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Social Interaction and Performance of Third-Year Students in Geometry

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ABSTRACT

Social interaction creates a vital source of opportunities to learn Mathematics and opportunities for students to talk about their own thinking, and this talk encourages reflection. A study was organized to find out the relationship between the social interaction and the performance of third-year students in geometry. Specifically, the study sought to determine their levels of accidental, repeated, regular, and regulated social interactions; students' academic performance in geometry; and the relationship between students' levels of social interaction and their performance in Geometry. The study used the descriptive-correlation method involving 39 students as respondents, and complete enumeration sampling design was used. The descriptive used for social interactions were outstanding, very satisfactory, satisfactory, poor and very poor while for the performance were very high, high, moderate, low and very low. The results showed no significant relationship with the social interaction, while the students' performance in geometry was very satisfactory. The study concludes that the social interaction has no influence on the performance of students in geometry. The study recommends further study shall be made on the relationship of the students' performances when clustered according to the different levels of social interaction so that appropriate intervention can be made easily.

Keywords **-** Mathematics Education, social interaction, performance, third year students, geometry, descriptive-correlation method, Davao City, Philippines

INTRODUCTION

In current trends of educational reform, the role played by social interaction in students' mathematical apprenticeship was being emphasized. Vygotskian approach agreed that interpersonal processes form the basis for intrapersonal processes. Each is a coauthor of his or her personal progress and development. Their potentials cognitive elaboration increases when collaborating with others in tasks designed to develop and create knowledge. Those that are carried out in the process of solving problems in pairs of a certain subject, Geometry for instance, are collaborative tasks. Through collaboration, students are given more chances to interact with one another and respond to their learning environment; thus, acquiring information and knowledge.

Social interaction was one of the most important parts of mathematics program, especially if students viewed as a young mathematician (Kamii, 1986). However, this is the element that is most often absent. In the current issues concerning the performance of students in mathematics, question on to what extent the interactions of students related to the problem solving influence their cognitive development was being emphasized. Nowadays, it is widely accepted that learning mathematics is a product of social activity (Sfard, 2002).

In United States, the data from the Trends in International Mathematics and Science Study (TIMSS) and National Assessment of Educational Progress (NAEP) in both 41 countries showed that the geometry is an area of dismal performance for the students at all levels. The results for the geometry at grade eight students from the TIMSS showed that 24 nations scored significantly higher than U.S. students and only four (4) nations scored significantly lower. Only 56 percent was the international mean score on geometry at grade eight. U.S. students scored 48 percent, on average.

Meanwhile, in the results of the TIMSS 2007 (Gonzales et al., 2008) showed that six percent of U.S. grade students scored at or above the advanced international benchmark contrasted to the international median of 2 percent in grade 8. Their assessment also showed that the mean score for U.S. eight graders was higher than the mean score of their peers in 37 of the 47 countries and lower than those in only five countries. However, the lowest performance from U.S. eight graders was in geometry, where they scored 20 points below the global average and surpassed by students in 14 countries. Results showed that they found geometry as one of the toughest mathematics subject and performed very low.

In the Philippines, the study of Science and Education Institute on the Trends in Mathematics and Science Study in 2003 showed that out of 46 participating countries Philippines eight-grade students' skills and competencies in Math ranked 42nd poorly. Likewise, the Philippine TIMSS executive report 2004 showed that only seven regions showed improvements in Mathematics competencies among 8th-grade students in four years. Results indicate very insignificant performance in student achievement test in each content domain. One main problem is the lack of students' interest in Mathematics and the peers in their environment.

In the Division of Davao City Region XI, the performance in mathematics is one of the primary concerns. For the past years, the result on the students' achievement test signifies poor performance in mathematics. Such poor performance strongly indicates weakness in students' higher order thinking skills and problem solving.

Among the secondary schools in the Division of Davao City, Panaga High School performed very low in terms of students' competencies in mathematics in2008 National Achievement Test (NAT). The school ranked bottom in all participating secondary public schools. Recently, the result of the National Career Assessment Examination (NCAE) 2011 showed that 10out of 39 students in geometry class got an average percentile rank, and 29 of them belong to the low average percentile rank. Those ten students are also the students who performed well in the geometry class and were active in participating and interacting within the classroom. As what Brembeeks (1980) asserted that students who succeed in the social relationship with their co-students have been found to be successful in their school's work.

From the above-mentioned realities, the researcher was prompted to find out the levels of social interaction of students and to determine whether it affects the performance of third- year students in geometry.

