

EFFECTS OF CLASSROOM PEER COLLABORATION AMONG SECONDARYSCHOOLS STUDENTS' ACHIEVEMENT IN MATHEMATICS: IMPLICATION FOR COUNSELLING

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Abstract: This study examined the effects of classroom peer collaboration among secondary schools students' achievement in Mathematics. Three hypotheses questions guided the study. The design used was the pretest-posttest quasi-experimental research design since data were collected before and after treatment. The population of this study consisted of all the secondary schools students in Ukwuani, Delta state, Nigeria. The sample used for this study was 100 secondary schools students from two (2) secondary schools in Ukwuani Local Government area in of Delta state. Two intact classes of Senior secondary 2 were used for the study. The research was conducted in the two selected secondary school for a period of 10 weeks. The researcher administered the questionnaire (PCI) to the subjects in two instances, a week prior to the treatment (pretest) and a week after the treatment (posttest). Treatment was based on the elaborate treatment package that specified contents and objectives. The pretest scores were used for the baseline comparison for the posttest statistical analysis. Within the period of the experiment, the control group 2 was taught without instructional materials. Subjects in the experimental group one were told to keep the benefits gained from the lessons to themselves at least during the period of the study to minimize confounding effects on the study. Data obtained were tested with Analysis of Covariance (ANCOVA), the t test statistic and the one way ANOVA because of their appropriateness to the hypotheses. The outcome of the study revealed that there is a significant effect of classroom peer collaboration on students' achievement in Mathematics in secondary schools in Ukwuani, Delta state, Nigeria. There is a significant difference between male and female and age stratifications on classroom peer collaboration on students achievement in Mathematics in secondary schools in Ukwuani, Delta state, Nigeria. From the research findings, it can be concluded that students learn better through peer groups rather than general classroom teaching. They are free to express themselves and to reveal their weak areas to their peers rather than to teachers. Mathematics is a broad subject, so peer learning should be encouraged in all schools both public and private schools to enhance students' performance in the subject.

Keywords: *academic achievement; counselling; Mathematics; peer collaboration.*

INTRODUCTION

Learning mostly occur when information is shared among people through group discussion both at home, offices, schools, etc. Traditionally, adults, especially parents, were considered the secondary socializers, responsible for assimilating the child into society. Behavior is influenced by social norms. Typically, norm conformity is enforced through social groups (Veenstra et al., 2018).

However, Laursen and Veenstra (2021) opined that peer collaboration force smoothes the establishment of friendships and integration into the peer group, encourage interpersonal and intragroup compatibility, and eradicate diversities that may perhaps result in social segregation. Furthermore peer relationships are critical, though organized relatively differently.

Peer group denotes people of the same age and ability interlaced together by mind-set resulting from general concern for the group. Peer collaboration is the term used to refer to peer-learning situations in which students work together in a class situation toward a shared understanding referred to as convergence. Adolescents make friends with similar others and join groups of similar others, a process known as selection similarity. Learning occurred when students are paired with their peers in the school as they tend to grasp knowledge from their each other. Present-day peer relations are between age group of approximately equivalent clout, working at parallel cognitive and physical developmental levels. The equalitarian scenery of peer collaborations makes them exceptional background to develop proficiency like

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cooperation, perspective-taking, collaboration, problem solving etc.

Cooperative learning is a meticulous type of peer collaboration in which the mutual framework is planned beneath explicit models for the learners. Peer cooperation classically involves division of tasks for a collective goal, with every member is liable to a particular feature of the task. Peer collaboration presumes the virtual equilibrium of proficiency and reasonableness in mutual respect to the procedure and the outcome of learning. In collaborative perspective, peer mates mutually convey a range of viewpoints or information base emanating from the multiplicity of personage histories, experiences, interests and backgrounds. Peer relationship is conceptualized as being proportioned, and the intent is to resolve, share and organize their perceptions to accomplish specified learning objectives. Amede (2020) established that peer impacts may possibly follow inclination of mental ill health, race, gender family and income.

What makes learning proportional is because children have equivalent status with other peers. Amede (2022) found that age stratifications among school children influence mastery in computer applications. There is an ambience of independence in which youngsters acquire knowledge from one another in a reciprocated atmosphere. The peer group consequently becomes more significant to children as they mature. Peer group often help the children in multiple ways that include: teaching the culture of the society, building potential social mobility, providing prospect for the children to play numerous social roles like assuming the status of a leader, an adherent, instructor or scholar. The peer groups in addition assist mates to gain freedom from authorities with ease and set attainable goals ahead of them than the anticipation of their parent and that of the society. In highlighting the importance of peer effects studies,

Güroğlu & Veenstra (2021) asserted that there is an increasing interest in studying the neural underpinnings of peer experiences in order to understand how peer interactions relate to adjustment and well-being. Mosha (2017) recognized that peer group had both positive and negative influence on adolescent educational performance in schools. Relatively, the pressure was found to be superior in government than the private owned secondary schools. It was further recognized that peers association, socialization, environment, globalization, and drug use had a

immense influence in shaping students' educational performance.

