

**MATHEMATICS LEARNING STRATEGY AND MATHEMATICS
ACHIVEMENT AMONG MIDDLE SCHOOL STUDENTS IN THE
NORTH OF JORDAN**

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Abstrak

Kajian *Trends in International Mathematics and Science Study* (TIMSS) pada tahun 1999, 2003, 2007 dan 2011 menunjukkan pelajar gred 8 dari Jordan memperoleh pencapaian yang rendah dalam matematik. Hal ini adalah berkaitan dengan banyak faktor termasuk faktor Strategi Pembelajaran Matematik (MLS). Sehingga kini tidak banyak kajian yang dijalankan berkaitan dengan MLS dan pencapaian matematik dalam kalangan gred 8 dari Jordan. Kajian ini bertujuan untuk mengenal pasti perbezaan jantina berdasarkan nombor, algebra, geometri, pencapaian matematik dan visualisasi ruang, dan sejauhmana faktor MLS pelajar iaitu sikap, motivasi, regulasi sendiri, konsep sendiri dan kebimbangan matematik menyumbang kepada pencapaian matematik. Kajian ini juga menentukan sama ada visualisasi ruang menjadi perantara antara MLS dan pencapaian matematik. Responden kajian ini, yang terdiri daripada 360 pelajar gred 8 lapan sekolah menengah harian daerah Alkoura di Utara Jordan, dipilih secara pensampelan rawak berstrata. Kajian ini menggunakan 65 item untuk mengakses MLS. Ujian matematik mengandungi 30 item manakala ujian visualisasi ruang mengandungi 32 item. Dapatan kajian menunjukkan pelajar perempuan memperoleh skor yang lebih tinggi dalam nombor, algebra dan ujian matematik tetapi tidak terdapat perbezaan jantina dalam skor geometri. Pelajar lelaki menunjukkan pencapaian yang lebih baik berbanding dengan pelajar perempuan dalam visualisasi ruang. Keputusan kajian juga menunjukkan bahawa sikap matematik, motivasi, regulasi sendiri dan keberkesanan sendiri menyumbang kepada pencapaian matematik kecuali kebimbangan matematik. Visualisasi ruang menjadi perantara pencapaian matematik dengan sikap, motivasi dan kebimbangan matematik. Kajian ini menyumbang kepada pengetahuan dan teori kognitif sosial berkaitan dengan domain afektif pelajar berdasarkan faktor MLS dan visualisasi ruang yang penting sebagai pengetahuan asas bagi pembelajaran matematik. Pendidik matematik di Jordan perlu mengambil kira faktor MLS apabila mengajar matematik kepada pelajar gred 8 bagi membantu meningkatkan pencapaian matematik mereka.

Kata kunci: Nombor, Algebra, Geometri, visualisasi *spatial*, Strategi Pembelajaran Matematik.

Abstract

The results of 1999, 2003, 2007 and 2011 Trends in International Mathematics and Science Study (TIMSS) showed that Jordanian 8th grade students' achievement in mathematics is low. Mathematics Learning Strategy (MLS) has been identified as one of the attributing factors. To date, there is little study on MLS and mathematics achievement among Jordanian 8th grade students. The study aimed to identify the level of differences between genders based on number, algebra, geometry, mathematics achievement and spatial visualization, and to what extent would the student's MLS factors such as attitude, motivation, self-regulation, self-efficacy and mathematics anxiety contribute to mathematics achievement. Additionally, the study aimed to determine whether spatial visualization mediates between the MLS factors and mathematics achievement. The respondents in this study, who comprised of 360 students, were selected through stratified random sampling, from eight public middle schools in Alkoura District in the North of Jordan. The study used 65 items to assess the MLS. The mathematics test contains 30 items (number, algebra & geometry) while the spatial visualization test contains 32 items. The findings showed that female students scored higher than male students in numbers, algebra, and mathematics test but there are no gender differences in geometry scores. Male students performed better than their female counterparts in spatial visualization. The results also showed that mathematics attitude, motivation, self-regulation and self-efficacy contributed to mathematics achievement except mathematics anxiety. Spatial visualization plays a mediating effect between mathematics achievement and attitude, motivation, and mathematics anxiety. This study contributes to knowledge and social cognitive theory about the students' affective domain base on MLS factors and spatial visualization which is important as prerequisite knowledge for learning mathematics. Mathematics educators in Jordan need to consider the MLS factors when teaching mathematics to 8th grade students to help improve their mathematics achievement.

Keywords: Numbers, Algebra, Geometry, Spatial visualization, Mathematics Learning Strategy.

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List of Abbreviations

MoE	Ministry of Education
NCTM	National Council of Teacher of Mathematics
TIMSS	Trends in International Mathematics and Science Study
UNRWA	United Nation Relief and Work Agency
CTT	Classical Test Theory
SPSS	Statistical Package for the Social Sciences

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The educational system is primarily viewed as a significant factor forming the basis of an individual's development and progress, which forms the core of countries' development. As such, more and more focus is being emphasized on the educational systems promotion on a global scale. In the context of Jordan, the government has made considerable efforts in developing its educational system. Such system has experienced tremendous development and increasing progress that date back to the 1920s (Al-Jaraideh, 2009). In addition, Jordan undertook the responsibility of the development of an extensive and high-quality system for its citizens' development. As a result, citizens residing in poor and remote areas have had access to schools and education (Al-Jaraideh, 2009). The country's position in favoring basic education over higher education has improved the literacy levels and facilitated the achievement of higher degrees of enrollment. Primary education in Jordan, while freely provided, is not compulsory and it comprises of ten classes from first to tenth class.

Study curricula all over the world, including Jordan, have witnessed a radical change – changes in curricula and courses of all education levels. Specifically, in the last two decades, mathematics curriculum has undergone a lot of development on both the international and local level. On the international arena, more developed countries have begun a comprehensive review of the mathematical teaching program to develop and make them up-to-date to keep abreast of the needs of the 21st century.

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REFERENCES

- Abakpa, B., & Agbo-Egwu, A. (2008). The effect of small group cooperative learning on students' achievement and retention in mathematics achievement tests, *Journal of Research in Science Education*, 1(1), 71-80.
- Abedi, J., Courtney, M., Leon, S., Kao, J., & Azzam, T. (2006). English language learners and math achievement: a study of opportunity to learn and language accommodation: Technical Report 702). Los Angeles: National Center for Research on Evaluation, Standards, and Student Testing (CRESST), University of California, Los Angeles.
- Abiam, P. O. & Odok, J. K. (2006). Factors in Students' achievement in different branches of secondary school Mathematics. *Journal of Education and Technology*. 1(1), 161-168.
- Ablard, K. E. & Lipschultz, R. E. (1998). Self-regulated learning in high-achieving students: Relations to advanced reasoning, achievement goals, and gender. *Journal of Educational Psychology*, 90(1), 94-101.
- Abo-lebdeh, K. (2008). Jordanian national report on the study of the international mathematics and Science TIMSS(2007). Retrieved September May 25, 2012 From [http://www.moe.gov.jo/Files/\(14-3-2011\)\(2-11-40%20PM\).pdf](http://www.moe.gov.jo/Files/(14-3-2011)(2-11-40%20PM).pdf)
- Abo-Zinah, F., & Ababnah, A. (2006). *Mathematics teaching Curriculum for Primary Classes*. Almaserah Publisher, Jordan.
- Abu-Hilal, M. M. (2000). A structural model of attitudes toward school subjects, academic aspirations, and achievement. *Educational Psychology*, 20(1), 75-8.
- Abu Mustafa, S. (2010). *The relationship between spatial ability and achievement in Mathematics for sixth grade students in UNRWA schools*. (Unpublished Master Theses). Islamic University – Gaza.
- Achor, E. E., Imoko, B. I., & Ajai, J. T. (2010). Sex Differentials in Students' Achievement and Interest in Geometry Using Games and Simulations Technique. *Necatibey Faculty of Education Electronic Journal of Science & Mathematics Education*, 4(1), 1-10.
- Aiken, L. (1979). Attitude towards mathematics and science in Iranian middle schools. *School Science and Mathematics*, 79(3), 229-234.

- Ajayi, K. O., Lawani, A. O., & Adeyanju, H. I. (2013). Effects of Students' Attitude and Self-Concept on Achievement in Senior Secondary School Mathematics in Ogun State, Nigeria. *Journal of Research in National Development*, 9(2), 202-211.
- Al-Astal, I. (2004). Mathematics anxiety among faculty of education and basic science students analysis of a bidimensional affective scale. *Journal of Instructional Psychology*, 36(3), 185-193.
- Alderman, K. M. (1997). *Motivation for achievement: Possibilities for teaching and learning*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Al-Jaraideh, Y. (2009). *Affecting information and communication technology (ICT) integration in Jordanian secondary schools*. (Unpublished Doctoral Dissertation). University Utara Malaysia, Malaysia, Kedah.
- Alkhateeb, H. (2001). Gender differences in mathematics achievement among high school students in the United Arab Emirates. *School Science and Mathematics*, 101(1), 5-9.
- Alkhateeb, M., Ababneh, A. (2011). Effect of the Use of a Problem Solving-Based Teaching Strategy on the Mathematical Thinking and Attitudes towards Mathematics with Seventh Graders in Jordan. *Journal of educational science*, 38(1), 189-204.
- Alias, M., Gray, D., & Black, T. (2002). Attitudes towards sketching and drawing and the relationship with spatial visualization ability in engineering students. *International Education Journal*, 3(3), 165-175.
- Allivatos, B., & Petrides, M. (1996). Functional activation of the human brain during mental rotation. *Neuropsychologia*, 35(2), 111-118.
- Areepattamannil, S. (2014). Relationship between Academic Motivation and Mathematics Achievement Among Indian Adolescents in Canada and India. *The Journal of General Psychology*, 141(3), 247-262.
- Arem, C. A. (2003). *Conquering mathematics anxiety*. 2nd Edition. Pacific Grove, CA: Brooks/Cole.
- Arslan, H., Carli, M. & Sabo, M. (2012). A research of the effect of attitude, achievement, and gender on mathematics education. *Acta Didactica napocensia*, 5(1), 45-52.
- Ashcraft, M. H. (2002). *Cognition*. London: Prentice Hall.

