Cross-Age Tutoring: Its Effects on High Performing Students and Students At-risk with Learning Disability in Mathematics

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Abstract

This study aimed to determine the effects of cross-age tutoring on high performing students and students at-risk with learning disabilities in Mathematics. The study reveals that compared to students in the control group, students in the experimental group shows higher increase both in cognitive and non-cognitive factors. The significant differences posted between the control and experimental groups of both high performing students and at-risk students are sufficient evidence to show that cross-age tutoring is an effective intervention to improve the cognitive and non-cognitive aspects of involved students.

Generally speaking, no significant relationships were found between cognitive and non-cognitive factors. This could be attributed to the homogeneity of the group. However, despite range restriction, the slight to substantial although not significant relationships posted between cognitive and non-cognitive factors can be considered as encouraging results that deserve to be examined in the future.

1. Introduction

The United Nations Educational, Scientific and Cultural Organization (UNESCO) underscore that education is not simply about making schools available for those who are already able to access them. Instead, it is also about being proactive in identifying the barriers and obstacles encountered by learners in attempting to access opportunities for quality education, as well as in removing those barriers and obstacles that lead to exclusion. The pledge of international community composed of governments, development agencies, civil society and the private sector to work together to reach the goals of Education for All (EFA) movement, which is to provide quality basic education for all children further support the idea of meeting the learning needs of all children.

Thus, the availability of scientifically based instructional practices which address the needs of all students, including those who are not functioning on grade level is crucial in meeting the goals of Education for All movement. Availability of research-supported practices applicable in classrooms as well as in schools as a whole, validated in the settings where it is to be implemented will facilitate access to the general education curriculum for struggling students most importantly those with special education needs.

The Department of Education in the Philippines acknowledged that learning gaps varies across students; thus, interventions that may have to be provided should be tailored to individual learning needs. The said department further recommended cross-age tutoring as one form of interventions that can be provided to students.

Tutoring takes and builds on one of the better aspects of human nature and values as well, which is our capacity and willingness to help each other, making it as one of the learning tool for both tutors and tutees, as well as an instrument for building positive interpersonal relationships among children.

It is precise for educational institutions to ensure that right attitude is being developed since it helps students to stay motivated towards their studies and react constructively to their learning experiences. Thus, a teaching strategy and intervention programs, which provides a learning environment that equip students with both necessary knowledge and skills and positive attitude will be more beneficial.

Education communities have the same opinion that students experiencing learning difficulties with academics need extra support and individualized attention. Individualized instruction caters to different learning styles and provides feedback and encouragement that are tailored to the learner's specific needs. This support could be given not only by teachers and school administrators but by high performing students in the school as well through cross-age tutoring.

The generally poor performance of the Filipinos in Mathematics as revealed by the 2003 Trends in International Mathematics and Science Study, the prevalence of arithmetic disability which is estimated to be at least 5% to 8% of the general population [1], and the current trends on the use of the different Response-to-Intervention Models as an alternative method in identifying children with special needs, prompted the researcher to conduct a study on Cross-Age Tutoring as a

prevention and early intervention model in the general education classroom prior to referral for special education.

This study established the effectiveness of cross-age tutoring in enhancing students' scholastic performance in Mathematics, their academic self-concept, and their attitude towards Mathematics. The outcome of this study are highly significant to teachers as it will provide them with an effective strategy that they may use in the classroom with diverse sets of students. The benefits derived from information about the effects of cross-age tutoring likewise provide academic administrators with an effective intervention strategy that can be adopted school-wide to generate improved attitude and performance among students as well as in developing school policy on the use of validated RTI model in identifying students with learning disabilities in Mathematics.

This study aimed to determine the effects of cross-age tutoring on high performing students and students at-risk with learning disabilities in Mathematics in Tinago National High School, Naga City, Philippines, S/Y 2012-2013.

Specifically, it sought to answer the following questions: 1) Are there significant differences between the control and experimental groups along cognitive and non-cognitive factors? 2) Is there a significant correlation between the cognitive and non-cognitive factors?

2. Brief review of literature

Tutoring works on cognitive as well as on emotional and social competence of the learner.

One-to-one tutoring has long been recognized as superior to group instruction, especially for students with special needs. Tutoring can adapt instruction to the learner's pace, learning style, and level of understanding. Feedback and correction are immediate and basic misunderstandings can be quickly identified and corrected [2].