FRAMEWORK

The opportunity of social interaction with others is very insignificant. It is dependent on student to student interaction. In Theoretical Origins of Social Interaction Models, Dewey (1980) did not only believe that social interaction stimulates learning but it is also on how learners begin to learn. Social demands and student to student assessment can be achieved by social interaction. The relations established among students were able to build main points in students' performances and school achievement. An increase in their self-esteem and ability

to construct a common inter-subjectivity are promoted by peer interactions. Thus, an effective way of promoting students' performances and school achievement within the Math classes is through implementing peer interactions (César, 1998; César & Torres, 1997). Several studies illustrated the importance of the comparison on school performances with daily life tasks that equivalent in their degree of complexity and its relation of its content (Carraher & Schliemann, 1989; Saxe, 1989; Wistedt, 1994). Because daily life activities were meaningful to them, subjects had much better performances in their daily life activities than in school tasks. However, performances may also be different when the situation or a task did not change and only the work instructions change, which is extremely significant in educational terms (César, 1994, 1995; Nunes, Light & Mason, 1993. The scholastic agreement on both pupils and teachers expectation from each other plays the most important role in the way pupils behave, in self-esteem and persistence when solving a task, in their school performances and achievements (Magada, 2009). This study is anchored to determine if social interaction affects the performance of the third-year students in geometry of Panaga High School, Davao City.

Mathematics knowledge is not strange to social interaction. According to Forman (2003), through communication processes in social contexts a substantial parts of mathematics learning are achieved. Silver and Smith (2002, p. 63) said that talking about mathematics with one another, and their teachers give opportunities for the students to think mathematics. Hurme and Jarvela (2005) said that the students are not only learning mathematical skills and procedures, but they have the opportunity to explain and justify their own thoughts, discuss their observations and observe models of how to use mathematics efficiently in different problems resolution situations. Lamper (1995) explained that students justify their perceptions when sharing interpretations or conjectures, offer verification or explain their reasoning.

Social interaction gives opportunities for students to converse about their own thinking, and this conversation encourages reflection. From the constructivist point of views, the major source of knowledge on all levels of mathematics is the reflective thinking. Von Glasersfeld (1991) stated that through social interaction, students lead to discuss their view of the problem and their own tentative approaches provides opportunities for them to reflect and to devise new and perhaps more viable conceptual strategies and eventually raises their self-confidence. Sztompka (2000) defines four types of social interaction: accidental, repeated, regular, and regulated social interactions.

The levels of social interaction in terms of accidental, repeated, regular, and regulated social interactions are the independent variables. The performances of third-year students in geometry of Panaga, High School, Davao City are the dependent variables of the study.

Social Interaction defines as the acts, the actions and the practices mutually oriented between two or more people. It also refers to actions or behaviors that take into account the experiences or mutual intentions of the intervention.

Accidental social interaction occurs when the collaboration is not planned, with low probabilities of being repeated. Moreover, the participants are not previously aware of each other's existence. Repeated social interaction occurs when representatives know each other beforehand. Regular social interaction is similarly referring to interactions that are at least somewhat often, whereas repeated interaction takes place occasionally. Regulated social interaction occurs when the interaction follows predefined rules that set the way users interact with each other. Performance of third-year students in geometry of Panaga, High School, was measured through their final grades in geometry on the second-grading period.

OBJECTIVES OF THE STUDY

A study was conducted to find out the relationship between Social Interaction and the Performance of Third-year Students in Geometry of Panaga High School, Davao City. The study desired to answer the following queries 1) the levels of the social interaction of students in terms of accidental social interaction, repeated social interaction, regular social interaction and regulated social interaction, 2) the academic performance of third-year students in geometry and 3) significant relationship between the performance of third-year students in geometry and their levels of social interaction classified as accidental social interaction, repeated social interaction, regular social interaction and regulated social interaction.

METHODOLOGY

Research Design

The descriptive-correlation method was used in the study. Descriptive is a method of qualitative and quantitative descriptions of general characteristics of the groups. By correlation method, relationships between and among variables were determined. It dealt with the correlation of the social interaction and

performance of the third-year students in geometry. It is descriptive because the data being gathered have undergone recording, analyzing and interpreting through the set of questionnaires that were used to determine the relationship between the social interaction and the third-year student's performance in geometry of Panaga High School, Davao City. In this study, it was determined as to whether social interactions were significantly related to the third-year student's performance in geometry. The relationships of the variables were established using correlation method.

Respondents

The respondents of this study were the third-year students of Panaga High School. A total of 39 students was the respondent, and complete enumeration sampling design was used. The third-year students of Panaga High School were composed of 39 students coming from different cultures. There were 11 students who belong to an ethnic tribe, and the rest were from a mixture of races (*Lumad & Bisaya*). These students come from normal and happy families with earning incomes suited for daily expenses. Most of them travel 6 to eight kilometers every day in coming to school.