- Ashcraft, M. H., and Kirk, E.P. (2001). The relationships among working memory, mathematics anxiety, and performance. *Journal of Experimental Psychology General*, 130 (2), 224 – 237.
- Assel, M. A., Landry, S. H., Swank, P., Smith, E. K. & Steelman, L. M. (2003). Precursors to mathematical skills: Examining the roles of visual-spatial skills, executive processes, and parenting factors. *Applied Developmental Science*, 7(1), 27-38.
- Atovigba, M., Vershima, M., O'kwu, E., & Ijenkeli. (2012). Gender trends in Nigerian secondary school students performance in algebra. *Research Journal of Mathematics and Statistics*, 4(2), 42-44.
- Augustyniak, K, Murphy, J. & Phillips, K. D. (2004). Psychological perspectives in assessing mathematics learning needs. *Journal of Instructional Psychology*, 32(4), 277-286.
- Aunio, P., Niemivirta, M., Hautamäki, J., Van Luit, J.E.H., Shi, J., & Zhang, M. (2006). Young children's number sense in China and Finland. *Scandinavian Journal of Educational Research*, 50(5), 483-502.
- Auzmendi, E. (1991). *Factors related to attitude toward statistics: A study with a Spanish sample*. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.
- Awang, H. & Ismail, N. A. (2009). Gender differences in mathematics learning in Malaysia Retrieved December 29, 2013, from <http://www.cimm.ucr.ac.cr/ojs/index.php/eudoxus/article/viewArticle/156/pdf>.
- Awofala, A. O. (2011). Is gender a factor in mathematics performance among Nigerian senior secondary students with varying school organization and location? *International Journal of Mathematics Trends and Technology*, 2(3), 17-21.
- Babbie, E. (1990). *Survey research methods*. Belmont, CA: Wadsworth.
- Bai, H., Wang, L., Pan, W., & Frey, M. (2009). Measuring mathematics anxiety: Psychometric analysis of a bidimensional affective scale. *Journal of Instructional Psychology*, 36(3), 185-193.
- Bandalos, D. L. (2002). The Effects of Item Parceling on Goodness-of-Fit and Parameter Estimate Bias in Structural Equation Modeling. *Structural Equation Modeling*, 9(1), 78-102.
- Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, N.J.: Prentice-Hall.

- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, New York: Prentiss Hall.
- Bandura, A. (1989). Self-Regulation of Motivation and Action through Internal Standards and Goal systems. In L. A. Pervin (ed.), *Goals concepts in Personality and Social psychology* (pp. 19-85). Hillsdale, NJ: Erlbaum.
- Bandura, A. (1994). Self efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior, 4*, 71-81. New York: Academic Press. (Reprinted in H. Friedman [Ed.], *Encyclopedia of mental health*. San Diego: Academic Press, 1998).
- Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*: New York: Freeman.
- Bandura, A. (1997). Self-efficacy: toward a unifying theory of behavioral change, *Psychological Review, 84*(2), 191-215.
- Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology, 88*(1), 87-99.
- Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares & T. Urdan (Eds.). *Self-efficacy beliefs of adolescents, 5*, 307-337.
- Baron, R. M., & Kenny, D. A. (1986). The Moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations, *Journal of Personality and Social Psychology, 51*(6), 1173-1182.
- Barton, P. E. (2004). Why does the gap persist. *Educational Leadership, 62*(3), 8-13.
- Battista, M. T. (1990). Spatial visualization and gender differences in high school geometry. *Journal of Research in Mathematics Education, 21*(1), 47-60.
- Battista, M. T. (1994). On Greeno's environmental/model view of conceptual domains: A spatial/geometric perspective. *Journal for Research in Mathematics Education, 25*(1), 86-94.
- Battista, M., Wheatley, G., & Talsma, G. (1982). The importance spatial visualization and formal reasoning for geometry learning in pre-service elementary teachers. *Journal for Research in Mathematics Education, 13*(1), 332-340.
- Bayrak, M. (2008). *Investigation of effect of visual treatment on elementary school students spatial ability and attitude towards spatial ability problems*. (Unpublished Master Thesis). Middle East Technical University.

- Bayram, S. (2004). *The Effect Of Instruction With Concrete Models On Eighth Grade Students' Geometry Achievement And Attitude Toward Geometry* (Doctoral dissertation). Middle East Technical University.
- Becker, J. (1981). Differential treatment of females and males in mathematics class. *Journal for Research in Mathematics Education*, 12(1), 40-53.
- Becker, M., Mcelvany, N., & Kortenbruck, M. (2010). Intrinsic and extrinsic reading motivation as predictors of reading literacy: A longitudinal study. *Journal of Educational Psychology*, 102(1), 773–785.
- Behr, A. L. (1988). *Empirical research methods for the human sciences*. Durban: Butterworths
- Beilock, S. L., Gunderson, E. A., Ramirez, G., & Levine, S. C. (2010). Female teachers' mathematics anxiety affects girls' math achievement. *Proceedings of the National Academy of Sciences*, 107(5), 1860-1863.
- Beller, M., & Gafni, N. (1996). 1991 International Assessment of Educational Progress in Mathematics and Sciences: The gender differences perspective. *Journal of Educational Psychology*, 88(2), 365.
- Bembenutty, H., & Zimmerman, B. J. (2003). The relation of motivational beliefs and self-regulatory processes to homework completion and academic achievement. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.
- Ben-Chaim, D., Lappan, G., & Houn, R. (1988). The effect of instruction on spatial visualization skills of middle school boys and girls. *American Educational Research Journal*, 25(1), 51-71.
- Beswick, K. (2006). Changes in pre-service teachers' attitudes and beliefs: the net impact of two mathematics education units and intervening experiences. *School Science and Mathematics*, 106(1), 36-47.
- Beswick, K. (2007). Teachers' beliefs that matter in secondary mathematics classrooms. *Educational Studies in Mathematics*, 65(1), 95-120.
- Betz, N. E. (1978). Prevalence, distribution, and correlates of mathematics anxiety in college students. *Journal of Counseling Psychology*, 25(5), 441-448.
- Birgin, O., Baloglu, M., Catlioglu, H., & Gurbuz, R. (2010). An investigation of mathematics anxiety among sixth through eighth grade students in Turkey. *Learning and Individual Differences*, 20(6), 654-658.

- Bishop, A. J. (1983). Space and Geometry. In R. Lesh, M. Landau (Eds.), *Acquisition of Mathematics Concepts and Processes* (pp. 175–203). Academic Press Inc., Orlando, Florida, USA.
- Bless, C., & Higson-Smith, S. (1995). *Fundamentals of social research methods: an African prospective* (2nd ed.). Cape Town: Juta & Co Ltd, Credapress.
- Bohner, G., & Wanke, M. (2002). *Attitudes and attitude change*. Psychology Press.
- Bos, K., & Kuiper, W. (1999). Modelling TIMSS Data in a European Comparative Perspective: Exploring Influencing Factors on Achievement in Mathematics in Grade 8. *Educational Research and Evaluation*, 5(2), 157-179.
- Boulter, D. (1992). *The effects of instruction on spatial ability and geometry Performance* (Unpublished master's thesis). University of Queen's, Ontario.
- Bramlett, D., & Herron, S. (2009). A study of African-American College students' attitude towards mathematics. *Journal of Mathematical Sciences & Mathematics Education*, 4(2), 43-51.
- Brannigan, V. (2004). Promoting academic achievement and motivation: discussion & contemporary issues based approach. University of Maryland.
- Brewer, D. S. (2009). *The effects of online homework on achievement and self-efficacy of college algebra students*. (Order No. 3366157, Utah State University). *ProQuest Dissertations and Theses*, 240.
- Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of cross-cultural psychology*, 1(3), 185-216.
- Brophy, J. (1998). *Motivating students to learn*. Boston, MA: McGraw-Hill.
- Brunner, M., Krauss, S., & Kunter, M. (2007). Gender differences in mathematics: Does the story need to be rewritten. *Intelligence*, 36(5), 403-421.
- Buckley, P.A., & Ribordy, S.C. (1982, May). Mathematics anxiety and the effects of evaluative instructions on math performance. Paper presented at the Midwestern Psychological Association, Minneapolis, MN.
- Cakmak, A. (2009). Analysis of nonlinear darcy-forchheimer flows in porous media. Unpublished Doctoral Dissertation, Texas Tech University, Texas, USA.
- Campbell, S. M., & Collaer, M. L. (2009). Stereotype threat and gender differences in performance on a novel visuospatial task. *Psychology of Women Quarterly*, 33(4), 437-444.

- Capraro, R. M. (2001). *Exploring the influences of geometric spatial visualization, gender, and ethnicity on the acquisition of geometry content knowledge*. Paper presented at the Annual Meeting of the Southwest Educational Research Association, New Orleans, LA.
- Capraro, R., Young, J., Lewis, C., Yetkiner, Z., & Woods, M. (2009). An Examination of Mathematics Achievement and Growth in a Midwestern Urban School District: Implications for Teachers and Administrators. *Journal of Urban Mathematics Education*, 2(2), 46-65.
- Carr, M., & Jessup, D. L. (1997) Gender differences in first-grade mathematics strategy use: Social and metacognitive influences. *Journal of Educational Psychology*, 89(2), 318-328.
- Carr, M. & Hettinger, H. (2003). Perspectives on mathematics strategy development. In J. M. Royer (Ed.), *Mathematical cognition* (pp. 33-68). Greenwich, CN: Information Age Publishing.
- Casey, M. B., Nuttall, R. L., & Pezaris, E. (1997). Mediators of gender differences in mathematics college entrance test scores: A comparison of spatial skills with internalized beliefs and anxieties. *Developmental Psychology*, 33(4), 669-680.
- Cassidy, J. (2002). Literacy 2001:What is and what should be.In W.M. Linek, E.G. Sturtevant, J.R. Dugan, & P.E. Linder (Eds.), *Celebrating the voices of literacy: 23rd yearbook of the College Reading Association* (pp. 2–6). Commerce: Texas A&M–Commerce; College Reading Association.
- Cates, G. L., & Rhymer, K. N. (2003). Examining the relationship between mathematics anxiety and mathematics performance: An instructional hierarchy perspective. *Journal of Behavioral Education*, 12(1), 23-34.
- Cavana, R. Y., Delahaye, B. L., & Sekaran, U. (2001). *Applied business research: Qualitative and quantitative methods*, Wiley & Sons.
- Cavanagh, R., & Sparrow, L. (2007). *Measuring mathematics anxiety: Constructin and validating the measure*. Curtin University.
- Chen, J. (2011). An evaluation of the relationship between classroom practices and mathematics motivation from student and teacher perspectives. (Unpublished Doctoral Dissertation). The George Washington University, USA.
- Cheng, S. K., & Seng, Q. K. (2001). Gender differences in TIMSS mathematics achievement of four Asian nations: A secondary analysis. *Studies in Educational Evaluation*, 27(4), 331-340.

