International Journal of Multidisciplinary Research and Modern Education (IJMRME)
Impact Factor: 6.725, ISSN (Online): 2454 - 6119
(www.rdmodernresearch.org) Volume 3, Issue 2, 2017

STUDENTS' GENDER, LEARNING STYLE, AND DIFFICULTIES IN SOLVING PROBLEMS IN COLLEGE ALGEBRA

Mildred Arellano Sebastian

Assistant Professor, Department of Education and Management Studies, Cavite State University – Tanza Campus, Philippines

Cite This Article: Sebastian, Mildred Arellano, "Students' Gender, Learning Style, and Difficulties in Solving Problems in College Algebra", International Journal of Multidisciplinary Research and Modern Education, Volume 3, Issue 2, Page Number 87-95, 2017.

Abstract:

The study was an attempt to determine the students' level of difficulties encountered in solving problems in college algebra as profiled in their gender and learning style. Difficulties in solving mathematical problems were measured in terms of conceptual and computational difficulties and were classified as to high, average, and low difficulty levels. Two research instruments were prepared: the learning style inventory (LSI) and the diagnostic test (DT) in college algebra. The LSI was adopted from Kolb's Model of Experiential Learning; while the DT was developed and was validated so as to achieve reliability and validity. A total of 84 students who were enrolled in College Algebra were considered in the study. Results revealed that there is significant relationship that exists between gender and preferred learning style; between gender and level of conceptual difficulty; between learning style and level of conceptual difficulty; and between learning style and computational difficulty. Furthermore, most of the female participants preferred the learning style of being converger; while the male students preferred being accommodator. Male and female students have no significant difference in conceptual difficulties; but male students outperformed female students in computational understanding. On the other hand, scores of assimilators in conceptual understanding is significantly higher than convergers; while convergers have higher computational understanding than assimilators.

Key Words: Kolb's Model of Experential Learning, Learning Style, Conceptual Difficulty & Computational Difficulty

1. Introduction:

There is mounting evidence that the way learner processes information affects what is learned and remembered. Within the education environment, identifying students' learning style has often been recognized in the education system. Learners who process information deeply and elaborately should recall more than those who do not According to the depth of processing concept, learning takes place when the learner thinks about the deeper meaning and conceptual associations of new information where depth implies a greater degree of semantic or cognitive analysis. Elaboration, on the other hand, facilitates learning as the learner associates new information with past experiences and knowledge. Thus, the importance of learning style could help understand students' preference of learning that could assist in selecting appropriate instructional methods and educational options. If students' learning style is known, educators could anticipate their students' preferences, take advantage of their strengths and avoid their weaknesses.

On the other hand, students' difficulties arise when students are introduced to new mathematical concepts because they are not ready to exploit these concepts or these concepts are too abstract (Mitchelmore & White, 1995). They may also have difficulty in understanding mathematical meanings and terminology or associating quantitative problem solving with conceptual problems. For this, students must be made aware that the computational aspect of mathematics is utterly dependent on conceptual understanding or vice versa.It is well-acknowledged that education environment is an important element in determining students' ability to reach their fullest quality. That is why; every mathematics teacher contributes to the dictum that for mathematics to be understandable, it has to be enjoyable. On the other hand, it will be a great help for the teachers if students could easily grasp their lessons. However, most teachers find it difficult to attract students' interest especially when students find mathematics a boring and difficult subject. Thus, the need to dig the students' difficulties in solving mathematics problems is indispensable. This way, teachers may introduce appropriate remedy since problem solving difficulties are identifiable and foreseeable.

Determining learning style could also lead to determining students' performance. Hence, if a student's learning style is identified, then he/she is able to adapt his/her learning style to whatever activity he/she is engaged to. This study will also help any teacher to identify the preferred learning style of the students so as to determine his/her performance in terms of problem solving. Once the learning style is identified, difficulties in solving mathematics problems will be minimized.