Tutoring involves one student having responsibility for assisting another student/s in the learning process. Peer tutoring is widely used as an umbrella term for tutoring, encompassing two of its three types. Gaustad (1993) defined peer tutoring as a one-on-one teaching process in which the tutor is of the same general age, grade, or academic status as the tutee. When the tutor is an older student, cross age tutoring is the appropriate term to use. The other type of tutoring is the parent/volunteer tutoring, where adults outside the school tutor students [3].

In cross-age tutoring, student pairings may include a variety of combinations such as elementary students with high school students or older students with younger students. It has been also applied to students with varying disabilities [4]. In fact, Okilwa and Shelby [5] reported that cross-age tutoring is effective for special education students in both general education and special education settings.

Tutoring has emotional as well as cognitive benefits. Kalkowski [6] pointed three commonly cited benefits of cross-age tutoring to both tutor and tutee: the learning of academic skills, the development of social behaviors and classroom discipline, and the enhancement of peer relations.

The heart of tutoring is diagnostic/prescriptive interaction — a cycle of assessment, feedback, and tailored instruction. In the one-on-one tutor-tutee relationship, learners have ample opportunities to practice vocabulary building, review, repetition, questioning, and other strategies focused on achievement without being compared to others [4].

Several types of cross-age tutoring programs has been implemented and obtained positive results. However, U.S. Department of Education stressed that a high quality tutoring program includes well-structured sessions, regular sessions, and monitoring and reinforcement of learners' progress. Considerations for developing tutoring programs includes target age groups, subject, and goals, resources (people, facilities, time, money), recruitment of tutors and matching with tutees, ongoing tutor training and support, and evaluation plan.

Wasik and Slavin as cited by Kerka [7] states that tutees whose tutors participated in ongoing, intensive training throughout their participation outperformed tutees whose tutors did not complete the ongoing training sessions. The importance of tutor training is reinforced by several other studies, which provide specific advice on the types of training that yield the best results. Jenkins & Jenkins as cited by Kerka [7] point to the importance of training in interpersonal skills so tutors do not become impatient with tutees. Furthermore, Warger in Kerka [7] says training should include strategies for reinforcing correct responses and properly correcting incorrect responses.

Rigorous evaluations of tutoring programs reported positive results for programs whose tutoring sessions ran from 10 to 60 minutes in length, although longer sessions did not necessarily result in better outcomes [7]. Tutoring programs in which tutors met with tutees at least three times a week were more likely to generate positive achievement for tutees than programs in which tutors and tutees met twice a week [7]. It is interesting to note that a meta-analysis of cross-age tutoring indicated that longer tutoring programs were not necessarily better for academic outcomes than shorter ones [3].
When a tutor knows his/her own Learning Style and the tutee's Learning Style, the tutor can better choose a modality to provide more successful tutoring. Tutors have a tendency to provide tutoring to paired students from their own perspective of how they learn. Tutors need to gear this interaction to how the student learns: Visual, Auditory, or Kinesthetic.

Rewards are a powerful motivator for student performance, especially when students feel like they have some control over their outcomes. Programs that include both rewards and autonomy (autonomy in choosing rewards and autonomy in monitoring progress) seem to be especially effective in promoting positive tutoring outcomes for tutees and tutors [3].

High quality tutoring programs provide appropriate opportunities for parents or guardians and families to get involved with student learning. Strategies for family involvement may include help for parents and/or family members to support learning at home, volunteer opportunities for families, and opportunities for families' concerns to be heard through advisory committees or group meetings [7]

3. Methodology and research design

This study used both experimental method and descriptive-correlation method, involving two groups of students, the control and experimental group. The experimental and control group were composed of both fourth year high performing students and grade 7 students who are at-risk with learning disabilities in Mathematics. Cross-age tutoring program was implemented in the experimental group wherein fourth year high performing students tutored grade 7 students who are at-risk with learning disabilities in Mathematics. However, the control group went through their lessons without any involvement in the cross-age tutoring program or any other similar program.

In the experimental group, fourth year high performing students (tutors) attended a one-day orientation on how to deal with their tutees (grade 7 students) academically, psychologically, and socially. Learning styles of both the tutees and tutors was considered in their pairing in the study. Fixed schedule and venue was followed in conducting the tutoring sessions three times a week. Incentives in a form of school supplies donated by the Naga City School Board were also given to tutors and tutees who religiously attend every tutoring session. Parents permit was sought for the experimental group.