- Chouinard, R., Karsenti, T., & Roy, N. (2007). Relations among competence beliefs, utility value, achievement goals, and effort in mathematics. *British Journal of Educational Psychology*, 77(3), 501-517.
- Chrysostomou, M., Tsingi, C., Cleanthous, E., & Pitta-Pantazi, D. (2010). *Cognitive styles and their relation to number sense and algebraic reasoning*. University of Cyprus.
- Churchill, G., & Iacobucci, D. (2004). *Marketing research: Methodological foundations* (9th ed.). Ohio: Thomson South-Western.
- Cleary, T. J., & Chen, P. P. (2009). Self-regulation, motivation, and math achievement in middle school: variations across grade level and math context. *Journal of School Psychology*, 47(5), 291-314.
- Clements, D. (1999). *Geometric and spatial thinking in young children*. In J. V. Copley (Ed). *Mathematics in the early years*, 66-79. Reston, VA: National Council of Teachers of Mathematics.
- Clements, D. H., & Battista, M. T. (1992). Geometry and spatial reasoning. In D. Grouws (Ed.). *Handbook of Research on Mathematics Teaching and Learning*, (pp. 420-464). Reston, VA: National Council of Teachers of Mathematics
- Clifford, E. (2008). *Visual spatial processing and mathematics achievement: The predictive ability of the visual spatial measures of the Stanford-Binet intelligence scales, fifth edition and the Wechsler intelligence scale for children fourth edition*. (Unpublished Doctoral Dissertation). The University of South Dakota.
- Coakes, S. j., & Steed, L. G. (2003). *SPSS Analysis Without Anguish*. Sydney: Australia: John Wiley & Sons.
- Cooper, M. (1992). Three-dimensional symmetry. *Educational Studies in Mathematics*, 23(2), 179-202.
- Cooper, C. R., & Schindler, P. S. (2008). *Business research methods* (10 ed.). Boston: McGraw Hill.
- Creswell, J. W. (1994). *Research design qualitative & quantitative approaches*, London: SAGE Publications.
- Creswell, J. W. (2003). *Research design* (2nd ed). London: Sage Publications.

- Cretchley, P. (2008). *Advancing research into affective factors in mathematics learning: Clarifying key factors, terminology and measurement*. Paper presented at the Navigating currents and charting directions: Proceedings of the 31 st Annual conference of Mathematics Education Research of Australasia.
- Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*. New York: Holt, Rinehart and Winston.
- Crombie, G., Sinclair, N., Silverthorn, N., Byrne, B. M., DuBois, D. L., & Trinneer, A. (2005). Predictors of young adolescents' math grades and course enrollment intentions: Gender similarities and differences. *Sex Roles*, 52(5), 351-367.
- De Bruin, A.B., Thiede, K.W., & Camp, G. (2001). Generating keywords improves metacomprehension and self-regulation in elementary and middle school children. *Journal of Experimental Child Psychology*, 109(3), 294-310.
- Deci, E. L., & Ryan, R. M. (2002). Overview of self-determination theory: An organismic dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3–33). Rochester, NY: University of Rochester Press.
- Dehaene, S. (1997). *The number sense. How the mind creates mathematics*. London, UK: Penguin Books.
- Dickinson, D. J., & Butt, J. A. (1989). The Effects of Success and Failure on the On-Task Behavior of High Achieving Students. *Education and Treatment of Children*, 12(3), 243-52.
- Di-Martino, P., & Zan, R. (2001). *Attitude toward mathematics: some theoretical issues'*, In M. van den HeuvelPanhuizen (ed.), *Proceedings of the 25th Conference of the International Group for the Psychology of Mathematics Education*, Vol. 3, Freudenthal Institute, University of Utrecht, Utrecht, the Neatherlands, pp. 209-216.
- Dornyei, Z., & Otto, I. (1998). Motivation in action: A process model of L2 motivation. *Working papers in applied linguistics* (Thames Valley University, London), 4, 43-69.
- Drew, D. E. (1996). *Aptitude revisited*. Baltimore, MD: Johns Hopkins University Press.
- Dursun, O. (2010). *The relationships among preservice teachers spatial visualization ability, geometry self-efficacy, and spatial anxiety*. (Unpublished MA thesis). Middle East Technical University.

- Eagly, A. H., & Chaiken, S. (1993). *The Psychology of Attitudes*, Fort Worth, NY: Harcourt Brace Jovanovich.
- Eleftherios, K., & Theodosios, Z. (2007). Students' beliefs and attitudes concerning mathematics and their effect on mathematical ability, *CERME*, 5(1), 258-267.
- Else-Quest, N., Hyde, J., & Linn, M. (2010). Cross-national patterns of gender differences in mathematics: A meta-analysis, *Psychological Bulletin*, 136(1), 103-127.
- Erbas, A. K., & Yenmez, A. A. (2011). The effect of inquiry-based explorations in a dynamic geometry environment on sixth grade students' achievements in polygons. *Computers & Education*, 57(4), 2462-2475.
- Evans, J., & Wedege, T. (2004). *Motivation and resistance to learning mathematics in a lifelong perspective*. Paper presented at the 10th International Congress on Mathematical Education, <http://www.icme10.dk/>, TSG 6, Copenhagen, Denmark.
- Farooq, M., & Shah, S. (2008). Students attitude towards mathematics. *Pakistan Economic and Social Review*, 4(1), 75-83.
- Feliciano, M. (2009). An overview of PTSD for the adult primary care provider. *The Journal for Nurse Practitioners*, 5(7), 516-522.
- Fennema, E. (1989). The study of affect and mathematics: A proposed generic model for research. In D. B. McLeod & V. M. Adams (Eds.), *Affect and mathematical problem solving: A new perspective*. (207-219). London: Springer-Verlag.
- Fennema, E., & Sherman, J. (1977). Sex-related differences in mathematics achievement, spatial visualization, and affective factors. *American Educational Research Journal*, 14(1), 51-71.
- Fiore, G. (1999). Math-abused students: Are we prepared to teach them? *Mathematics Teacher*, 92(5), 403-407.
- Fischbein, E. (1987). *Intuition in science and mathematics: An educational approach*. Dordrecht, Holland: Reidel
- Fraenkel, J., & Wallen, N. (2006). How to design and evaluate research in education. New York: McGraw Hill Companies, Inc.
- Fuchs, L. S. (2005). Prevention research in mathematics: improving outcomes, building identification models, and understanding disability. *Journal of Learning Disabilities*, 38(4), 35-352.

- Furinghetti, F., & Pehkonen, E. (2002). Rethinking characterizations of beliefs. In *Beliefs: A hidden variable in mathematics education*. (pp. 39-57). Springer Netherlands.
- Furner, J. M., & Berman, B. T. (2003). Mathematics anxiety: Overcoming a major obstacle to the improvement of student math performances. *Childhood Education, 79*(3), 170–175.
- Gallagher, A. M., & Kaufman, J. C. (2005). Integrative Conclusion in Gender Differences. In: Gallagher and Kaufman (Eds.), *Mathematics: An Integrative Psychological Approach*. Cambridge University Press.
- Gamer, M., & Engelhard J, G. (1999). Gender differences in performance on multiple-choice and constructed response mathematics items. *Applied Measurement in Education, 12*(1), 29-51.
- Gardner, R. C. (2010). *Motivation and second language acquisition: The socio-educational model* (Vol. 10): Peter Lang Pub Incorporated.
- Gaulin, S., & FitzGerald, R. (1986). Sex differences in spatial ability: an evolutionary hypothesis and test. *The American naturalist, 127*(1), 74-88.
- Geary, D. C. (1994). *Children's mathematical development: Research and practical applications*. Washington, DC: American Psychological Association.
- Geary, D. C. (2004). Mathematics and learning disabilities. *Journal of Learning Disabilities, 37*(1), 4-15.
- Geary, D., & DeSoto, C. (2001). Sex differences in spatial abilities among adults from the United States and China. *Evolution and cognition, 7*(2), 172-177.
- Geary, D., Saults, S. J., Liu, F., & Hoard, M. K. (2000). Sex differences in spatial cognition, computational fluency and arithmetical reasoning. *Journal of Experimental Child Psychology, 77*(4), 337-353.
- George, D., & Mallery, P. (2010). *SPSS For Windows Step By Step: A Simple Guide And Reference 18.0 Update* Author: Darren George, Paul Mallery.
- Ghanbarzadeh, N. (2001). An investigation of the relationship between mathematics attitude, self efficacy beliefs and math performance expectations and the math performance of the 9th grade girl and boy students in Tehran. Unpublished Master Thesis, University of Tehran.
- Ghbari, T., Abu Shendi, Y., & Abu Sheirah, K. (2008). Spatial ability among students in the college of information technology at zarqa private university in relationship to certain variables. *UOS journal for humanities and social science, 7*(2), 251-273.