Problem solving is the foundation of much mathematical ability (Reys, Lindquist, Lambdin, Smith, and Suydam, 2004). It is so important that the National Council of Teachers of Mathematics (NCTM) has identified it as one of the five fundamental mathematical process standards (NCTM, 2000). Therefore, to find gender differences in mathematical problem could lead into determining an effective way of teaching mathematics.

Keefe (1979) as cited by Said & Ghani (2009) defined learning style as a characteristic cognitive, affective, and physiological behaviors that serve as a relatively stable indicator of how individuals perceive, interact with and respond to the learning environment. It is a predisposition to adopt a particular learning strategy involving a particular pattern of information processing activities. The concept of learning style describes individual differences in learning based on the learner's preference for employing different phases of the learning cycle. Because of hereditary equipment, particular life experiences, and the demands of the present environment, a preferred way of choosing among the four learning modes is developed. The conflict between being concrete or abstract and between being active or reflective in patterned, characteristic ways is resolved.

According to Kolb (1984), learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it. Although each individual may have a dominant learning style, it is important to remember that a learning style describes how one learns, not how well he/she learns. No particular style is intrinsically better or worse than another – only different. Understanding the commonalities and differences between one's learning style and those they are working with may be useful in communicating more effectively. It can also give an idea of one's strengths and where he/she can grow.

At first, Kolb showed that learning styles could be seen on a continuum running from concrete experience to reflective observation to abstract conceptualization to active experimentation.

Concrete experience is a receptive, experience based approach to learning that relies for a large part on judgments based on feelings. CE individuals tend to be empathetic and people - oriented. They are not primarily interested in theory; instead they like to treat each case as unique and learn best from specific examples. In their learning they are more oriented towards peers than to authority and they learn best from discussion and feedback with fellow CE learners. CE learners preferred laboratory, field work, videos, and observations.

Reflective observation orientation is a tentative, impartial and reflective approach to learning. They rely on careful observation of others and/or like to develop observations about their own experience. They like lecture format learning so they can be impartial objective observers. They are mostly introverts and preferred self-reflection exercises, journals, and brainstorming.

An analytical, conceptual approach to learning: logical thinking, rational evaluation. These learners are oriented to things rather than to people. They learn best from authority-directed learning situations that emphasize theory. They do not benefit from unstructured discovery type learning approaches. They preferred learning from lectures and papers.

An active, doing approach to learning that relies heavily on experimentation. These learners learn best when they can engage in projects, homework, small group discussion. They do not like lectures, and tend to be extroverts. They are fond of simulations, case studies, and homework.

Kolb further argued that there are four types of learning style, namely, convergent, divergent, assimilative and accommodative.

The convergent learning style relies primarily on the dominant learning abilities of abstract conceptualization and active experimentation. The greatest strength of this approach lies in problem solving, decision-making, and the practical application of ideas. The style works best in situations where there is a single correct answer or solution to a question or problem. The style suggests a preference for task accomplishment or productivity rather than for more socio-emotional experiences.

The divergent learning style has the opposite learning strengths from the convergent. It emphasizes concrete experience and reflective observation. Its greatest strength lies in imaginative ability and awareness of meaning and values. The primary adaptive ability of divergence is to view concrete situations from many perspectives and to organize many relationships into a meaningful "gestalt." The emphasis in this orientation is on adaptation by observation rather than action. It is called divergent because it works best in situations that call for generation of alternative ideas and implications, such as a "brainstorming" idea session. The style suggests a preference for socio-emotional experiences over task accomplishment.

In assimilation, the dominant learning abilities are abstract conceptualization and reflective observation. The greatest strength of this orientation lies in inductive reasoning and the ability to create theoretical models, in assimilating disparate observations into an integrated explanation. As in convergence, this orientation is focused less on socio-emotional interactions and more on ideas and abstract concepts. Ideas are valued more for being logically sound and precise than for their practical values. It is more important that the theory be logically sound and precise.