Likewise, Panaga High School is located at a far-flung area of Panaga, Colosas, Paquibato District Davao City, an approximately 63 kilometers of distance from the Davao City bus terminal to Sto. Tomas Davao del Norte. From the latter, it takes about 21 kilometers of travelling a long distance trip through rough roads and crossing two big rivers before reaching the school. Panaga High School is considered as one of the farthest secondary schools in the Division of Davao City.

Instrumentation

To determine the relationship of social interaction and performance of the third-year students in geometry of Panaga High School, the researcher used sets of the survey questionnaire for the social interactions and used the final grades on the second-grading period of the school year 2011-2012. The survey questionnaires for social interaction adapted from the study of Magada (2009) with minor modifications based on the results of validation which was done prior to sampling. The survey questions were translated into its mother tongue to be understood by the participants. Revised copies were pilot-tested to the third-year students of A. L. Navarro National High School, Lasang, Davao City and the reliability test resulted to 0.92.

Data Collection

In conducting the study, a set of steps were followed and these were the following:

1. Seeking permission to conduct the study. The researcher sent letters to the respective administrators of the schools concerned, asking permission to administer the pilot testing and to conduct the study.
2. Administering the questionnaires. The respective questionnaires for social interactions and performance of third-year students in geometry were administered by the researcher.
3. Retrieving the questionnaires. Questionnaires were retrieved after providing the students ample time in accomplishing them.
4. Gathering the responses. The two sets of questionnaires were collated for data analysis.
5. Subjecting data to statistical analysis. Data gathered were run through the appropriate statistical tool.
6. Interpreting the data. Interpretation of data was made possible through the help of a statistician. Data were statistically processed and converted to tabular presentations. Tables were analyzed, interpreted and given educational implications.

The data gathered were summarized, translated and analyzed using the following statistical tools 1) weighted mean score, 2) Pearson product-moment coefficient of correlation, and 3) statistical computations were done using the SPSS 17.0 software.

The interpretations from the data output based at alpha (α) = 0.05 level of significance using a two-tailed test.

RESULTS AND DISCUSSION

Levels of Social Interaction

The students' overall levels of social interaction would be expounded in table which is differentiated into accidental social interaction, repeated social interaction, regular social interaction, and regulated social interaction. Each pointer obtained a high qualitative description. Accidental social interaction was high with a mean score of 3.52, and this means that students often manifest 61% - 80% of social interaction. It also denotes that students often feel self-

confident and comfortable in meeting a person for the first time. They often find it easy to deliberate and open a conversation with others even if it was the first time they met. Students often give smile to fellow students whom they met for the first time and usually put a smile in introducing the topic in geometry. They often find it easy to interact in discussing subject matter in geometry with their classmates whom they meet for the first time. Students often give importance in listening to people's ideas or opinions about any topics for the first time. With other people, they were ready to support the cognitive theory of Bandura (2002) that students are feeling confident with people they meet for the first time, which is taking intense by a mark of developing social skills. Students often find it easy to discuss topics in Geometry, interact in discussing the topic, consult others' opinions and listen to others' ideas and opinions whether they just met them for the first time. This shows that students have high regard for themselves in accidental social interaction that takes place for the first time.

Repeated social interaction was high with a mean score of 3.78 and this denotes that student's often distinct 61% - 80% social interaction. This indicator has the highest mean compared to the other indicators, and this implies that students often find it confident in conversing, interacting and meeting other people repeatedly. They often feel conscious every time they get a chance to interact with their classmates. Students often feel high-spirited when their classmates agree to the solution and opinion every time they discuss problems in geometry.

Table 1. Summary of the levels of social interaction

Social Interactions differentiated into:	Mean	Standard Deviation	Qualitative Description
Accidental Social Interaction	3.52	0.63	High
Repeated Social Interaction	3.78	0.64	High
Regular Social Interaction	3.77	0.55	High
Regulated Social Interaction	3.62	0.55	High
Overall	**3.67**	**0.53**	**High**

They often listen to other's ideas and understand it every time they discuss a certain topic in Geometry. This conformed to the idea of Stephan and Stephan (1985) that anxiety can be reduced by established clear expectations of behavior during inter-group contact. The students were confident with their classmates/ group mates they frequently met and they were able to have the ability to organize interactions with their group during discussions and interaction.