- Gliem, J., & Gliem, R. (2003). Calculating, interpreting, and reporting cronbach's alpha reliability coefficient for likert-type scales. 2003 midwest research to practice conference in adult, continuing, and community education. The Ohio State University, Columbus, OH, October 8-10, 2003.
- Goodchild, S. (2001). Students' Goals. A case study of activity in a mathematics classroom. Norway: Caspar Forlag.
- Gomez-Chacon, I. M. (2000). Affective influences in the knowledge of mathematics. *Educational Studies in Mathematics*, 43(2), 149-168.
- Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic motivation from childhood through late adolescence: A longitudinal study. *Journal of Educational Psychology*, 93(1), 3-13.
- Gourgey, A. F. (1984, April). The relationship of misconceptions about math and mathematical self-concept to mathematics anxiety and statistics performance. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.
- Graham, S., & Golan, S. (1991). Motivational influences on cognition: Task involvement, involvement, and depth of information processing. *Journal of Educational Psychology*, 83(2), 187-194.
- Green, L. T. (1990). Test anxiety, mathematics anxiety, and teacher comments: Relationships to achievement in remedial mathematics classes. *Journal of Negro Education*, 59(3), 320-335.
- Guilford, J. P. (1967). The nature of human intelligence. New York: McGraw-Hill.
- Guilloteaux, M. J., & Dörnyei, Z. (2008). Motivating Language Learners: A Classroom Oriented Investigation of the Effects of Motivational Strategies on Student Motivation. *TESOL quarterly*, 42(1), 55-77.
- Gully, S. M., Incalcaterra, K. A., Joshi, A., & Beaubien, J. M. (2002). A meta-analysis of team efficacy, potency, and performance: Interdependence and level of analysis as moderators of observed relationships. *Journal of Applied Psychology*, 87(5), 819-832.
- Gupta, S. (2011). *Explaining the gender gap in high school mathematics achievement: An analysis of the educational longitudinal study*. Unpublished Master Thesis, California University, USA.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis*. (5thed). New Jersey: Prentice Hall.

- Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate data analysis*, 6th edn, Pearson Education, Inc, Upper Saddle River, New Jersey.
- Hair, J. F., Black, B., Babin, B., Anderson, R. E., & Tatham, R. L. (2010). *Multivariate Data Analysis: A Global Perspective* (7th ed). New Jersey, USA: Pearson Education Inc.
- Halat, E. (2008). In-service middle and high school mathematics teachers: Geometric reasoning stages and gender. *The Mathematics Educator*, 18(1), 8-14.
- Hall, J. F. (1989). *Learning and memory* (2nd Ed.). Massachusetts: Allyn and Bacon.
- Halpern, D. F., Benbow, C. P., Geary, D. C., Gur, R., Hyde, J. S., & Gernsbacher, M. A. (2007). The science of sex differences in science and mathematics. *Psychological Science in the Public Interest*, 8(1), 1-51.
- Hammoury, H. (2004). Attitudinal and motivational variables related to mathematics achievement in Jordan: Findings from the Third International Mathematics and Science Study (TIMSS), *Educational Research*, 46(3), 241-257.
- Hampton, N. Z., & Mason, E. (2003). Learning disabilities, gender, sources of efficacy, self-efficacy beliefs, and academic achievement in high school students. *Journal of School Psychology*, 41(2), 101-112.
- Hanna, G. (1986). Sex differences in the mathematics achievement of 8th graders in Ontario. *Journal of Research in Mathematics Education*, 17(1), 231-237.
- Hannula, M. S. (2002). Attitude towards mathematics: emotions, expectations and values', *Educational Studies in Mathematics* 49(1), 25-46.
- Hannula, M. (2003). Affect towards mathematics; narratives with attitude. In M. A. Mariotti (Ed.), *Proceedings of the Third Conference of the European Society for Research in Mathematics*. [CD] Pisa, Italy.
- Hannula, M. S. (2006). Motivation in mathematics: Goals reflected in emotions. *Educational Studies in Mathematics*, 63(2), 165-178.
- Hannula, M. S., Evans, J, Philippou, G., & Zan, R. (coord.) (2004). Affect in mathematics education – exploring theoretical frameworks. In M. J. Hoines & A.B. Fuglestad (eds.) *Proceedings of the 28 th Conference of the International Group for the Psychology of Mathematics Education*. 1, 107-138. Bergen University Collage.
- Harris, K. R., Friedlander, B. D., Saddler, B., Frizzelle, R. & Graham, S. (2005). Self-monitoring of attention versus self-monitoring of academic performance: Effects among students with ADHD in the general education classroom. *Journal of Special Education*, 39(3), 145-156.

- Healy, L., & Hoyles, C. (2002). Software tools for geometrical problem solving: Potentials and pitfalls. *International Journal of Computers for Mathematical Learning*, 6(3), 235-256.
- Henryson, S. (1971). Analysis and using data on test items. In Thorndike R. (Eds.), *Educational measurement* (2nd ed.) (pp. 124- 153). Washington, D.C: America Council on Education.
- Hight, O. L. (1993). *The effects of math confidence/study skills instruction on the mathematics achievement attitudes and study skills behavior of remedial math college students*. (Order No. 9407642, University of Maryland College Park). *ProQuest Dissertations and Theses*, 390-390 p.
- Hodges, C. B. (2005). *Self-efficacy, motivational email, and achievement in an asynchronous mathematics course*. (Order No. 3197970, Virginia Polytechnic Institute and State University). *ProQuest Dissertations and Theses*, 152-152 p.
- Hoffer, A. (1981). Geometry is more than proof. *Mathematics teacher*, 74(1), 11-18.
- Holden, G. (1991). The relationship of self-efficacy appraisals to subsequent health related outcomes: A meta- analysis. *Social Work in Health Care*, 16(1), 53-93.
- Hopko, D. R., McNeil, D. W., Lejuez, C. W., Ashcraft, M. H., Eifert, G. H., & Riel, J. (2003). The effects of anxious responding arithmetic and lexical decision task performance. *Journal of Anxiety Disorders*, 17(6), 647-665.
- Hsiao, R. (2003). *A case study: Student's motivation and expectation in taking sports law course*. Paper presented at Sport Marketing Association Inaugural Conference, Gainesville, FL.
- Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist*, 60(6), 581-592.
- Hyde, J. S., & Linn, M. C. (2006). Gender similarities in mathematics and science. *Science*, 314(5799), 599-600.
- Idris, N. (1998). *Spatial visualization, field dependence/independence, van hiele level, and achievement in geometry: The influence of selected activities for middle school students*. (Order No. 9900847, The Ohio State University). *ProQuest Dissertations and Theses*, 276-276 p.
- Ifamuyiwa, A., & Ajilogba, S. (2012). A problem solving model as a strategy for improving secondary school students' achievement and retention in further mathematics, *ARNP Journal of Science and Technology*, 2(2), 122-130.

- Ikegulu, T. N. (2000). The differential effects of gender and mathematics anxiety apprehension on developmental students' academic performance and persistence. ERIC Document Reproduction Service No. ED451824.
- Isiksal, M., & Askar, P. (2005). The effect of spreadsheet and dynamic geometry software on the achievement and self-efficacy of 7th-grade students. *Educational Research, 47*(3), 333-350.
- Isiksal, M., & Cakiroghi, E. (2008). Gender differences regarding mathematics achievement: The case of Turkish middle school students. *School Science and Mathematics, 108*(3), 113-120.
- Jackson, J. W. (2002). Enhancing self-efficacy and learning performance. *Journal of Experimental Education, 70*(3), 243-254.
- Jarvela, S., & Jarvenoja, H. (2011). Socially constructed self-regulated learning and motivation regulation in collaborative learning groups. *Teachers College Record, 113*(2), 350-374.
- Jarwan, F. (2002). Personal and family factors discriminating between high and low achievers on the TIMSS_R. (publication series no. 94) (Amman, National Center for Educational Research and Development, NCERD).
- Jones, E. P. (2001). *Gender and mathematics attitudes of middle school students in arkansas*. (Order No. 3017962, The University of Memphis). *ProQuest Dissertations and Theses, 55-55 p*.
- Joo, Y. J., Bong, M., & Choi, H. J. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and internet self-efficacy in web-based instruction. *Educational Technology Research and Development, 48*(2), 5-17.
- Joseph, E. (2012). Psych-Academic variables and mathematic achievement of 9th grade students in Nigeria. *British Journal of Education, Society & Behavioral Science, 2*(2), 174-183.
- Kabiri, M. (2003). *The role of math self-efficacy in mathematics achievement with regard to personal variables*. MA Thesis, Teacher Training University.
- Kadijevich, D. (2008). TIMSS 2003: Relating dimensions of mathematics attitude to mathematics achievement. *Journal of the institute of Educational Research, 40*(2), 327-346.
- Kali, Y., & Orion, N. (1996). Spatial abilities of high-school students in the perception of geologic structures. *Journal of research in science teaching, 33*(4), 369-391.

- Kaplan, R. M., & Saccuzzo, D. P. (2001). *Psychological Testing-Principles, Applications, and Issues.*(5th ed.). Belmont, CA: Wadsworth.
- Karaman, T., & Togrol, A. (2000). Relationship between gender, spatial visualization, spatial orientation, flexibility of closure abilities and performance related to plan geometry subject among sixth grade students. *Journal of Education, 26*(1).
- Karimi, A., & Venkatesan, S (2009). Mathematics anxiety, mathematics performance and academic hardiness in high school students. *International Journal of Educational Sciences, 1*(1), 33-37.
- Kaufman, S. B. (2007). Sex differences in mental rotation and spatial visualization ability: Can they be accounted for by differences in working memory capacity. *Intelligence, 35*(3), 211-223.
- Kayhan, E.B. (2005). *Investigation of High School Students' Spatial Ability.* Dissertation, Ankara: Middle East Technical University.
- Keller, J., (2002). Blatant stereotype threat and women's Mathematics performance: Selfhandicapping as a strategic means to cope with obtrusive negative performance expectations, *Sex Roles, 47*(4), 193-198.
- Kesici, S., & Erdogan, A. (2010). Mathematics anxiety according to middle school students' achievement motivation and social comparison. *Education, 131*(1), 54-63.
- Khatoon, T. & Mahmood, S. (2010). Mathematics anxiety among secondary school students in India and its relationship to achievement in mathematics, *European Journal of Social Sciences, 16*(1), 75-86.
- Khoush-Bakht, F. & Kayyer, M. (2005). A survey on motivational model of math learning in elementary students. *Journal of Psychology, 9*(1), 67-81.
- Kiamanesh, A. R., Hejazi, E., & Esfahani, Z. N. (2004). The role of mathematics self-efficacy, math self-concept, perceived usefulness of mathematics and mathematics anxiety in math achievement. In *3rd International Biennial SELF Research Conference, Berlin.*
- Kimber, C. (2009). *The effect of training in self-regulated learning on mathematics anxiety and achievement among preservice elementary teachers in a freshman course in mathematics concepts.* Unpublished Doctoral Dissertation, The Temple University Graduate Board.
- Kimura, D. (1999). *Sex and Cognition.* Cambridge, MA: The MIT Press.

