-S.-Puentespina.pdf

Puracan, K. J., Tabar, M. C., & Peteros, E. (2023). Math interest and performance of Grade 11 students in general mathematics. *International Multilingual Journal of Science and Technology (IMJST), 8*(6), 6383-6396.

Quijano , H. U., Uy , A. C., & Franca , G. C. (2023). Parental involvement and academic performance of Grade 12 Students. *Asian Journal of Education and Social Studies, 47*(4), 11–17. https://doi.org/10.9734/ajess/2023/v47i41029

Racca, R. & Lasaten, R. (2016). English language proficiency and academic performance of Philippine science high school students. *International Journal of Languages, Literature and Linguistics, 2*(2), 65. doi:10.18178/IJLLL.2016.2.2.65

ReachOut Schools Australia. (n.d.). *Why it's important to understand student needs and interests.* ReachOut Schools. https://schools.au.reachout.com/articles/why-its-important-to-understand-student-needs-and-interests

Reang, J. J., & Kaipeng, R. (2022). A study on the influence of peer group on academic performance of students. *International Journal of Creative Research Thoughts, 10*(11), ISSN: 2320-2882. https://ijcrt.org/papers/IJCRT2211091.pdf

Reynolds, A.J. & Walberg, H. J. (1992). A Study of Factors that Influence College Achievement. www.files.eric.ed.gov

Rotgans, J. I., & Schmidt, H. G. (2014). Interest in subject matter: The mathematics predicament. *Higher Education Studies, 4*(6), 31-42. https://files.eric.ed.gov/fulltext/EJ1075621.pdf

Ryan, V., Fitzmaurice, O., & O'Donoghue, J. (2022). Student interest and engagement in mathematics after the first year of secondary education. *European Journal of Science and Mathematics Education, 10*(4), 436-454. https://doi.org/10.30935/scimath/12180

Saeki, E., Chang, Y., Osipova, A. (n.d.). *Parent involvement in schools around the globe.* http://journals.sagepub.com/pb-assets/cmscontent/SPI/parent-involvement.pdf

Safe Supportive Learning. (n.d.). *School climate improvement.* https://safesupportivelearning.ed.gov/school-climate-improvement

Sameroff, A. (2010). A unified theory of development: A dialectic integration of nature and nurture. Child development, 81(1), 6-22. https://www.academia.edu/3306294/A_unified_theory_of_development_A_dialectic_integration_of_nature_and_nurture

Samuelsson, J. (2011). Development of self-regulated learning skills in mathematics in lower secondary school in Sweden. *Nordic Journal of Mathematics Education, 16*(3), 25-42.

Sapungan, G. M., & Sapungan, R. M. (2014). Parental involvement in a child's education: Importance, barriers and benefits. *Asian Journal of Management Sciences & Education, 3*(2), 42-48.

Sarkar, S., Das, G., & Banik, C. (2022). Peer pressure and its impact on academic achievements of students of secondary schools. *Journal of Positive School Psychology, 6*(3), 8104–8123. https://www.journalppw.com/index.php/jpsp/article/download/5062/3292/5746

Satheeskumar, T., & Thayaparan, A. (2018). Determinants of students' interest in learning quantitative techniques among undergraduates in Sri Lanka. *Journal of Economics and Business, 1*(4). https://doi.org/10.31014/aior.1992.01.04.38

Sauer, K. (2012). *The impact of student interest and instructor effectiveness on student performance* (Education Masters, Paper 243). https://fisherpub.sjf.edu/education_ETD_masters/243

Schmid, E., & Garrels, V. (2021). Parental involvement and educational success among vulnerable students in vocational education and training. *Educational Research, 63*(4), 456–473. https://doi.org/10.1080/00131881.2021.1988672

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *Kolner Zeitschrift fur Soziologie und Sozialpsychologie, 69*(Suppl 2), 107–131. https://doi.org/10.1007/s11577-017-0454-1

Schukajlow, S. (2015, July). Effects of enjoyment and boredom on students' interest in mathematics and vice versa. In *Proceedings of the 39th Psychology of Mathematics Education Conference, 4*, 137-144. https://www.researchgate.net/profile/Stanislaw-Schukajlow/publication/280341160_Effects_of_enjoyment_and_boredom_on_students'_interest_in_mathematics_and_vice_versa/links/55b331b408aec0e5f431d8ed/Effects-of-enjoyment-and-boredom-on-students-interest-in-mathematics-and-vice-versa.pdf

Schwartz, K. (2019, February 20). *How the power of interest drives learning.* MindShift. https://www.kqed.org/mindshift/32503/how-the-power-of-interest-drives-learning

Seeram, E. (2019). An overview of correlational research. *Radiologic Technology, 91*(2), 176-179.