The accommodative learning style has the opposite strengths from assimilation, emphasizing concrete experience and active experimentation. The greatest strength of this orientation lies in doing things, in carrying out plans and tasks and getting involved in new experiences. The adaptive emphasis of this orientation is on opportunity seeking, risk taking and action. This style is called accommodative because it is best suited for those situations where one must adapt oneself to changing immediate circumstances. In situations where the theory or plans do not fit the facts, those with an accommodative style will most likely discard the plan or theory.

Studies have shown that students could match their learning style to an appropriate activity or environment (Felder, 1995; Said & Ghani, 2009). These studies argued that the greater attention paid to the congruence of learning activities within students' learning style, the better the students will learn. Therefore, the failure to recognize the importance of different learning styles would often lead to students' poor performance.

On the other hand, lack of many mathematics skills caused difficulties in solving problem. Students are required to apply and integrate many mathematical concepts and skills during the process of making decision and problem-solving. Garderen (2006) stated deficiency in visual-spatial skill might cause difficulty in differentiating, relating and organizing information meaningfully. However, the lacked of mathematics skills among students are varied (Hill 2008; Kaufman 2008; Berch & Mazzocco 2007; Garderen 2006; Osmon et al. 2006; Garnett 1998; Nathan et al. 2002). This study looked into five types of mathematics skills.

- ✓ number fact skill (proficiency of number facts, tables and mathematics principal);
- ✓ arithmetic skill (accuracy and logarithm in computational and mathematical working-procedure);
- ✓ information skill (expertise to connect information to a concept, operational, and experience as well the expertise to transfer information and transform problems into mathematical sentence);
- ✓ language skill (proficiency of terms and relevance of mathematical information)
- ✓ visual spatial skill (skill to visualize mathematical concepts, manipulate geometrical shape and space meaningfully).

Conceptual understanding and procedural knowledge are essential to skills in problem solving (Geary, 2004). These skills should be supported by cognitive systems that control focus and interference in information processing. Apart from that, language and visual-spatial skills are also important to interpret and to manipulate information effectively in the working memory. Any obstacle at any levels could lead to difficulties in the process of problem-solving. The difficulties could become cumulative with time. Although, theoretically the age of eleven years old and upwards is the age of formal-operational phase but it varies according to the cognitive maturity. This could influence the degree of difficulties in spite of pedagogical, affective, physiology and psychosocial factors (Dacey & Travers 2006; Carnine 1997). Theoretically, based on Geary (2004) and Garnett (1998), lacked in mathematics skills that could cause difficulties in mathematics especially in problem-solving might be due to interference in cognitive abilities.

Many students struggled to accomplish mathematics especially in problem-solving (Garderen 2006; Zahrah et al. 2003). However, they still need to learn mathematics because of its importance in daily life (Meese 2001; Kaufman 2008; Berch & Mazzocco 2007). They must be able to solve problem because problem solving is important for the development of human competencies (T. Subahan, 2007). In real life, students need to solve problems because that is a basic way to survive in our daily life and mathematics is seen as the language. The primary and secondary mathematics curriculum emphasized on arithmetic, problem-solving, communication, mantic-thinking, connection-building and technology application skills. Mathematics skills such as language, number fact, information and arithmetic are vital in problem-solving. Deficiency in any of these skills could cause difficulties in mathematics skills among students (Hill, 2008).

Studies showed that students felt difficult in mathematics because, they had difficulty understanding and retrieving concepts, formulas, facts and procedure and lacked the ability to visualize mathematics problems and concepts. Weakness in understanding concepts, logic-thinking and lacking of strategic knowledge caused errors in problem-solving (Tay Lay Heong 2005). Occurrence of similar errors signified difficulties. A part from that, error analysis showed that students were lacking in arithmetic and procedure knowledge as a result from weak conceptual understanding. Many students could not bring meaning to the problems and did not know how to plan and perform the problem-solving strategies. However, not many studies emphasized on the difficulties of mathematics problem solving related to mathematics skills deficit. If the difficulties in mathematics skills involved are understood, better programs to overcome the difficulties could be prepared. Moreover, if learning approaches and teaching strategies applied did not fulfill the intellectual needs of the students, these could lead to students' difficulties in learning mathematics. Teachers need to understand students' potential, problems and learning difficulties in order to implement effective teaching strategy and to produce meaningful learning among students (Meese, 2001).