- Kinsey, B. L., Towle, E., O'Brien, E., & Bauer, C.F. (2008). Analysis of self-efficacy and ability related to spatial tasks and the effect on retention of engineering students. *International Journal of Engineering Education*, 24(3), 488-494
- Kline, R. B. (1998). *Principles and practice of structural equation modeling*. New York: Guilford Press.
- 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), 448-470.
- Krejcie, R.V., & Morgan, D.W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607-610.
- Kuhl, J. (2000). A functional-design approach to motivation and self-regulation. The dynamics of personality systems interactions. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 111-169). San Diego, CA: Elsevier Academic Press.
- Kushman, J. W., Sieber, C., & Harold, K. P. (2000). This isn't the place for me: School dropout. In D. Capuzzi & D. R. Gross (Eds.), *Youth at risk: A prevention resource 48 for counselors, teachers, and parents* (3rd ed., pp. 471-507). Alexandria, VA: American Counseling Association.
- Kwon, S, Y. (2001). *Investigating the relationship between motivational factors and self regulatory strategies in the knowledge construction process*. Graduate school of Ewha-Womans University, Seoul, Korea. [Online] <http://www.icce2001.org/cd/pdf/poster3/krola.pdf> [2001, November 20]
- Learning in an Electronic Age. (2002, June 30). *The Star*, p. 7.
- Landry, C. C. (2003). *Self-efficacy, motivation, and outcome expectation correlates of college students' intention certainty*. (Order No. 3085684, Louisiana State University and Agricultural & Mechanical College). *ProQuest Dissertations and Theses*, 206-206 p.
- Leary, M. R. (1995). *Introduction to behavioral research methods* (2nd ed.). Belmont, CA: Brooks/Cole.
- Lee, J., Grigg, W., & Dion, G. (2007). The Nation's Report Card [TM]: Mathematics 2007--National Assessment of Educational Progress at Grades 4 and 8. NCEES 2007-494. *National Center for Education Statistics*.
- Lee, K., Ng, S. F., Ng, E. L., & Lim, Z. Y. (2004). Working memory and literacy as predictors of performance on algebraic word problems. *Journal of Experimental Child Psychology*, 89(2), 140-158.

- Leopold, C., Gorska, R. A., & Sorby, S. A. (2001). International experiences in developing the spatial visualization abilities of engineering students. *Journal for Geometry and Graphics*, 5(1), 81-91.
- Levine, S. C., Huttenlocher, J., Taylor, A., & Langrock, A. (1999). Early sex differences in spatial skill. *Developmental Psychology*, 35(4), 940-949.
- Levine, S. C., Vasilyeva, M., Lourenco, S. F., Newcombe, N., & Huttenlocher, J. (2005) Research report: Socioeconomic status modifies the sex difference in spatial skill. *Psychological Science*, 16(11), 841-845.
- Ley, K., & Young, D. B. (1998). Self-regulation behaviors in underprepared (developmental) and regular admission college students. *Contemporary Educational Psychology*, 23(1), 42-64.
- Linnenbrink, E. A., & Pintrich, P. R. (2002a). The role of motivational beliefs in conceptual change. In M. Limon & L. Mason (Eds.), *Reconsidering conceptual change: Issues in theory and practice* (pp. 115-135). Dordrecht, The Netherlands: Kluwer Academic Press.
- Linnenbrink, E. A., & Pintrich, P. R. (2002b). Motivation as an enable for academic success. *School Psychology Review*, 13(3), 313-327.
- Linn, M. C., & Petersen, A. C. (1985). Emergence and characterization of sex differences in spatial ability: A meta-analysis. *Child Development* 56(6), 1479-1498.
- Lloyd, J. E. V., Walsh, J., & Yailagh, M. S. (2005). Sex, differences in performance attributions, self-efficacy, and achievement in mathematics: If I'm so smart, why don't I know it? *Canadian Journal of Education*, 28(3), 384-408.
- Loong, T. (2012). Self-Regulated learning between low-, average-, and high math achievers among pre-university international students in Malaysia. *European Journal of Social Science*, 30(2), 302-312.
- Lopez, F., & Lent, R. (1992). Source of math self-efficacy in high school students. *Career Development Quarterly*, 41(1), 3-12.
- Lowrie, T., & Kay, R. (2001). Relationship between visual and nonvisual solution methods and difficulty in elementary mathematics. *The Journal of Educational Research*, 94(4), 248-255.
- Luo, R., Yang, Y., & Shen, J. (2008). Analysis of principal non-intellectual factors influencing senior middle school students' mathematics achievement. *Journal of Mathematics Education*, 1(1), 172-181.

- Lusby, B. (2007). Increasing Student's Self-efficacy in Mathematics. *Rising Tide*, V. 5, 1-7.
- Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for Research in Mathematics Education*, 30(5), 520-540.
- Ma, X., & Xu, J. (2004). The causal ordering of mathematics achievement: A longitudinal panel analysis. *Journal of Adolescence*, 27(2), 165-179.
- Maio, G., Maio, G. R., & Haddock, G. (2010). *The Psychology of Attitudes and Attitude Change*. SAGE Publications Ltd.
- Malhotra, N. K. (1998). Self concept and product choice: An integrated perspective. *Journal of Economic Psychology*, 9(1), 1-28.
- Malpass, J. R., O'Neil, H. F., & Hocevar, D. (1999). Self-regulation, goal orientation, self-efficacy, worry, and high-stakes math achievement for mathematically gifted high school students. *Roeper Review*, 21(4), 281-288.
- Manoah, S. A., Indoshi, F. C., & Othuon, L. O. (2011). Influence of attitude on performance of students in mathematics curriculum. *Educational Research*, 2(3), 965-981.
- Margolis, H., & McCabe, P. (2003). Self-efficacy: A key to improving the motivation of struggling learners. *Preventing School Failure*, 47(4), 162-169.
- Martin, M. O., Mullis, I. V., & Foy, P. (2008). *TIMSS 2007 international mathematics report: Findings from IEA's trends in international mathematics and science study at the fourth and eighth grades*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.
- Mason, L., & Scrivani, L. (2004). Enhancing students' mathematical beliefs: An intervention study. *Learning and Instruction*, 14(2), 153-176.
- Mata, M., Monteiro, V., & Peixoto, F. (2012). Attitude towards mathematics: Effects of individual, motivational and social support factors. *Child Development Research*,
- May, R. (1977). *The meaning of anxiety*. New York: Norton.
- Mayer, K. J. (1999). *Exploring the role of service process and its effect on guest encounter satisfaction*. (Order No. 9946526, University of Nevada, Las Vegas). *ProQuest Dissertations and Theses*, 261-261 p.
- McCoy, L. (2005). Effect of demographic and personal variables on achievement in eighth-grade algebra. *The Journal of Educational Research*, 98(3), 131-136.

- McGee, M. G. (1979). Human spatial abilities: Psychometric studies and environmental, genetic, hormonal, and neurological influences. *Psychological Bulletin*, 86(5), 889-918.
- McLeod, D. (1992). *Research on affect in mathematics education: A reconceptualization*. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 575-596). New York: Macmillan.
- Mealey, D. L. (1990). Understanding the motivation problems of at-risk college students. *Journal of Reading*, 33(8), 598-601.
- Megdadi, F., Alkhateeb, A. (2003). Upper primary stage students acquisition of mental arithmetic skills in Jordan. *Journal of Damascus University*, 19(2), 71-98.
- Melhem, A. (2004). *Management strategy and its impact on perceived self-efficacy on a sample of students with high and low achievement in the upper primary stage*. (Unpublished doctoral dissertation), Amman Arab University, Amman, Jordan.
- Meyer, M. L., Salimpoor, V. N., Wu, S. S., Geary, D. C., & Menon, V. (2010). Differential contribution of specific working memory components to mathematics achievement in 2nd and 3rd graders. *Learning and Individual Differences*, 20(2), 101-109.
- Middleton, J. A. & Spanias, P. A. (1999). Motivation for achievement in mathematics: Findings, generalization and criticism of the research", *Journal for Research in Mathematics Education*, 30(1), 65-88.
- Miller, H., & Bichsel, J. (2004). Anxiety, working memory, gender and math performance. *Personality and Individual Differences*, 37(3), 591-606.
- Miller, K. F., Major, S. M., Shu, H. & Zhang, H. (2000). Ordinal knowledge: number names and number concepts in Chinese and English. *Canadian Journal of Experimental Psychology*, 54(2), 129-139.
- Miller, S. F. (1991). *A study of the relationship of mathematics anxiety to grade level, gender, intelligence, and mathematics achievement*. (Order No. 9127651, Memphis State University). *ProQuest Dissertations and Theses*, , 84-84 p.
- Ministry of Education Directorate of Educational Research and Development. (2008). *The development of education. National report of the Hashemite Kingdom of Jordan*. Paper Presented at the 48th session, of the International Conference on Education, Geneva.