To determine the cognitive effects of the cross-age tutoring program, first to fourth quarter grades of students in the experimental and control group were compared. Similarly, first to fourth quarter examination results in Mathematics of the control and experimental group were also compared.

A pre-survey and post-survey on attitude towards Mathematics and students' level of academic self-concept was conducted to determine the non-cognitive effects of the cross-age tutoring program to fourth year high performing students and grade 7 students at-risk with learning disabilities in Mathematics.

3.1 Respondents

The respondents of the study were the fourth year high performing students and grade 7 students who are at-risk with learning disabilities in Mathematics enrolled in Tinago National High School, Naga City, Philippines during the school year 2012-2013. Mathematics teachers from the elementary grades and current teachers of grade 7 students also served as the respondents of this study in identifying students at-risk with learning disabilities in Mathematics.

The study used both probability sampling and non-probability sampling in determining the respondents and assigning members of the control and experimental groups. Purposive sampling has been used to determine the high performing students and students at-risk with learning disabilities in mathematics while, simple random sampling has been used to assign students in the control and experimental groups.

To determine the grade 7 students who are at-risk with learning disabilities in Mathematics, evaluation of educational record from the elementary to the first grading period in grade 7 were conducted. Furthermore, their scores in the National Achievement Tests and Mathematical Ability Test in school entrance examination

were also considered. The Rating Scale for Teachers (RST) on Learning Disability developed by the Special Education Division [8] of the Department of Education was utilized to establish the characteristics of the child at-risk with learning disability in Mathematics. Those who pass the screening process will be further subjected to an informal assessment in mathematics using instruments developed by the Special Education Division of the Department of Education. Grade 7 students who were considered as students at-risk with learning disabilities in Mathematics served as subjects in this study. Fifty percent (50%) of these students served as tutees in the cross-tutoring program, while the remaining fifty percent (50%) continued their studies in the usual manner in the classroom without the assistance of fourth year tutors.

Likewise, to determine the high performing fourth year students, records from first to third year high school were evaluated. Scores in Mathematical Ability Test in the National Career Assessment Examination (NCAE) was also considered. Fourth year students who belonged to the top 20 % were considered in this study. Part of these fourth year students were paired to selected tutees and served as tutors in the cross-age tutoring program, while the other part were not involved in the program.

3.2 Instruments

This study used questionnaires, observation checklist, informal interviews, and some readings to verify the validity of some responses. The questionnaires used have three (3) parts, namely; Part I which solicited answers on the attitude of the respondents towards Mathematics. Part II was the questions which measured the level of academic self-concept of the respondents, and Part III determined the learning styles of each respondent.

Part I and Part II of the instrument used a 5-point Likert scale to determine points that best described the variables. For part I, the instrument of Layones [9] for the attitude towards Mathematics was adopted by the researcher. This instrument registered overall internal consistency coefficients of 0.87, which can be taken as indicating adequate reliability for the whole scale. However, the behavioral and cognitive components which were reported to have questionable and poor reliability were still adopted because the items measured psychological constructs.

For part II, The Academic Self-Concept Questionnaire (ASCQ) developed by Liu and Wang [10] was adopted in this study to measure the level of academic self-concept of the respondents. The ASCQ is composed of two 10-item subscales: students' academic confidence (10 items) and students' academic effort (10 items). The academic confidence (AC) subscale assessed students' feelings and perceptions about their academic competence, while the academic effort (AE) subscale assessed students' commitment to and involvement and interest in schoolwork. A Rasch analysis using case estimate scores based on the second binary answer of the ASCQ, shows that the academic self-concept scale has been found to be valid with students with learning disabilities. Rasch analysis of the ASCQ also confirms the unidimensionality of the instrument, which means that only a single construct is measured by items in a scale[11].