Students' views on the difficulties faced might be a guideline in preparing diagnostics instrument and explicit programs so as to assist this group of students. Understanding of the difficulties faced among students is crucial in preparing meaningful modules and programs. Attention on specific mathematics skills might lead to more meaningful teaching and learning process. However, studies on problem-solving that were interrelated to the mathematics skills are still insufficient even though the understanding of the mathematics skills involved in the mathematics problem solving difficulties is essential.

To better understand how to enhance mathematical thinking and learning in today's students, especially students with math problem solving difficulty, the nature of mathematical knowledge must be understood first. Mathematicians and cognitive scientists appear to agree that conceptual understanding must be present for the development of mathematical literacy and competence. Conceptual understanding includes both declarative and procedural knowledge (Goldman & Hasselbring, 1997). Declarative knowledge can be considered factual knowledge about mathematics like knowing the sum of a pair of addends or identifying and knowing the definition of a mathematical term. It serves as the building blocks for procedural knowledge. Procedural knowledge, on the other hand, can be defined as the rules, algorithms, or procedures used to solve mathematical tasks. For example, the order of operations is a rule for simplifying expressions that have more than one operation.

Many students, despite a good understanding of mathematical concepts, are inconsistent at computing. They make errors because they misread signs or carry numbers incorrectly, or may not write numerals clearly enough or in the correct column. These students often struggle when basic commutation and finding solutions are stressed (Scott, 2004). These inconsistencies which manifest in their computational skills are attributed to their difficulties in mathematical procedure, analysis of problem and performing mathematical operations.

1.1 Research Problem:

The study aimed to determine the students' level of difficulties encountered in solving problems in college algebra as profiled in their gender and learning style.Specifically, the study sought answers to the following questions.

- ✓ What is the students' profile in terms of gender and learning style?
- ✓ What are the level of the students' difficulties in solving problems in college algebra in terms conceptual and computational difficulties?
- ✓ Does student's gender influence his/her preferred learning style?
- ✓ Does student's gender influence his/her level of difficulties in solving problems in college algebra? and
- ✓ Does student's learning style influence his/her level of difficulties in solving problems in college algebra?

2. Methodology:

Two sets of research instruments were prepared in order to determine the goals of the study. The learning style inventory (LSI) adapted from Kolb (1984) was used to determine the learning style of each participant. Also, a diagnostic test (DT) in college algebra was developed in order to explore the students' level of difficulties in problem solving.

Prior to data gathering, the DT was administered to 32 students, who were not included in the list of participants, to ensure that all items were correctly perceived and were content valid accordingly. This was done to avoid misunderstanding and distraction on the part of the students. This way, findings and results will be highly reliable and valid upon achieving the goals of this study. The Cronbach's Alpha coefficients for the conceptual difficulties and the computational difficulties yielded values of 0.884 and 0.852 which indicate that the items included in the diagnostic test were acceptable.

The participants were requested to complete the Learning Style Inventory to develop their Learning Style Profiles by ranking each set of four works in the 10-item test. The participants were asked to assign a 4 to the word that best characterizes their learning style, a 3 to the next best, a 2 to the next and a 1 to the least characteristic word.

The partially correct and incorrect reasons for conceptual items plus the solutions for computational items were analyzed qualitatively. The results were transmuted to standard scores to identify the level of problem solving difficulties.