- Mistretta, R. M. (2000). Enhancing geometric reasoning. *Adolescence*, 35(138), 365-379.
- Moe, A., & Pazzaglia, F. (2006) Following the instructions! Effects of gender beliefs in mental rotation. *Learning and Individual Differences*, 16(4), 369-377.
- Moenikia, M., & Zahed-Babelan, A. (2010). A study of simple and multiple relations between mathematics attitude, academic motivation and intelligence quotient with mathematics achievement. *Procedia-Social and Behavioral Sciences*, 2(2), 1537-1542.
- Mohd, N., Mahmood, T. F. P. T., & Ismail, M. N. (2011). Factors that influence students in mathematics achievement. *International Journal of Academic Research*, 3(3), 49-54.
- Montague, M. (2008). Self-regulation strategies to improve mathematical problem solving for students with learning disabilities. *Learning Disability Quarterly*, 31(4), 37-44.
- Morrise, D., & Lusby, B. (2007). Increasing Students self-efficacy in mathematics. *Rising Tide*, 5, 1-7. Retraved from <http://www.smcm.edu/educationstudies/pdf/rising-tide/volume-5/lusby.pdf>
- Moritz, S. E., Feltz, D. L., Fahrbach, K. R., & Mack, D. E. (2000). The Relation of Self-Efficacy Measures to Sport Performance: A Meta-Analytic Review. *Research Quarterly for Exercise and Sport*, 71(3), 280-294.
- Mousoulides, N., & Philippou, G. (2005). *Students' motivational beliefs, self-regulation strategies and mathematics achievement*. In H. L. Chick & J. L. Vincent (Eds.), Presented of the 29th Conference of the International Group for the Psychology of Mathematics Education (PME) (pp. 321-328). Melbourne, Australia: PME.
- Mullis, I. V., Martin, M. O., Fierros, E. G., Goldberg, A. L., & Stemler, S. E. (2000b). *Gender differences in achievement: IEA's Third International Mathematics and Science Study* Chestnut Hill, MA: Boston College.
- Mullis, I. V., Martin, M. O., Foy, P., & Arora, A. (2012). *TIMSS 2011 international results in mathematics*.
- Multon, K., Brown, S., & Lent, R. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology*, 38, 30-38.
- Nasser, F. (2004). Structural model of the effect of cognitive and effective factors on the achievement of Arabic-speaking pre-service teachers in introductory statistics. *Journal of Statistics Education*, 12(1), 1-28.

- Nasser, F., & Birenbaum, M. (2005). Modeling mathematics achievement of Jewish and Arab eighth graders in Israel: The effects of learner-related variables. *Educational Research & Evaluation, 11*(3), 277-302.
- National Center for Education Statistics. (2007). *The Nation's Report Card: America's High School Graduates (NCES 2007-467)*.
- National Council of Teachers of Mathematics. (1989). Commission on Standards for School Curriculum and evaluation standards for school mathematics. Restone VA: author.
- National Council of Teachers of Mathematics. (2000). Principles and Standards for School Mathematics. Reston, Va. NCTM.
- Neuman, W. L. (2003). *Social research methods: Qualitative and quantitative approaches* (5th ed.). Boston: Allyn and Bacon.
- Newbill, P. L. (2005). *Instructional strategies to improve women's attitudes toward science*. (Order No. 3164126, Virginia Polytechnic Institute and State University). *ProQuest Dissertations and Theses, 253-253* p.
- Newstead, K. (1998). Aspects of children's mathematics anxiety. *Educational Studies in Mathematics, 36*(1), 53-71.
- Nicolaidou, M. & Philippou, G. (2003). Attitudes towards mathematics, self-efficacy and achievement in problem solving. *European Research in Mathematics III*.
- Nelson, C. J., Lee, J. S., Gamboa, M. C., & Roth, A.J. (2008). Cognitive effects of hormone therapy in men with prostate cancer. *Cancer, 113*(5), 1097-1106.
- Nielsen, I. L., & Moore, K.A., (2003). Psychometric data on the mathematics self-efficacy scale. *Educational and Psychological Measurement, 63*(1), 128-138.
- Norwood, K. S. (1994). The effects of instructional approach on mathematics anxiety and achievement. *School Science and Mathematics, 94*(5), 248-254.
- Nunes T., & Bryant, P. (1996). *Children doing mathematics*. Oxford, UK: Blackwell.
- Nunnally, J. C. (1978). *Psychometric Theory* (2nd ed.). New York: McGraw-Hill.
- Nunnaly, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.
- Okoye, N. (1983). Are Boys Better than Girls in Mathematics and English Language Performance. *Psychology for Energyday Living, 2*(2).

- O'Neil, H. F., & Schacter, J. (1997). Test Specifications for Problem Solving Assessment, CSE Technical Report 463. Los Angeles, CA: Center for the Study of Evaluation.
- Op't Eynde, P., De Corte, E., & Verschaffel, L. (2002). *Framing students' mathematics-related beliefs*. In G. C. Leder, E. Pehkonen & G. Törner (Eds.), *Beliefs: A hidden variable in mathematics education*. (pp. 13-37). Dordrecht: Kluwer Academic Publishers.
- Ott, C. D. (2010). *Self-regulation and math attitudes: Effects on academic performance in developmental math courses at a community college*. (Order No. 3434592, University of Kansas). *ProQuest Dissertations and Theses*, 186.
- Ovez, F. (2012). An examination on the relationship between mathematics anxiety and achievement of 5th, 6th, 7th and 8th grade students. *International Mathematical Forum*, 7(60), 2987-2994.
- Ozlem, D. (2010). *The relationship among preservice teachers' spatial visualization ability, geometry self efficacy, and spatial anxiety*. Unpublished Doctoral Dissertation, Middle State Technical University.
- Pajares, F. (1996). Self-Efficacy Beliefs in Academic Settings. *Review of Educational Research*, 66 (4), 543-578.
- Pajares, F. (1997). *Gender differences in mathematics self-efficacy beliefs*. In A. Gallagher & J. Kaufman (Eds.). *Mind the Gap: Gender differences in mathematics*. Boston, MA: Cambridge University Press.
- Pajares, F., & Graham, L. (1999). Self-efficacy, motivation constructs, and mathematics performance of entering middle school students. *Contemporary Educational Psychology*, 24(2), 124-139.
- Pajares, F. & Kranzler, J.H. (1995). Self-efficacy beliefs and general mental ability in mathematical problem-solving. *Contemporary Educational Psychology*, 20(4), 426-443.
- Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem-solving: A path analysis. *Journal of Educational Psychology*, 86(2), 193-203.
- Pajares, F., & Miller, M. D. (1997). Mathematics self-efficacy and mathematical problem solving: Implications of using different forms of assessment. *Journal of Experimental Education*, 65(3), 213-228.

- Pajares, F., & Urdan, T. (1996). Exploratory factor analysis of the Mathematics Anxiety Scale. *Measurement and Evaluation in Counseling and Development*, 29(1), 35-47.
- Pallant, J. (2001). *SPSS survival manual: a step by step guide to data analysis using SPSS for windows* (version 10 and 11). Buckingham: Open University Press.
- Pallant, J. (2005). *SPSS Survival Manual: A Step Guide to Data Analysis Using SPSS* (version 12), Chicago, Illinois: Open University Press.
- Pallant, J. (2007). *SPSS survival manual- Step by step guide to data analysis using SPSS for Windows (Version 15)* (3rd ed.). UK: Open U.
- Pandiscio, E. A. (1994). *Spatial visualization and mathematics achievement: A correlational study between mental rotation of objects and geometric problems*. (Order No. 9506073, The University of Texas at Austin). *ProQuest Dissertations and Theses*, 53-53 p.
- Papanastasiou, C. (2000). Effects of attitudes and beliefs on mathematics achievement. *Studies in Educational Evaluation*, 26(1), 27-42.
- Parker, P. D., Marsh, H. W., Ciarrochi, J., Marshall, S., & Abduljabbar, A. S. (2014). Juxtaposing math self-efficacy and self-concept as predictors of long-term achievement outcomes. *Educational Psychology*, 34(1), 29-48.
- Paterson, M., Perry, E., Decker, C., Eckert, R., Klaus, S., & Wendling, L., et al., (2003). Factors associated with high school mathematics performance in the United State. *Stduies in Education Evaluation*, 29(2), 91-108.
- Perels, F., Dignath, C., & Schmitz, B. (2009). Is it possible to improve mathematical achievement by means of self-regulation strategies? Evaluation of an intervention in regular math classes. *European Journal of Psychology of Education*. 24(1), 17-31.
- Pietsch, J., Walker, R., & Chapman, E. (2003). The relationship among self concept, self efficacy, and performance in mathematics during secondary school. *Journal of Educational Psychology*, 95(3), 589-603.
- Pintrich, P., & De Groot, E. (1990). Motivational and self regulated learning: Components of classroom academic performance. *Journal of Educational Psychology*, 82(1), 33-50.
- Pintrich, P. (1999). The Role of Motivation in Promoting and Sustaining Self-Regulated Learning. *International Journal of Educational Research*, 31(6), 459-470.

- Pintrich, P. (2000a). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology*, 92(3), 544-555.
- Pintrich, P. (2000b). The role of goal orientation in self-regulated learning. In Boekaerts, M., Pintrich, P., & Zeidner, M. (2000). *Handbook of self-regulation* (pp. 452-502). San Diego, CA: Academic Press.
- Pintrich, P. R., & Garcia, T. (1994). Student goal orientation and self regulation in the college classroom. In M. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement: Goals and self-regulatory processes* (Vol. 7, pp. 371-402). Greenwich, CT: JAI Press.
- Pintrich, P. R., Smith, D., Garcia, T., & McKeachie, W. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor, Michigan, 48109, 1259.
- Pintrich, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and applications*. Englewood Cliffs, NJ: Merrill/Prentice Hall.
- Pintrich, P. R., Smith, D., Garcia, T., & McKeachie, W. (1993). Reliability and Predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement*, 53(3), 801-813.
- Pintrich, P. R., & Zusho, A. (2002). The development of academic self-regulation: the role of cognitive and motivational factors. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 249-284). San Diego, CA: Academic Press.
- Ponton, M. K. (2002). Motivating students by building self-efficacy. *Journal of Professional Issues in Engineering Education & Practice*, 128(2), 54-57.
- Popham, W. (2005). Students' attitudes count. *Educational Leadership*, 62(5), 84-85.
- Preis, C., & Biggs, B. (2001). Can instructors help learners overcome mathematics anxiety. *ATEA Journal*, 28(4), 6-10.
- Ramirez, G., Gunderson, E., Levine, S., & Beilock, S. (2012). Spatial anxiety relates to spatial abilities as a function of working memory in children. *The Quarterly Journal of Experimental Psychology*, 65(3), 474-487.
- Rayan, A. (2008). Spatial ability among Al-Quds Open University students studying elementary school education major. *Palestine Journal of open education*, 2(1), 115-144.