Regular social interaction was high with a mean score of 3.77, and this means that students often distinct 61% - 80% of social interaction. Students often feel high-spirited, confident and socially comfortable upon discussing and interacting with other people regularly or every day. They are often considerate to other student's ideas, suggestions and discussions about particular topics in geometry every day. They often make it a point to speak and interact to their classmates when they meet them every day. The implication from the findings is logically answering Goffman's (1959) ideas that the position of social interaction has its own logic and structure, therefore helping people to construct their self. That would mean that they were confident to be with the people at regular meetings as they are already acquainted with the latter that make them comfortable with those on regular contacts in school or in some other places. It simply implied that students have already exhibited great social skills (Magada, 2009).

Consequently, regulated social interaction was high with a mean score of 3.62 that means that students often distinct 61% - 80% of social interaction. Students often feel high-spirited, confident, socially responsive, morally boosted when interactions regulated. They often find it easy to communicate and share ideas and opinions with their classmates. They often find it easy also to talk about geometric problems in group discussions and never encountered difficulties

working with their classmate in solving problems. The overall mean of the level of social interactions was 3.77 that denote high, and this also marks that student often noticeable 61% - 80% of social interaction. It only means that whatever social interactions, students react positively on their interaction with their classmates. Students were confident, comfortable, high-spirited, morally boosted and self-conscious in the manifestation of the social interaction. Results confirmed Boyd's (2002) ideas that in all interactions, identity, performance, context and regulation are constantly operating and interacting as the students were often socially-confident every time they were in school. However, the result would disclose that they often feel high-spirited with someone who answers problems correctly during discussions; feel easy to speak about geometric problems in group discussion; sometimes never encountered difficulties working with fellow students; and often feel socially confident interacting with others when interactions are regulated. Students tend to be more conscious about what to react, to share, and to speak and when to react, to share, to speak to others because the fear of conflict behaviors did not conform to the group's social norms.

In all societies, social interaction is present and plays a vital part in how relate to each other, do tasks and live their lives. Social interaction is the process by which people act toward or respond to one another (Hurst, 2003). The interplay of many factors including our perceptions, cognitions and behaviors in specific social contexts involves in such interaction.

The findings emphasized that the respondents were highly satisfied and contented as to their level of social interactions were concerned. It would imply the need to sustain the motivation and their active participation on social interactions. The idea of Kearsley (1994) stated that the fundamental role in the process of cognitive development that played by social interaction also goes along with Piaget (1970) who asserted that the crucial source of opportunities to learn mathematics and that the process of constructing mathematical knowledge involves cognitive conflict, reflection and active cognitive reorganization can be achieved by social interaction.

Academic Performance of Third-year Students in Geometry

A summary of the performance of third-year students in geometry as perceived by the students were summed up, and the weighted mean was calculated and tabulated.

According to Bishop (1989), Geometry is the mathematics of space, and the study of geometry helps students represent and make sense of both the world of mathematics and where they live. The National Council of Teachers

of Mathematics (2000) stated that through the study of geometry, students are expected to learn about geometric structures and analyze their characteristics and relationships, building understanding from informal to more formal thinking, and passing from recognizing different geometric shapes to geometry reasoning and geometry problem-solving.

The data on the table revealed that the performance of third-year students indicates very satisfactory that revealed a mean score of 79.65, and this means that most of the students got a grade between 60 – 79.99. The result shows that students pointed high level of performance in geometry.

Correlations between the Levels of Social Interaction and Performance of Third-year Students in Geometry

Presented in the table is the result of the test of significance of the relationship between the levels of Social Interaction and Performance of Third-year Students in Geometry. Accidental social interaction which was compared to the performance of third-year students in geometry led to the result of computed R-value of 0.241 which is not significant using two-tailed test. The result was not significant which led to the acceptance of the null hypothesis. It showed that the social interaction in terms of accidental social interaction has no impact on the performance of third-year students in geometry. Likewise, repeated social interaction which was correlated to the performance of third-year students marked a computed R-value of 0.256 which is not significant using two-tailed test. The acceptance of the null hypothesis considered, and this would imply that repeated social interaction does not influence the third-year student's performance in geometry.

Regular social interaction was also correlated to the performance of third-year students in geometry. The computed R-value is 0.255 which is not significant using two-tailed test. The result showed that regular social interaction was not significantly related to the performance of third-year students. The acceptance of the null hypothesis was prompted, and this means that regular social interaction has nothing to do with the performance of third-year students in geometry. Consequently, regulated social interaction as correlated to the performance of third-year students obtained a computed R-value of 0.220 which is not significant using two-tailed test. The result was not significant that the null hypothesis accepted and this would imply that regulated social interaction has no impact on the performance of third-year students in geometry.