The peer group provides the students with a wide variety of experiences which can boost their academic performance. Peer group provides the colleagues with a considerable degree of emotional security, which helps in their intellectual development. Besides it offers the opportunity for the development of loyalties that goes beyond the immediate family e.g. political and social loyalties, which are important for future adjustment. However, influence of acquaintances can be constructive or unconstructive, depending on the personality of those associates and the way they behave. Adolescents whose associates display disruptive or problem behaviour are further expected to show negative behaviours themselves (Brendgen et al., 2018). Vitaro et al. (2018) confirm that the accomplishment of intercession for high-risk adolescence is improved by lesser relationship with deviant peers and additional involvement with non-deviant peers who offer substitute role models and maintain socially tolerable behaviour. In school setting, extremely intelligent associates are predictable to influence their friends with better learning outcome, while disclosure to lower achieving friends will probably result in lower performances amongst scholars (Headey & Alderman, 2019). Brendgen et al.'s (2019) finding show that verbal abuse by the teacher during childhood was related to behaviour challenges and a low likelihood of having attained an elevated school results.

Furthermore, popular peers set evocative norms in the group. In classrooms where popular peers are aggressive, classmates increase their aggression. Also, in classes where popular peers are social, classmates increase their sociality (Laninga-Wijnen & Veenstra, 2021). Nowhere has growth been more obvious than in the area of school adjustment. Results from longitudinal social network analyses imply that peers exert a positive influence on school scores (Duxbury & Haynie, 2020; Gremmen et al., 2017).

However, everything is not rose-colored as often assumed. Evidence suggests that selection similarity and peer influence account for a substantial portion of friend homophiles across a wide range of domains (Laninga-Wijnen & Veenstra, 2021).

Friends and peer associates are accountable for boost in absenteeism and school misbehavior (Rambaran Schwartz, Badaly, Hopmeyer, Steglic & Veenstra, 2017).

Teachers have employed a number of teaching methods to advance teaching and learning and halt the high rate of failure in examinations but to no avail as the rate kept rolling higher. It is therefore necessary for educators to engage student to student in teaching and learning activities. Although there is unending debate on the pressure of peer group on educational accomplishment, there is obvious harmony in the assumption. Consequently, it becomes necessary for researchers to further explore issues related to school and peer collaborations. This study thus examined the effects of classroom peer collaboration on secondary schools students' achievement in Mathematics in Ukwuani, Delta state, Nigeria.

In every classroom situation, students always sit together, do things together and in addition play together. It is necessary to extend this relationship to teaching and learning process so as to deduce if the pattern of relationship can promote learning. The Holy book warns that bad friends can spoil good habits. Also, good friend can enrich and modify youth behaviours.

Educationally deficient students are mostly involved in all sort of atrocities that negate academic accomplishment, such as cultism, bullying, theft, Kidnapping, banditry, drug abuse, just to mention a few. These nonstandard behaviours have led to school dropouts and poor academic achievement. The rate at which most students failed examinations left much to be desired. It is also a common observation that most students are extremely intelligent. Associating intelligent students with those of lesser one can lead to better outcome. Therefore, this study investigated effects of classroom peer collaboration on secondary school students' achievement in Mathematics.

The study examined the effects of classroom peer collaboration on students' achievement in Mathematics in secondary schools in Ukwuani, Delta state, Nigeria. Specific objective include to: (1) To ascertain effect of classroom peer collaboration on secondary school students' achievement in Mathematics in Ukwuani, Delta state, Nigeria. (2) To determine the difference between male and female on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. (3) To evaluate the difference on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. on the basis of age stratifications.

The hypotheses of this study are: (1) There is no significant effect of classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. (2) There is no significant difference between male and female on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. (3) There is no significant difference in classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. on the basis of age stratifications.

Mathematics is a core subject linked generally to the development of any nation. It is a science of order. Everything about mathematics is well arranged and logical. Mathematics serves as the bases for technology this implies that technology cannot stand in isolation without mathematics. Mathematics sharpens the brain, this might be the reason why Akinoso, (2017) quipped that if a student is good in mathematics, every other subject will be easy to handle. Thomson (2018) also averred that a student who does not perform well in mathematics will end up struggling in other fields of study and such students' career options will be limited. Busari and Akinoso, (2020) submitted that highly mathematics-anxious learners have characteristics of a strong tendency to avoid mathematics, undercuts their mathematics competence, and forecloses high-and-mighty career paths. Attitude is a construct which is an emotional disposition to learning influence the learning of mathematics. Attitude can be positive or negative depends on students' emotions. A positive attitude can be of great benefit to learning while a negative attitude can lead to discouragement due to poor results. Attitude influences mathematics achievement, literacy, and reasoning. Kennedy (2019) averred that attitude reflects the value, self-confidence, enjoyment, motivation, and anxiety of students towards mathematics. Attitude towards mathematics implies students' predisposition towards mathematics (Fonseca, 2012) which can either be positive or negative. Kennedy (2019) asserted that early engagement in Mathematics prevents negative attitudes.