- Reuhkala, M. (2001). Mathematical skills in ninth-graders: Relationship with visuospatial abilities and working memory. *Educational Psychology, 21*(4), 387- 399.
- Reynolds, A., & Walberg, H. (1992). A process model of mathematics achievement and attitude. *Journal for Research in Mathematics Education, 23*(4), 306-328.
- Richardson, F. C., & Suinn, R. M. (1972). The Mathematics Anxiety Rating Scale: Psychometric data. *Journal of Counseling Psychology, 19*(6), 551-554.
- Richardson, F. C., & Woolfolk, R. L. (1980). *Mathematics Anxiety*. In I.G. Sarason (Ed.) *Test Anxiety: Theory, Research, and Applications*. Hillsdale, N.J.: Lawrence Erlbaum Associates.
- Richardson, J. T. (1994). Gender differences in mental rotation. *Perceptual and Motor Skills, 78*(2), 435-448.
- Riveiro, J. M., Cabanach, R. G., & Arias, A. V. (2001). Multiple-goal pursuit and its relation to cognitive, self-regulatory, and motivational strategies. *British Journal of Educational Psychology, 71*(4), 561-572.
- Robichaux, R. L. R. (2000). *The spatial visualization of undergraduates majoring in particular fields of study and the relationship of this ability to individual background characteristics*. (Order No. 9958996, Auburn University). *ProQuest Dissertations and Theses, 177-177 p.*
- Robson, C. (1993). *Real world research a resource for Social Scientists and Practitioner Researchers*. Oxford: Blackwell.
- Rohde, T. E. (2008). *An examination of how visual perception abilities influence mathematics achievement*. Case Western Reserve University.
- Rohde, T. E., & Thompson, L. A. (2007). Predicting academic achievement with cognitive ability. *Intelligence, 35*(1), 83-92.
- Ross, A., Bruce, D., & Scott, G. (2012). The gender confidence gap in fractions knowledge: Gender differences in student belief–achievement relationships. *School science and mathematics, 112*(5), 278-288.
- Rovira, E. & Sancho, T. (2012). The relationship between cognition and affect on online mathematics and their interaction over time. *eLearn Center Research Paper Series, 4*(1), 43-55.
- Royster, D., Harris, M., & Schoeps, N. (1999). Dispositions of college mathematics students. *International Journal of Mathematical Education in Science and Technology, 30*(3), 317-333.

- Ruban, L., McCoach, D. B., & Reis, S. M. (2002). Gender Invariance in the Impacts of Pre-College Scholastic Factors and Self-Regulated Learning Variables on the Academic Attainment of Undergraduate Students. Retrieved From <http://files.eric.ed.gov/fulltext/ED465338.pdf>
- Ruffell, M., Mason, J., & Allen, B. (1998). Studying attitude to mathematics. *Educational Studies in Mathematics*, 35(1), 1-18.
- Rusell, D. (2009). *Algebraic equations*. Retrieved august 22, 2012, from: <http://math.about.com/od/algebra/a/WhyAlgebra.htm>.
- Ryan, A. M., & Pintrich, P. R. (1997). Should I ask for help. The role of motivation and attitudes in adolescents' help-seeking in math class. *Journal of Educational Psychology*, 89(2), 329-341.
- Sabah, S., & Hammouri, H. (2010). Does subject matter matter. Estimating the impact of instructional practices and resources on student achievement in science and mathematics: findings from TIMSS 2007. *Evaluation & Research in Education*, 23(4), 287-299.
- Saffer, N. (1999). Core subjects and your career. *Occupational Outlook Quarterly*, 26-40. Retrieved June 25, 2013, from www.bls.gov/opus/ooq
- Saihi, S. (2012). Test anxiety and its motivators among students. *Journal of human and social science*, 7(1), 74-89.
- Sari, H. (2000). *An Analysis of the policies and provision for children with special educational needs in England and Turkey*. Unpublished Thesis, England: Oxford Brookes University, Westminster Institute of Education.
- Sartawi, A., Alsawaie, O., Dodeen, H., Tibi., & Alghazo, I. (2012). Predicting mathematics achievement by motivation and self efficacy across gender and achievement levels. *Interdisciplinary Journal of Teaching and Learning*, 2(2), 59-77.
- Scarpello, G. (2007). Helping students get past mathematics anxiety. *Techniques: Connecting Education & Careers*, 82(6), 34-35.
- Schunk, D. H., & Pajares, F. (2002). The development of academic self-efficacy. In A. Wigfield & J. Eccels (Eds.). *Development of achievement motivation* (pp.15-31). San Diego: Academic Press.
- Schreiber, J. B. (2002). Institutional and student factors and their influence on advanced mathematics achievement. *The Journal of Educational Research*, 95(5), 274-286.

- Schreiber, J. B. (2000). *Advanced mathematics achievement: A hierarchical linear model*. Unpublished doctoral dissertation. Indiana University, Bloomington, Indiana.
- Schweinle, A., Meyer, D. K., & Turner, J. C. (2006). Striking the right balance: Students' motivation and affect in elementary mathematics. *Journal of Educational Research*, 99(5), 271-293.
- Scott, J. S. (2001). *Modeling aspects of students' attitudes and performance in an undergraduate introductory statistics course*. (Order No. 3025389, University of Georgia). *ProQuest Dissertations and Theses*, 153-153 p.
- Seabra, R., & Santos, E. (2008). Evaluation of the Spatial Visualization Ability of Entering Students in a Brazilian Engineering Course. *Journal for Geometry and Graphics*, 12(1), 99–108.
- Sekaran, U. (2000). *Research methods for business: A skill building approach*. NY: John Wiley & Sons, Inc.
- Sekaran, U. (2003). *Research methods for business: A skill-building approach* (4th ed). New York. John Wiley & Sons, Inc.
- Shafiq, H. (2013). *Examining the effects of gender, poverty, attendance, and ethnicity on algebra, geometry, and trigonometry performance in a public high school*. (Order No. 3559520, Columbia University). *ProQuest Dissertations and Theses*, 260.
- Shashaani, L. (1995). Gender differences in mathematics experience and attitude and their relation to computer attitude. *Educational Technology*, 35(3), 32-38.
- Shores, M., & Shannon, D. (2007). The Effects of Self-Regulation, Motivation, Anxiety, and Attributions on Mathematics Achievement for Fifth and Sixth Grade Students. *School Science and Mathematics*, 107(6), 225-236.
- Shores, M., & Shannon, D. (2010). The effects of self-regulation, motivation, anxiety, and attributions on mathematics achievement for fifth and sixth grade students. *School Science and Mathematics*, 107(6), 225-236.
- Silver, E. A., Strutchens, M. E., & Zawojewski, J. S. (1996). NAEP findings regarding race/ethnicity and gender: Affective issues, mathematics performance, and instructional context. In P. A. Kenney & E. A. Silver (Eds.), *Results from the sixth mathematics assessment of the National Assessment of Educational Progress*. Reston, VA: NCTM.

- Sim, S., & Rasiah, R. I. (2006). Relationship between item difficulty and discrimination indices in true/false-type multiple choice questions of a para-clinical multidisciplinary paper. *Annals-Academy of Medicine Singapore*, 35(2), 67-71.
- Singh, K., Granville, M., & Dika, S. (2002). Mathematics and Science achievement: Effects of motivation, interest and academic engagement. *Journal of Educational Research*, 95(6), 323-332.
- Singh, P. (2009). An Assessment of Number Sense among Secondary School Students. *International Journal for Mathematics Teaching and Learning*, 155(1), 1-29
- Sipus, Z., & Cizmesija, A. (2012). Spatial Ability of Students of Mathematics Education in Croatia Evaluated by the Mental Cutting Test. *Annales Mathematica et Informaticae*. 40(1), 203-216.
- Skaalvik, S., & Skaalvik, E. M. (2004). Gender differences in Math and verbal self concept, performance exceptions and motivation. *Sex Role: A Journal of Research*. Retrieved 21 May, 2012, from <http://www.findarticles.com>.
- Sprigler, M. D., & Alsup, J. K. (2004). An analysis of gender and the mathematical reasoning ability sub-skill of analysis- synthesis. *Education*, 123(4), 763-769.
- Sorge, C., & Schau, C. (2002). *Impact of engineering students attitudes on achievement in statistics: A structural model*. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.
- Stacey, K., & MacGregor, M. (1999). Taking the algebraic thinking out of algebra. *Mathematics Education Research Journal*, 11(1), 25-38.
- Stevens, T., Olivarez, A. J., Lan, W. Y., & Tallent-Runnels, M. K. (2004). Role of mathematics self-efficacy and motivation in mathematics performance across ethnicity. *The Journal of Educational Research*, 97(4), 208-222.
- Stipek, D., Salmon, J. M., Givvin, K. B., & Kazemi, E. (1998). The Value (and Convergence) of Practices Suggested by Motivation Research and Promoted by Mathematics Education Reformers. *Journal for Research in Mathematics Education*, 29(4), 465-488.
- Stramel, J. K. (2010). *A naturalistic inquiry into the attitudes toward mathematics and mathematics self-efficacy beliefs of middle school students*. (Order No. 3419596, Kansas State University). *ProQuest Dissertations and Theses*, 186.
- Stringer, R. W., & Heath, N. (2008). Academic self-perception and its relationship to academic performance. *Canadian Journal of Education*, 31(2), 327-345.