However, the data concerning accidental social interaction, repeated social interaction, regular social interaction and regulated social interaction

illustrated that there existed a significant correlation between each other, and the respondents' high regard for social interactions encouraged and led them to improve and enhance their social skills and to be open to assimilating interaction from the other students or groups.

The overall value of social interaction was correlated to the performance of third-year students in geometry and obtained a computed R-value of 0.270 which is not significant using two-tailed test, and this means that there was no significant relationship between the social interactions and performance of third-year students in geometry. Thus, the null hypothesis is accepted. Social interaction has no impact on the performance of third-year students in geometry.

Social interactions construct knowledge and understanding. Strozzi (2001) and National Research Council (2000) affirmed that as knowledge emerges, the activities results engaged and shared in an environment that connects individuals, materials, cultural tools, and symbol systems. Thus, cognitive development and teaching highlighted the importance of the relationship among individuals and the learning environment.

According to Kamii and National Association for the Education of Young Children (1982), mathematics classroom should include many opportunities for social interactions. Thus, it shows that the social interaction is the important aspects of being a mathematician. The simple act of one child explaining his problem-solving to another caused the child to understand his own thought process better. Without the interaction, children simply memorize how to get the correct solution, without developing a greater understanding. When students interact with their peers, they learned best. Asking for help and interacting with others, help them understand the problem-solving process, thus, acquiring knowledge at the same time.

Pearson Product-Moment of Coefficient of Correlation (Pearson r) test showed that social interactions in terms of accidental social interaction, repeated social interaction, regular social interaction and regulated social interaction were not significantly correlated to the Performance of Third-year Students in Geometry, and this mean that whether students had a high or low social interaction, his performance in Geometry remained the same.

In general, looking at the alpha value at 0.05 level of significance, the result suggested for the acceptance of the null hypothesis. The researcher, therefore, disclosed that there was no significant relationship between the social interaction and the performance of third-year students in geometry. Students together with their peers develop their own social skills through the experiences among each

other. Thus, these experiences help them to improve at their own expense. On some aspects, Banks (1999) stated that multicultural education confirmed that the students were able to see themselves potentially in the curriculum, their voices being heard and valued in the classroom. With the knowledge of students being possessed by them, they were able to recognize, create or define the social situation. They were able to recognize a solution and it did not guarantee to have a good performance. Their social interactions to others will give the opportunity to explore and learn new things out of their relationships with their peers.

According to Henderson and Atencio (2007), learning best achieved when varied and multiple opportunities engage in inquiry at many different levels situated in physical, social, and interactive contexts. Since learning is social, it is oftentimes generated through dialogue with others and in reflection with others. The observations of others' actions and the subsequent replication of the behaviors facilitates into their own schemata.

The students' initiation to mathematical discourse influenced by the meta-discursive rules that control the communicative effort (Sfard, 2002). These rules determine the choices of the participants when they act, and they embed their values and beliefs as the implicit regulators of interpersonal and intrapersonal communication. It determines the evolution of their mathematical discourse the way the members of the mathematics classroom develop rules that guide their social behavior by reflecting their own intentions about their interaction. Moreover, Dekker and Elshout-Mohr (2004) mentioned that students attain more mathematical level often rising that follow effective model for interaction.

According to Chaviaris and Kafoussi (2009) that the social interaction does not play a significant role and learning of mathematics is an individual process. Kafoussi et al. (2009) stated that during a mathematical discussion student with high-achieved on mathematical ideas seemed to be more respectable than the low-achieved students. Towards this direction, the mathematics educator must consider the question on how students could change their participation in classroom mathematical practices into a more democratic context that is based on the mutual respect of ideas of their classmates and the development of equivalent relationships.

The instrument used in obtaining the levels of social interaction of third-year students was the Likert-Scale. It could be better if this is revised into rubrics form. We must also consider other factors influencing the social interaction of the students.

The total respondents of the study were 39 third-year students only and complete enumeration design was used. Since only one section was taken as

respondents, inclusion of third-year students of other schools would be advised to further validate the relationships of the variables of the study.

CONCLUSIONS

The following conclusions are drawn from the findings of the study: 1) the level of social interaction of third-year students was high; 2) accidental social interaction has no impact on the performance of students in geometry; 3) repeated social interaction does not influence the performance of students in geometry; 4) regular social interaction has nothing to do with the performance of students in geometry; and, 5) regulated social interaction has no impact on the performance of students in geometry.

RECOMMENDATION

Further study shall be made about the possible relationship of the students' performances when clustered according to the different levels of social interaction so that appropriate intervention can be made simply.

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