2.1Criteria for Scoring:

Scores of each student for each item were based on the following scoring system:

Table 1: Criteria for scoring the diagnostic test

Criteria	Score
Incorrect answer, no answer	0
Incorrect answer, partially correct reason	1
Correct answer, incorrect reason	1
Incorrect answer, correct reason	2
Correct answer, partially correct reason	2
Correct answer, correct reason	3

To determine the level of difficulty each student encountered in solving problems in college algebra, their scores on the twenty-item conceptual and computational tests were summed up. Each score of the students for the two tests were converted to standard scores or z-scores. Then, these standard scores were interpreted as follows:

Table 2: Verbal interpretation of z-scores

Z – Scores	Verbal Interpretation
Below -1.00	High-difficulty Level
-1.00 to +1.00	Average-difficulty Level
Above +1.00	Low-difficulty Level

3. Research Results:

Table 3 presents the descriptive statistics of the scores in the diagnostic test administered in the student-participants. These were presented for the two types of exam, namely the conceptual difficulty test and the computational difficulty. These data were used to determine whether a certain student belongs to the classifications of low-difficulty level (LDL), average-difficulty level (ADL), and high-difficulty level (HDL) for the two types of tests. For the conceptual difficulty component, the highest score that a student gained was 23 while the lowest was 5. The average score was 13.61 and the standard deviation was 5.20. On the other hand, for the computational difficulty component, the highest score that a student gained was 25 while the lowest was 4. The average score is 13.33 and the standard deviation was 5.27.

Table 3: Descriptive statistics for the students' scores in the diagnostic tests

Statistics	Conceptual Difficulty Test	Computational Difficulty Test
Highest Score	23	25
Lowest Score	5	4
Arithmetic Mean	13.61	13.33
Standard Deviation	5.20	5.27

Table 4 presents the distribution of the participants in terms of their level of difficulties in solving problems in college algebra. A total of 28 participants (33.33%) were classified to have low-difficulty level in terms of conceptual difficulties in college algebra, 33 participants (39.29%) were found to have average-difficulty while 23 participants (27.38%) were found to have high-difficulty level.

On the other hand, one-fourths of the total participants (25.00%) were found to have low-difficulty level in terms of computational difficulties in college algebra; 48.81% had average-difficulty level while 26.19% had high-difficulty level.

Table 4: Students' level of difficulties in solving problems in college algebra

Difficulties	Frequency(n = 84)	Relative Frequency (%)
Conceptual Difficulties		
Low-difficulty level	28	33.33
Average-difficulty level	33	39.29
High-difficulty level	23	27.38
Computational Difficulties		
Low-difficulty level	21	25.00
Average-difficulty level	41	48.81
High-difficulty level	22	26.19

Table 5 presents the distribution of the students-participants as to their gender and preferred learning style. As presented in the table, more female participants preferred being accommodator, converger, and diverger as their learning style; but there were more male assimilators as compared to female.

Table 5: Distribution of participants in terms of their gender and preferred learning style

Preferred Learning Style	Gender		Total
	Female	Male	
Accommodator	18	6	24
Assimilator	6	12	18
Converger	18	5	23
Diverger	13	6	19
Total	55	29	84

Table 6 presents the comparison of the students' level of conceptual difficulties in solving problems in college algebra based on their gender. For the female students, 17 out of 55 female students have low difficulty, 18 students have average difficulty, and 20 have high difficulty levels. On the other hand, the male students' level of difficulties is divided into 11 for low difficulty, 15 for average difficulty and three for high difficulty levels.

Table 6: Comparison of the students' level of conceptual difficulties in solving problems in college algebra based on their gender

Level of Conceptual Difficulties	Gender		
	Female	Male	Total
Low-difficulty level	17	11	28
Average-difficulty level	18	15	33

High-difficulty level	20	3	23
Total	55	29	84

Table 7 presents the comparison of the students' level of computational difficulties in solving problems in college algebra based on their gender. For the female students, 22 out of 55 female students have low difficulty, 15 students have average difficulty, and 18 have high difficulty levels. On the other hand, the male students' level of difficulties is divided into 19 for low difficulty, seven for average difficulty and three for high difficulty levels.