- Stoeger, H., & Zeigler, A. (2005). Evaluation of an elementary classroom self regulated learning program for gifted mathematics under achievers. *International Education Journal*, 6(2), 261-271.
- Suarez-Álvarez, J., Fernandez-Alonso, R., & Muniz, J. (2014). Self-concept, motivation, expectations, and socioeconomic level as predictors of academic performance in mathematics. *Learning and Individual Differences*, 30, 118-123.
- Suinn, R. (1972). Mathematics anxiety rating scale information brief. Rocky Mountain Behavioral Science Institute, Fort Collins, CO.
- Summers, C. H. (2001). Mechanisms for quick and variable responses. *Brain, behavior and evolution*, 57(5), 283-292.
- Tal, S., Abu-wardih, T. (2013). The Effectiveness of a Manual Training Program in the Development of Mental Rotation Ability. *Journal of Educational Science*, 40(3), 1000-1020.
- Tapia, M., & Marsh, G. E. (2001). Effect of gender, achievement in mathematics, and grade level on attitudes toward mathematics. Paper presented at the Annual Meeting of the Mid-South Educational Research Association. *Science, Mathematics, and Environmental Education*, 1-20.
- Tartre, L. A. (1990). Spatial Orientation Skill and Mathematical Problem Solving. *Journal for Research in Mathematics Education*, 21(1), 216-229.
- Tawalbeh, A. (2002). *The importance of mathematics anxiety, self-concept and attitude on students achievement in mathematics*. (Unpublished master theses), Yarmouk University, Irbid, Jordan.
- Taylor, J. A. (1997). Factorial validity of scores on the Aiken Attitude to Mathematics Scales for adult pre-tertiary students. *Educational and Psychological Measurement*, 57 (1), 125-130.
- Tella, A. (2007). The impact of motivation on student's academic achievement and learning outcomes in mathematics among secondary school students in Nigeria, *Eurasia Journal of Mathematics, Science & Technology Education*, 3(2), 149-156.
- Thompson, B. (2004). *Exploratory and confirmatory factor analysis: Understanding concepts and applications*. American Psychological Association.
- Tobias, S. (1990). Mathematics anxiety: An update. *National Academic Advising Association Journal*, 10 (1), 47-50.

- Tolar, T. D. (2007). *A cognitive model of algebra achievement among undergraduate college students*. (Order No. 3332596, Georgia State University). *ProQuest Dissertations and Theses*, 146-n/a.
- Torbeyns, J., Van Den Noortgate, W., Ghesquière, P., Verschaffel, L., Van de Rijt, B. A., & van Luit, J. E. (2002). Development of early numeracy in 5-to 7-year-old children: A comparison between Flanders and The Netherlands. *Educational Research and Evaluation*, 8(3), 249-275.
- Tucker, C. M., Zayco, R. A., & Herman, K. C. (2002). Teacher and child variables as predictors of academic engagement among low-income African American children. *Psychology in the Schools*, 39(4), 477-488.
- Turgut, M. (2007). *Investigation of 6., 7. and 8. Grade Students' Spatial Ability*. Dissertation, Izmir: Dokuz Eylül University. United Nation Educational, Scientific and Cultural Organization.
- Um, K. U., Corter, J., & Tatsuoka, K. (2005). Motivation autonomy support, and mathematics performance: a structural equation analysis. *Department of Human Development, Teachers College, Columbia University, unpublished manuscript*.
- Usiskin, Z. (1987). Resolving the continuing dilemmas in school geometry. In M. M. Lindquist & A. P. Shulte (Eds.), *Learning and teaching geometry K-12* (pp. 17-31). Reston, VA: National Council of Teachers of Mathematics.
- Vale, C. (2008, January). Trends and factors concerning gender and mathematics in Australasia. In *[ICME-11: Proceedings of the 11th International Congress on Mathematical Education]* (pp. 1-8). [International Commission on Mathematical Instruction].
- Vancouver, J. B., Thompson, C. M., Tischner, E. C., & Putka, D. J. (2002). Two studies examining the negative effect of self-efficacy on performance. *Journal of Applied Psychology*, 87(3), 506-516.
- Vancouver, J. B., Thompson, C. M., & Williams, A. A. (2001). The changing signs in the relationships among self-efficacy, personal goals, and performance. *Journal of Applied Psychology*, 86(4), 605-620.
- Van de Rijt, B., Godfrey, R., Aubrey, C., van Luit, J. E., Ghesquière, P., Torbeyns, J., & Magajna, L. (2003). The development of early numeracy in Europe. *Journal of Early Childhood Research*, 1(2), 155-180.
- Vermeer, H. J., Boekaerts, M., & Seegers, G. (2000). Motivational and gender differences: Sixth-grade students' mathematical problem-solving behavior. *Journal of Educational Psychology*, 92(2), 308-315.

- Veurink, N., & Hamlin, A. (2011). *Spatial visualization skills: Impact on confidence and success in an engineering curriculum*. American Society for Engineering Education.
- Voyer, D., Voyer, S., & Bryden, M. P. (1995). Magnitude of sex differences in spatial abilities: A meta-analysis and consideration of critical variables, *Psychological Bulletin*, 117(1), 250-270.
- Waage, K. (2007). *Intrinsic and extrinsic motivation versus social and instrumental rationale for learning mathematics*. Paper presented at the Proceedings of the 5th Congress of the European Society for Research in Mathematics Education. Lanarca, Cyprus: University of Cypress.
- Wai, J., Cacchio, M., Putallaz, M., & Makel, M. C. (2010). Sex differences in the right tail of cognitive abilities: A 30year examination. *Intelligence*, 38(4), 412-423.
- Walker, R. T. & Guzdial, M. (1999). Collaborative music to motivate mathematics learning. Retrieved May 11, 2012 from <http://guzdial.cc.gatech.edu/cscl99/CSCLjukebox.pdf>
- Wang, J. (2008). Stimulating Students' Motivation in Foreign Language Teaching. *US-China Foreign Language*, 6(1), 30-34.
- Watts, B. K. (2011). *Relationships of mathematics anxiety, mathematics self-efficacy and mathematics performance of adult basic education students*. (Order No. 3449398, Capella University). *ProQuest Dissertations and Theses*, 99.
- Weinstein, C., Palmer, D., & Shulte, A. (2002). *LASSI: Learning and study strategies inventory* (2nd edition). H & H Publishing Inc.
- Wentzel, K. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology*, 90(2), 202-209.
- Wechsler, D. (1999). *Wechsler abbreviated scale of intelligence*. Psychological Corporation.
- Wheatley, G. H. (1998). Imagery and mathematics learning. *Focus on Learning Problems in Mathematics*, 20(2), 65-77.
- Wheatley, M. J. (1992). *Leadership and the new science: Learning about organizations from an orderly universe*. San Francisco: Berrett-Koehler Publishers.

- Wisembaker, J., Scott, J., & Nasser, F. (2000, July/Aug). *structural equation models relating attitudes about and achievement in introductory statistics courses: A comarison of results from the U.S. and Israel*. Paper presented at the 9th on International Congress Mathematics Education, Tokyo, Japan.
- Witt, M. (2012). The impact of mathematics anxiety on primary school children's working memory. *Europe's Journal of Psychology*, 8(2), 263-274.
- Wood, D.A. (1960). *Test construction: Development and interpretation of achievement tests*. Columbus, OH: Charles E. Merrill Books, Inc.
- Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*. 82(1), 81–91.
- Wolters, C. A. (2011). Regulation of motivation: Contextual and social aspects. *Teachers College Record*, 113(2), 265-283.
- Wolters, C. A. (1998). Self-regulated learning and college students' regulation of motivation. *Journal of Educational Psychology*, 90(2), 224-235.
- Yenilmez, K., Girginer, N., & Uzun, O. (2007). Mathematics Anxiety and Attitude Level of Students of the Faculty of Economics and Business Administrator; The Turkey Model. *International Mathematical Forum*, 2(41), 1997- 2021.
- Yildirim, S. (2010). Self efficacy, intrinsic motivation, anxiety and mathematics achievement: Findings from Turkey, Japan and Finland. Necatibey Faculty of Education Electronic. *Journal of Science and Mathematics Education*, 5(1), 277-291.
- Yin, R. K. (2003). *Case Study Research: Design and Methods* (3rd ed.). Thousand Oaks: Sage Publication.
- Yunus, M., Suraya, A., & Wan Ali, W. Z. (2009). Motivation in the Learning of Mathematics. *European Journal of Social Sciences*, 7(4), 93-101.
- Zhang, X., & Chen, S. (2012). Analysis on the influencing factors of spatial learning effect from the perspective of educational communication. International Confernece on Innovation and Information Management (ICIIM 2012).
- Zikmund, W. G. (2003). *Business research methods* (7th ed). Toronto: Dryden Press.
- Zikmund, W. G., & Babin, B. J. (2012). *Essentials of marketing research* (9tb ed.). Cincinnati, OH: South-Western Pub.
- Zikmund, W., Babin, B., Carr, J., & Griffin, M. (2009). *Business research methods* (8th ed.). Cincinnati, OH: South-Western.

- Zimmerman, B. J. (2000). Attaining self-regulation. In Boekaerts, M., Pintrich, P., & Zeidner, M. (2000). *Handbook of self-regulation* (pp. 13-39). San Diego, CA: Academic Press.
- Zimmerman, B. J. (2000). Self-Efficacy: An Essential Motive to Learn. *Contemporary Educational Psychology, 25*(1), 82-91.
- Zimmerman, B. J. (2001). Theories of self-regulated learning and academic achievement: An overview and analysis. In B.J. Zimmerman & D.H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (2nd ed., pp. 1-37). Mahwah, NJ: Erlbaum.
- Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal, 45*(1), 166-183.
- Zimmerman, B. J., Bonner, S., & Kovach, R. (1996). *Developing self-regulated learners: Beyond achievement to self-efficacy*. Washington, DC: American Psychological Association.
- Zimmerman, B. J. & Martinez-Pons, M. (1988). Construct validation of a strategy model of student self-regulated learning. *Journal of Educational Psychology, 80* (3), 284-290.
- Zimmerman, B. J., & Martinez-Pons, M. (1990). Development of a structured interview for assessing students' use of self-regulated learning strategies. *American Educational Research Journal, 23*(4), 614-628.