The Index of Learning Styles (ILS) was adopted and served as the Part III of the questionnaire. This instrument was created in 1991 and was revised in 1994 by Richard M. Felder and Barbara Soloman of North Carolina State University [12]. Several analyses of responses to the Index of Learning Styles have been published. The principal results that bear on the reliability and validity of the instrument are as follows [13]; test-retest correlation coefficients for all four scales of the ILS varied between 0.7 and 0.9 for an interval of four weeks between test administrations and between 0.5 and 0.8 for intervals of 7 months and 8 months. All coefficients were significant at the 0.05 level or better. Internal consistency reliability of the ILS using Cronbach's alpha coefficients were all greater than the criterion value of 0.5 for attitude surveys in three of four studies. Internal consistency reliability refers to the homogeneity of items intended to measure the same quantity, that is, the extent to which responses to the items are correlated. Tuckman as cited by Felder [13] suggests that an alpha of 0.75 or greater is acceptable for instruments that measure achievement and 0.5 or greater is acceptable for attitude assessments.

The researcher personally administered the instrument to the respondents. To establish rapport and cooperation from respondents, he was around to clarify directions in answering the questionnaire. Informal interviews were also conducted after the distribution and retrieval of questionnaires.

The Rating Scale for Teachers (RST) on Learning Disability and informal assessment in Mathematics developed by the Special Education Division [8] of the Department of Education was also utilized by the researcher to establish the characteristics of the child leading to a learning disability.

3.3 Statistical treatment

The APA recommendations in reporting statistics were adopted in the research. In testing significant differences between means of both independent and dependent variables, the p-value together with its corresponding t-value was used. Effect size was also computed and reported in the results. To determine the significant correlation between the cognitive factors and non-cognitive factors in the performance of the students, Spearman's Rank Correlation Coefficient (rs) was used.

4. Results and discussions

The researcher hypothesized that cross-age tutoring can be used to improve more the cognitive and non-cognitive aspects of both high performing students and students at-risk with LD in Mathematics. It is further hypothesized that cognitive and non-cognitive factors considered are significantly related.

In terms of scholastic performance in Mathematics, findings shows that final rating of the control and experimental groups of at-risk students differed significantly according to Welch's *t*-test, $t(18)= -3.734$, $p<0.01$. On average, the control group received a final rating of 73.15, while the experimental group got a higher final rating of 77.73 in Mathematics. The effect size is considered large based on the result of Cohen's *d* test which is equal to 1.672. However, the scholastic performance of the control and experimental group of fourth year high performing students seems to be insignificantly different due to the Welch's *t*-test result of $t(18)= -0.514$, $p>0.05$. The

effect size is also small based on the Cohen's *d* value of 0.230. However, the average final rating of the experimental group is 86.1, which is slightly higher than the 85.2 average final rating of the control group.

The scores in Mathematics quarterly tests of the control and experimental group of both high performing and at-risk students are not significantly different. Findings reveal that out of 30 items test, the control group of high performing students scored on the average of 21.55 while the experimental group scored slightly higher on the average of 22.78. Welch's *t*-test result is $t(18) = -0.170$, $p > 0.05$ and the Cohen's *d* value is 0.291 which is considered small effect. Similarly, the Welch's *t*-test result of $t(18) = -1.664$, $p > 0.05$ between the control and experimental group of at-risk students show that their scores in Mathematics quarterly tests are not significantly different. However, the effect size is considered medium based on the 0.744 Cohen's *d* result. The average score of the experimental group of at-risk students is 11.18 which is considerably higher than 9.13 average score of the control group.

Generally speaking, the significant to slightly higher scholastic performance in Mathematics and scores in Mathematics quarterly tests among the experimental participants seem to provide evidence to declare that cross-age tutoring was able to yield positive effects on the improvement of cognitive factors of both tutors and tutees. This result corroborates what previous researchers have found in terms of cognitive benefits of tutoring. The literature is replete with studies showing that one-to-one tutoring is recognized as an effective intervention to improve the academic performance of the learner (Gaustad, 1993[2]; Kalkowski, 1995[6]; Presbitero, 2002[14]; Okilwa & Shelby, 2010[5]).

Using Welch's *t*-test, findings reveals that the control and experimental groups of both high performing and at-risk students were not significantly different before the experiment in terms of Attitude towards Mathematics and Academic Self-Concept herein referred to as non-cognitive factors. However, the study indicates a more improved attitude towards mathematics among experimental group compared with the control group after implementing cross-age tutoring. This is borne out by the fact that $t(18) = -2.463$, $p < 0.05$ and $t(18) = -3.152$, $p < 0.01$ was computed showing significant difference between the experimental and control group of high performing students and at-risk students, respectively. Significant difference on the gains in attitude towards mathematics between the control and experimental group of high performing students was also computed as revealed by the Welch's *t*-test result of $t(18) = -1.875$, $p < 0.10$. Although the gains in attitude towards mathematics was found to be insignificantly different between the control and experimental group of at-risk students, the computed Cohen's *d* of 0.541 shows that still cross-age tutoring has medium effect on this factor. Notwithstanding, these results supports the researcher's hypothesis.