Table 7: Comparison of the students' level of computational difficulties in solving problems in college algebra based on their gender

Level Of Computational Difficulties	Gender		
	Female	Male	Total
Low-difficulty level	22	19	41
Average-difficulty level	15	7	22
High-difficulty level	18	3	21
Total	55	29	84

Table 8 presents the comparison of the students' level of conceptual difficulties in solving problems in college algebra based on their preferred learning style. For the accommodator and assimilator learning styles, most of the students were found to have average-difficulty level in conceptual difficulties; for converger, it is the low-difficulty level; and for diverger, it is the high difficulty level.

Table 8: Comparison of the students' level of conceptual difficulties in solving problems in college algebra based on their learning style

Level of Conceptual Difficulties	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
Low-difficulty level	7	4	11	6
Average-difficulty level	11	12	6	4
High-difficulty level	6	2	6	9
Total	24	18	23	19

Table 9 presents the comparison of the students' level of computational difficulties in solving problems in college algebra based on their preferred learning style. For the accommodator and divereger learning styles, most of the students were found to have average-difficulty level in conceptual difficulties; for converger, it is the low-difficulty level; and for assimilator, it is from average to high difficulty level.

Table 9: Comparison of the students' level of computational difficulties in solving problems in college algebra based on their learning style

Level of Computational Difficulties	Learning Style			
	Accommodator	Assimilator	Converger	Diverger
Low-difficulty level	7	2	11	1
Average-difficulty level	13	8	8	12
High-difficulty level	4	8	4	6
Total	24	18	23	19

Table 10 presents the results of the tests of association conducted to determine whether the student's gender, preferred learning style and difficulties in solving problems in college algebra influenced one another. Since categorical data were involved, these data were tested using the Chi-square test of association. From the said table, it can be seen that all pairs of variables were significant under the 5% level of significance. This means that each paired variables influenced each other. That is, student's gender influence his/her preferred learning style, student's gender influence his/her difficulties in solving problems in college algebra, and student's learning style influence his/her difficulties in solving problems in college algebra.

Table 10: Chi-square matrix the variables involved

Variables	Variables	
	Gender	Learning Style
Gender	-	-
Learning Style	10.926*	-
Conceptual Difficulties	6.720*	13.159*
Computational Difficulties	6.409*	15.261*

* – significant at $\alpha = 5\%$

Since associations among the variables were present, it is interesting to note where these associations can be accounted to. Table 11 presents the proportion of male and female participants' preferred learning style and their level of difficulties in solving problems in college algebra. It can be seen that most of the female participants preferred the learning styles of accommodator or converger; while the male students preferred being assimilator. For conceptual difficulties, female students have high difficulty level while male students have average difficulty level. But for computational difficulty, both the male and female students have low difficulty level.

Table 11: Proportion of male and female as to their preferred learning style and level of difficulties

Variables	Proportion (%)	
	Female (n_1 = 55)	Male (n_2 = 29)
Learning Style		
Accommodator	32.73	20.69
Assimilator	10.90	41.38
Converger	32.73	17.24
Diverger	23.64	20.69
Conceptual Difficulties		
Low difficulty level	30.91	37.93
Average difficulty level	32.73	51.72
High difficulty level	36.36	10.34
Computational Difficulties		
Low difficulty level	40.00	65.52
Average difficulty level	27.27	24.14
High difficulty level	32.73	10.34

Table 12 presents the proportion of the participants' preferred learning style and their level of difficulties in solving problems in college algebra. For conceptual difficulties, students who were classified to be accommodator and assimilator tend to have average difficulty level; while converger have low difficulty level and diverger have high difficulty level.

On the other hand, for computational difficulty, both the accommodator and diverger have average difficulty level; while convergers have low difficulty level. Assimilators tend to have average to high difficulty level.