Servallos, N. J. (2023, December 7). PISA: Phl 5 To 6 Years Behind. Youth & Education. https://www.onenews.ph/articles/pisa-phl-5-to-6-years-behind

Shah, V., & Shah, A. (2018). Relationship between student perception of school worthiness and demographic factors. *Frontiers in Education, 3*, 45. https://doi.org/10.3389/feduc.2018.00045

Shintia, D., Arafat, Y., & Setiawan, A. A. (2021). The influence of school library utilization and reading interest on student achievement. *Journal of Social Work and Science Education, 2*(2), 127-136. https://ejournal.karinosseff.org/index.php/jswse/article/view/235/214

Shumow, L., Lyutykh, E., & Schmidt, J. A. (2011). Predictors and outcomes of parental involvement with high school students in science. *School Community Journal, 21*(2), 81-98.

Sincero, S. M. (2012). Ecological systems theory. http://www.environment.gen.tr/ecological-systems-theory/844-ecological-systems-theory.pdf

Siregar, N. C., Rosli, R., & Nite, S. (2023). Students' interest in Science, Technology, Engineering, and Mathematics (STEM) based on parental education and gender factors. *International Electronic Journal of Mathematics Education, 18*(2), em0736. https://doi.org/10.29333/iejme/13060

Snow, G. (2011). *Development of a math interest inventory to identify gifted students from underrepresented and diverse populations.* Masters Theses & Specialist Projects. Paper 1052. http://digitalcommons.wku.edu/theses/1052

Sohn, H., Park, H., Jung, H. (2023). The effect of extra school funding on students' academic achievements under a centralized school financing system. *Education Finance and Policy 2023, 18*(1): 1–24. doi: https://doi.org/10.1162/edfp_a_00375

Sorbo, K. (2020). *Impacts of parent involvement on student success at the secondary grade levels.* https://nwcommons.nwciowa.edu/education_masters/222/

Stanard, P., Belgrave, F. Z., Corneille, M. A., Wilson, K. D., & Owens, K. (2010). Promoting academic achievement: The role of peers and family in the academic engagement of African American adolescents. *Journal of prevention & intervention in the community, 38*(3), 198-212.

Stanford Encyclopedia of Philosophy. (n.d.). Phenomenology. In Stanford Encyclopedia of Philosophy. https://plato.stanford.edu/entries/phenomenology/

Statistics Solutions. (n.d.). Path Analysis. https://www.statisticssolutions.com/free-resources/directory-of-statistical-analyses/path-analysis/

Steidtmann, L., Kleickmann, T., & Steffensky, M. (2023).Declining interest in science in lower secondary school classes: Quasi-experimental and longitudinal evidence on the role of teaching and teaching quality. *Journal of Research inScience Teaching,60*(1), 164–195.https://doi.org/10.1002/tea.21794

Stevenson, D. L., & Baker, D. P. (1987). The family-school relation and the child's school performance. *Child Development, 58*(5), 1348–1357. https://doi.org/10.2307/1130626

Streiner, D. L. (2005). Research methods in psychiatry finding our way: An introduction to path analysis. *The Canadian Journal of Psychiatry, 50*(2), 115-122.

Suan, J. (2014, March). Factors Affecting Underachievement in Mathematics. *Proceeding of the Global Summit on Education GSE 2014* (E- ISBN 978-967-11768-5-6) 4-5. Kuala Lumpur, Malaysia. Organized by WorldConferences.net

Tan, N. & De Leon, A. (2014, September 6). "FAST FACTS: Philippine Science High School'. *Rappler*. https://www.rappler.com/newsbreak/iq/68238-fast-facts-philippine-science-high-school/

Tavakol, M. & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education,* 2: 53 – 55.

Tembe, N., Anyagh, P. I., & Abakpa, B. (2020). Students mathematics interest as correlate of achievement in mathematics: Evidence from a sub-saharan student sample. https://www.researchgate.net/publication/347384651_Students_Mathematics_Interest_as_Correlate_of_Achievement_in_Mathematics_Evidence_from_a_Sub-Saharan_Student_Sample/fulltext/5fe1eae145851553a0df959a/Students-Mathematics-Interest-as-Correlate-of-Achievement-in-Mathematics-Evidence-from-a-Sub-Saharan-Student-Sample.pdf

The Wellspring Foundation for Education. (n.d.). *What is an education ecosystem?* https://thewellspringfoundation.org/resources/education-

ecosystem/#:~:text=Education%20Ecosystem%20is%20a%20concept,the%20provision%20of%20quality%20education

Times Higher Education. (n.d.). *Can Filipino students be good at math?* Times Higher Education Hub. https://www.timeshighereducation.com/hub/p/can-filipino-students-be-good-math#:~:text=According%20to%20the%20said%20study,age%20group%20in%20other%20countries.