The improvement in attitude towards mathematics among the experimental group indicates that aside from cognitive effects, cross-age tutoring has emotional benefits as well. This result substantiate what previous studies have reported (Gaustad, 1993[2]; Kalkowski, 1995[6[; Abalayan, 2006[15]). Layones [9] stressed that affective dimension in Mathematics which include beliefs, emotional reactions, and attitude plays a vital role in the teaching and learning process. Thus, improving the

emotional characteristics of the learner such as their attitude towards the subject is as important as improving their cognitive and academic traits.

In terms of academic self-concept, the control and experimental group of high performing students shown to be significantly different based on the Welch's *t*-test on post-survey and gains result of $t(18)= -2.463$, $p< 0.05$ and $t(18)= -3.080$, $p<0.01$, respectively. However, it is interesting to note that no significant differences were computed on the post-survey and gains in academic self concept of the control and experimental groups of at-risk students as shown by Welch's *t*-test result of $t(18)=0.372$, $p> 0.05$ and $t(18)=0.128$,$p>0.05$, respectively. This implies that cross-age tutoring significantly improved the academic self-concept of the tutors but failed to improve the same variable in the tutees. These results partially support the researcher's hypothesis.

The researcher's findings support the foregoing literature and studies that tutoring works on social competence as well (Gaustad, 1993[2]; Abalayan, 2006[15]). The work on emotional and social competence and well-being such as tutoring has wide range of educational and social benefits, including improved behavior, increased inclusion, increased social capital and improvement to mental health, to name a few [16]. Due to the significant impact of academic self-concept has on person's life; fostering positive self-concept development in children should be an important goal of any educational system.

This study also investigated on the relationship between cognitive and non-cognitive factors. As revealed, only the control group of high performing students showed a significant correlation between scholastic performance in Mathematics and Academic Self-Concept based on the computed Spearman's Rank Correlation coefficient (rs) of 0.67, $\alpha = 0.05$. However, this relationship was found to be substantial (rs=0.45) but not significant in the experimental group of at-risk students. Slight relationship between these variables was noticed in the experimental group of high performing students and control group of at-risk students with a computed correlation coefficient of 0.30 and 0.27, respectively. Albeit, this result partially supported the researcher's hypothesis and uphold the educators increasing awareness that a students' perception of him/herself may have a significant influence on his/her academic performance in school.

Substantial but not significant relationship (rs=0.55) between the variables scholastic performance in mathematics and the attitude towards this subject was found in the control group of high performing students. This relationship was found to be slight (rs=0.20) in the experimental group of high performing students and negligible in the control group (rs= -0.08) and experimental group (rs= -0.15) of at-risk students. This result did not support the researcher's hypothesis and contradicts with the findings of previous studies which shows significant relationships between scholastic performance in Mathematics and attitude towards the subject (Bare, 2010[17]; Balisoro, 2011[18]).

The relationship between scores in mathematics quarterly test and attitude towards the subject was also tested. Table 4 further reveals that the relationship between these variables was found to be substantial (rs=0.53) in the control group of high performing students, negligible (rs=0.05) in the experimental group of high

performing students and slight in the control group (rs= -0.33) and experimental group (rs= -0.28) of at-risk students. All of these computed correlation coefficient were found to be insignificant at 0.05 alpha level. Similarly, insignificant relationships were also found between the variables scores in mathematics quarterly test and academic self-concept. The computed correlation coefficient were all considered negligible in the control (rs=0.14) and experimental (rs= -0.08) group of at-risk students. Slight relationship (rs=0.25) was found in the experimental group of high performing students and a substantial (rs=0.45) but not significant relationship was posted in the control group of high performing students.

Summarizing, the relationship between the scholastic performance in mathematics and academic self-concept was found to be significant among the control group only of high performing students. However, no further significant relationships were found between other cognitive and non-cognitive factors both in the control and experimental groups of either high performing students or at-risk students. These low correlation computed could be attributed to the homogeneity of the group. However, despite range restriction, the slight to substantial but not significant relationships posted between cognitive and non-cognitive factors can be considered as an encouraging results that deserve to be examined in the future.