Table 12: Proportion of preferred learning style and level of difficulties

Variables	Proportion (%)			
	Accommodator (n_1 = 24)	Assimilator (n_2 = 18)	Converger (n_3 = 23)	Diverger (n_4 = 19)
Conceptual Difficulties				
Low difficulty level	29.17	22.22	47.82	31.58
Average difficulty level	45.83	66.67	26.09	21.05
High difficulty level	25.00	11.11	26.09	47.37
Computational Difficulties				
Low difficulty level	29.17	11.11	47.82	5.26
Average difficulty level	54.17	44.44	34.79	63.16
High difficulty level	16.66	44.44	17.39	31.58

4. Conclusion:

The findings of this study is enough to say the following generalizations:

- ✓ Student's gender could influence his/her preferred learning style. Female participants preferred the learning styles of accommodator or converger; while the male students preferred being assimilator.The results of the studies of Philbin, M., Meier, E., Huffman, S., & Boverie P., (1995); Loo, (2002); Draper (2004) revealed that gender was an indicator of learning style is also similar to the findings of this study.
- ✓ Student's gender could influence his/her level of difficulties in solving problems in college algebra. For conceptual difficulties, female students have high difficulty level while male students have average difficulty level. But for computational difficulty, both the male and female students have low difficulty level. Moreover, a large body of literature reports that there are gender differences in mathematical problem solving favoring males (Zhu, 2007). This is equivalent into saying that the gender of the participants could influence his mathematical problem solving skills that has been established in this study.
- ✓ Student's learning style could influence his/her level of difficulties in solving problems in college algebra. This is in consonance with the findings of Eksi (2006) in his study of the relationship between learning styles and problem solving skills among college students.Furthermore, this study provided that for conceptual difficulties, students who were classified to be accommodator and assimilator tend to have average difficulty level; while converger have low difficulty level and diverger have high difficulty level. For computational difficulty, both the accommodator and diverger have average difficulty level; while convergers have low difficulty level. Assimilators tend to have average to high difficulty level.

Understanding the correlations between and among students' gender, learning style, and difficulties in solving problems is one of the key responsibility of the teacher. This understanding will allow the teacher to modify his teaching-learning to cope with the needs of 21st century learner. The teacher may vary his/her teaching techniques that would conform to the learning style preferences of their students. Others may improve their instructional materials, lesson plans and techniques of test construction, conforming to a learner-centered environment to minimize difficulties.

5. Acknowledgement:

The author wishes to thank Dr. Dinah L. Espineli and Dr. Cristina M. Signo for allowing the research to conduct the study in the college students. Also, she wishes to express her deepest gratitude to Ms. Purelyn M. Umpay, Ms. Joy S. Gutang, and Mr. Dandy G. Soriano for helping her collect data necessary to complete the study.