Tolk, A. (2012). What are the characteristics of a scholar? *Modeling, Simulation & Visualization Engineering Faculty Publications.* https://digitalcommons.odu.edu/cgi/viewcontent.cgi?article=1033&context=msve_fac_pubs

Topor, D. R., Keane, S. P., Shelton, T. L., & Calkins, S. D. (2010). Parent involvement and student academic performance: a multiple mediational analysis. *Journal of Prevention & Intervention in the Community, 38*(3), 183–197. https://doi.org/10.1080/10852352.2010.486297

University of Tübingen. (2017, May 8). *Parents' motivation influences students' academic outcomes.* ScienceDaily. https://www.sciencedaily.com/releases/2017/05/170508083417.htm

U.S. Census Bureau. (2021, November 20). *Educational attainment.* https://www.census.gov/topics/education/educational-attainment/about.html

Usaini, I., Abubakar, N. B., & Bichi, A. A. (2015, September). *Influence of school environment on academic performance of secondary school students in Kuala Terengganu, Malaysia.* https://www.researchgate.net/publication/305659360_INFLUENCE_OF_SCHOOL_ENVIRONMENT_ON_ACADEMIC_PERFORMANCE_OF_SECONDARY_SCHOOL_STUDENTS_IN_KUALA_TERENGGANU_MALAYSIA

Valdez, E. (2016, October). Predictors of mathematics performance of the Grade VI pupils of Cauayan Northeast District: Basis for Intervention Program. *The Online Journal of New Horizons in Education, 6*(4). https://www.tojned.net/journals/tojned/articles/v06i04/v06i04-17.pdf

Vasquez, A. G., & Vasquez, A. R. G. (2021). Parental involvement and students' attitude: Its influence on students' achievement in mathematics in the modular distance learning. *International Journal of Science, Engineering and Technology, 10*(1). https://www.ijset.in/wp-content/uploads/IJSET_V10_issue1_101.pdf

Viewsonic. (2023). *Building an impactful education ecosystem: The 4 key components.* https://www.viewsonic.com/library/education/building-an-impactful-education-ecosystem-the-4-key-components/

Viray, J. (2016). Parental involvement as predictor of student academic performance. *Imperial Journal of Interdisciplinary Research (IJIR), 2*(6), 1379.

https://www.academia.edu/29295946/Parental_Involvement_as_Predictor_of_Student_Academic_Performance

Voyles, M. J. (2011). *Student academic success as related to student age and gender* (Doctoral dissertation). University of Tennessee, Chattanooga.

Wilson, R. (2012). *The impact of student interest and instructor effectiveness on student performance* [Master's thesis, St. John Fisher College]. Fisher Digital Publications. https://fisherpub.sjf.edu/cgi/viewcontent.cgi?article=1244&context=education_ETD_masters

Wong, S. L., & Wong, S. L. (2019). Relationship between interest and mathematics performance in a technology-enhanced learning context in Malaysia. *Research and Practice in Technology Enhanced Learning, 14*(1), 1-13.

Xie, G., & Zhang, Y. (2020). School of golden touch? A study of school effectiveness in improving student academic performance. *Journal of Chinese Sociology, 7*(1), 7. https://doi.org/10.1186/s40711-020-00118-7

Yadav, Dharmendra. (2017). Exact definition of mathematics. *International Research Journal of Mathematics, Engineering and IT, 4*, 34-42. https://www.researchgate.net/publication/313678763_EXACT_DEFINITION_OF_MATHEMATICS/citation/download

Yang, L., Chiu, H. M., Sin, K. F., and Lui, M. (2020). The effects of school support on school engagement with self-determination as a mediator in students with special needs. *International Journal of Disability, Development and Education, 69*(4), 399–414. doi: 10.1080/1034912X.2020.1719046

Yesmambetova, K. N. (2019). Students' lack of interest: How to motivate them? *Universal Journal of Educational Research, 7*(3), 797-802. https://doi.org/10.13189/ujer.2019.070320

Yonson, D. (June 2016). Level of parent involvement in the elementary and secondary levels. *The Normal Lights, 10*(101), 182-203. DOI: 10.56278/tnl.v10i1.178.

Yu, X., Wang, X., Zheng, H., Zhen, X., Shao, M., Wang, H., & Zhou, X. (2023). Academic achievement is more closely associated with student-peer relationships than with student-parent relationships or student-teacher relationships. *Frontiers in Psychology, 14*, 1012701. https://doi.org/10.3389/fpsyg.2023.1012701

Yulianti, K., Denessen, E., Droop, M., & Veerman, G.-J. (2022). School efforts to promote parental involvement: The contributions of school leaders and teachers. *Educational Studies, 48*(1), 98-113. https://doi.org/10.1080/03055698.2020.1740978

Zhao, T., Perez-Felkner, L. (2020). Perceived abilities or academic interests? Longitudinal high school science and mathematics effects on postsecondary STEM

outcomes by gender and race. *International Journal of STEM Education, 9*(42). https://doi.org/10.1186/s40594-022-00356-w