5. Conclusions

On the basis of the foregoing results and interpretations, there seems to be sufficient evidence to conclude that cognitive and non-cognitive factors of both high performing students (tutors) and at-risk students (tutees) is positively affected by the implementation of cross-age tutoring. The experimental group were found to have slightly higher to significantly different improvements in scholastic performance in Mathematics, scores in Mathematics quarterly test, attitude towards Mathematics and academic self-concept. Thus, this paper suggests that schools can take concrete steps to institutionalize a program implementing cross-age tutoring involving high performing students in the upper level as tutors and at-risk students in the lower level as tutees. Authorities in the division level can initiate a division wide implementation of a program involving cross-age tutoring.

In addition, further interventions and examinations should be done to those students who will not demonstrate the same improvement shown by the experimental participant in this research since these students might be eligible to receive special education services. On the other hand, future studies that will examine further the relationship between the cognitive and non-cognitive factors should also be conducted.

6. References

[1] Deborah Deutsch Smith and Naomi Chowdhuri Tyler. "Introduction to Special Education: Making a Difference," 7th ed. (New Jersey: Pearson Education, Inc. , 2010), p. 166

[2] Joan Gaustad, "Peer and Cross-Age Tutoring," ERIC Digest, University of Oregon, 1993

[3] Debbie R. Robinson and Janet Schofield, "Peer and Cross-age Tutoring: Outcomes and Their Design Implications," Department of Psychology, University of Pittsburgh, 2004

[4] The Access Center, "Using Peer Tutoring for Mathematics," The American Institute for Research, September, 2004

[5] Nathern S. A. Okilwa and Liz Shelby, "The Effects of Peer Tutoring on Academic Performance of Students with Disabilities in Grades 6 Through 12: A Synthesis of the Literature," Hammill Institute on Disabilities and SAGE Publications, 2010

[6] Page Kalkowski. "Peer and Cross-Age Tutoring," School Improvement Research Series, U.S. Department of Education. 1995

[7] Sandra Kerka, "Tutoring," Learning Work Connection, The Ohio State University, 2007

[8] Special Education Division. "Educational and Psycho-Diagnostic Screening and Assessment of Children with Learning Disabilities," Bureau of Elementary Education, Department of Education, Manila, Philippines, 2006

[9] Romeo C. Layones. "Cognitive Apprenticeship: Its Effect on Stdent's Attitude Towards Mathematics and Performance in College Algebra," (Unpublished Master's Thesis, University of Nueva Caceres, March, 2009).

[10] Liu, W. C. & Wang, C. K. J. (2005). Academic self-concept: A cross-sectional study of grade and gender differences in a Singapore Secondary School. *Asia Pacific Education Review, 6*(1)*,* 20-27.

[11] Joyce Bei Yu Tan & Shirley M. Yates, "A Rasch Analysis of the Academic Self-Concept Questionaire" *International Education Journal*, 2007, 8(2), 470-484.

[12] Richard M. Felder and Barbara A. Soloman. "Index of Learning Styles," North Carolina State University, 1994

[13] Richard M. Felder and Joni Spurlin. "Applications, Reliability and Validity of the Index of Learning Styles," International Journal of Engineering Education, Vol.21, No.1, pp. 103-112, 2005

[14] Nelia Presbitero " Peer Tutoring and Mathematics Achievement" (Unpublished Master's Thesis, University of Nueva Caceres, March, 2002).

[15] Joseph Pepito Abalayan " Peer Tutoring: its effectiveness in the teaching of elementary algebra" (Unpublished Master's Thesis, University of Nueva Caceres, October 2006)

[16] Norah Frederickson and Tony Cline. "Special Educational Needs, Inclusion and Diversity," 2nd ed. (New York: Open University Press, McGraw Hill Company, 2009) p. 455-456

[17] Arniel Cavite Bare "Non-intellective characteristics of fourth year high school students and their mathematics performance" (Unpublished Master's Thesis, University of Nueva Caceres, October 2010)

[18] Ludovina V. Balisoro. "Cognitive and Non-Cognitive Factors: Their Relationship to Mathematics Performance," (Unpublished Master's Thesis, University of Nueva Caceres, October, 2011).

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