6. References:

1. Berch, D. B. & Mazzocco, M. M. M. (2007). Why is math so hard for some children? The nature and origins of mathematical learning difficulties and disabilities. Maryland: Paul H. Brookes Publishing Company.
2. Carnine, M. (1997).Instructional design in mathematics for student with learning disabilities. Journal of learning disabilities, 30: 130 – 141.
3. Dacey, J. S. & Travers, J. F. (2006).Human development across the lifespan.6th edition. Boston: McGraw Hill.
4. Draper, S. R. P. (2004). The effects of gender grouping and learning style on student curiosity in modular technology education laboratories.Unpublished dissertation.Virginia Polytechnic Institute and State University.
5. Eksi, H. (2006, January). The relationship between learning styles and problem solving skills among college students. Educational Sciences, 6(1): 255 – 264.
6. Felder, R. (1995). Learning and teaching style preferences of community mental health professionals. Community Mental Health Journal, 11(4): 450 – 461.
7. Gallagher, A. M., DeLisi, R., Holst, P. C., McGillicuddy-DeLisi, A. V., Morely, M. & Cahalan, C. (2000).Gender differences in adavanced mathematical problem solving. Journal of Experimental Child Psychology, 75: 165 – 190.
8. Garderen, D. V. (2006). Spatial visualization, visual imaginary and mathematical problem solving of students with varying abilities. Journal of learning disabilities, 39(6): 496 – 506.
9. Garnett, K. G. (1998). Math Learning Disabilities.Journal of CEC.Retrieved on June 24, 2013 from http://www.idonline.org/ld_indepth /math_skill/garnet.html.
10. Geary, D. C. (2004).Mathematical and learning disabilities. Journal of learning disabilities, 37(1): 4 – 15.
11. Goldman, S. and Hasselbring, T. (1997).Achieving meaningful mathematics literacy for students with learning disabilities. Journal of Learning Disabilities, 30 (2): 198 – 208.
12. Halpern, D. F. (2000).Sex differences in Cognitive abilities (3rd Ed.). Mahwah, New Jersey: Lawrence Erlbaum Associates.
13. Hill, B. (2008). Cognitive skills and mathematical skills.21st century skill. Retrieved June 24, 2013 from
14. http://www.21stcenturyskills.org/route21/index.php?option=com_ilibrary
15. Kaufman, L. (2008). Dyscalculia: Neuroscience and education. Journal of Education Research, 50(2): 163 – 175.
16. Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Englewood Cliffs, NJ: Prentice Hall.
17. Kolb, D. A. (2000).Facilitator's guide to learning. Boston: Hay/McBer.
18. Loo, R. (2002).The distribution of learning styles and types for hard and soft business majors. Educational Psychology, 22(3): 349 – 360.
19. Meese, R. L. (2001). Teaching learners with mild disabilities integrating research practice. Singapore: Wadworth Thomson Learning.
20. Mitchelmore, M. & White, P. (1995). Abstraction in mathematics: Conflict resolution and application. Mathematics education research journal, 7(1): 50 – 68.
21. Nathan, V., Lauren, Sarah, L., Adam, & Nathan, S. (2002). Difficulties with math: what can stand in the way of a students' mathematical development. Misunderstood minds.Retrieved June 24, 2013 from http://www.misunderstoodmind/math_skill.
22. National Council of Teachers of Mathematics (2000).Principles and Standards for School Mathematics. Reston, VA: National Council of Teachers of Mathematics

23. Osmon, D. C., Smerz, J. M., Braun, M. M. & Plambeck, E. (2006). Processing abilities associated with math skills in adult learning disability. Journal of clinical and experimental neuropsychology, 28: 84 – 95.
24. Pajares, F. (1996).Self-efficacy beliefs and mathematical problem-solving of gifted students. Contemporary Educational Psychology, 21: 325 – 344.
25. Philbin, M., Meier, E., Huffman, S., & Boverie P. (1995).A survey of gender and learning styles. A Journal of Research, 32(7 – 8): 485 – 495.
26. Reys, R., Lindquist, M., Lambdin, D., Smith, N., and Suydam, M. (2004). Helping children learn mathematics (6th ed). New York: John Wiley & Sons, Inc.
27. Said, J. and Ghani, E. K. (2009). The effect of course selection and course experience on students' learning style preference. European Journal of Social Sciences, 10(1): 74 – 84.
28. Scott, W. (2004). Learning difficulties and learning disabilitis: Identifying an issue – the issue of identification. Learning Difficulties: Multiple Perspectives (pp. 1-15). French Forrest, NSW: Pearson Australia.
29. T. Subahan, (2007). Problem solving and human capital.Proceedings of the third international conference on research and education in mathematics (ICREM3). INSPEM: Universiti Putra Malaysia.
30. Tay Lay Heong, (2005). Problem solving abilities and strategies in solving multistep mathematical problems among form 2 students. Kertasprojeksarjana.University Malaya.
31. Zhu, Z. (2007). Gender differences in mathematical problem solving patterns: A review of literature. International Education Journal, 8(2): 187 – 203.