Collaborative learning is a learning environment that allows active participation in the learning process (Oludipe et al., 2010). A collaborative learning strategy is a form of strategy that gives every student equal access and opportunity to learning. Collaborative learning occurred when groups of students work together in searching for meaning, understanding, and

solutions to create an artifact of learning (Akinoso, 2017). Collaborative learning helps learners to learn by collaborating with others and working together to achieve a common goal. According to Fakomogbon and Bolaji (2020), collaborative learning is viewed as an approach employed by teachers for facilitating learning and improving students' performance.

Collaborative learning helps learners to share their understanding and learning experiences and helps to promote their learning performance as well as for both groups and individuals. The researchers such as Johnson, Johnson, and Smith, (2007) concluded that collaborative learning can promote academic and social educational outcomes. Collaborative skills are essential in this present age to meet challenges in learning. The collaboration skills include listening skills, expressing ideas and opinions, following directions, asking for help, giving and receiving compliments and constructive criticism, and negotiating. The lack of collaboration among students leads to poor academic achievement, low perceptions of greater social support, and low self-esteem (Uwizeyimana et al., 2018). However, the use of collaboration improves the performance of students and encourages teamwork, more retention, and promotes students to be more engaged in the learning process and transfer of knowledge (Nkechinyere et al., 2018). Collaborative learning has been used for promoting learning achievement and encourages socialization and positive interaction among students.

Olanrewaju, (2019) in a study on collaborative learning technique on achievement found that collaborative learning technique improve students' achievement in mathematics. Johnson, (2006) found collaborative learning effective in improving academic achievement. Galton, Hargreaves, and Pell (2009) found that the group taught with collaborative strategy had better achievement than the other group. Also, Stoner, (2004) concluded the positive effect of cooperative strategy on mathematics achievement of students.

Constructivism is a theory of learning that refers to the idea that learners construct their learning based on previous experiences. In constructivism theory, learning is an active process in which a learner uses sensory input and constructs meaning out of the world. Constructivist theory is an approach where meaningful activities are proposed to learners and the learners reflect, search and use their capacities

for being creative and initiative takers (Dagar, 2016). In constructivism theory, a learner is an active participant in the learning process, and the teacher acts as a facilitator that helps learners to create their understanding and learning (Fernando & Marikar, 2017). Thus, in the context of this study, this theory emphasized the learner-centered, learner-directed, and collaborative style of teaching and learning. Therefore, in this theory, the knowledge is created through the interaction between teacher and learner, and within students themselves. Constructivism is expected to be an important learning theory that teachers will use to help their learners to learn chemistry effectively through the use of collaborative learning.

METHOD

The design is pretest-posttest quasi-experimental research design as data were collected before and after treatment. The population of this study covers all secondary schools students in Ukwuani, Delta state, Nigeria. The sample used for this study was 100 secondary schools students from two (2) secondary schools in Ukwuani, Delta state. The selected secondary schools are: (1) Exiokpor secondary School, Exiokpor. (2) Mixed secondary School, AkokuEbedei

Two intact classes of senior secondary two were used in each of the secondary schools above.

The major research instrument(s) adopted in the study was the questions by the researcher titled: peer collaborative Learning Inventory (PCLI). Tests were administered to respondents before and after treatment.

Research experts in National Open University of Nigeria determined the validity of instrument. A sample of the instrument was shown to the fellow lecturer for professional corrections and comments which were incorporated into the final draft of the instrument to ensure that it had content of validity.

The pilot study of the instrument was administered to 30 secondary schools students in Ndokwa West local government area of Delta state which was outside the scope of this study and re-administered after 2 weeks interval to the same set of students. The scores of the two tests were used to determine the reliability. The data generated from the respondents was analyzed with Person Product moment correlation co-efficient and a reliability co-efficient of 0.76 was obtained, which was deemed adequate for the study.

The research was conducted in the two secondary school selected for a period of 10 weeks. The researcher administered the

questionnaire (IMI) to the subjects in two instances, a week prior to the treatment (pretest) and a week after the treatment (posttest). Treatment was based on the elaborate treatment package that specified contents and objectives. The pretest scores were used for the baseline comparison for the posttest statistical analysis. Within the period of the experiment, the control group 2 was taught without instructional materials. Subjects in the experimental group 1 were told to keep their benefits from the lessons to themselves at least during the period of the

study to minimize confounding effects on the study. Data obtained were tested with Analysis of Covariance (ANCOVA), the t test statistic and the one way ANOVA because of their appropriateness to the hypotheses.

RESULTS AND DISCUSSION

Null hypotheses 1: There is no significant effect of classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria.

Table 1. *The analysis of covariance (ANCOVA) statistic on the effect of peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria, using pretest scores as covariate*

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	326.616 ^a	2	163.308	322.666	.000	.869
Intercept	105.781	1	105.781	209.003	.000	.683
Pretest	5.496	1	5.496	10.859	.001	.101
Class	251.553	1	251.553	497.022	.000	.837
Error	49.094	97	.506			
Total	2613.000	100				
Corrected Total	375.710	99				

a. R Squared = .869 (Adjusted R Squared = .867)

Table 1 above depicts the analysis of covariance (ANCOVA) statistic on the effect of classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria, using pretest scores as covariate. The results revealed a significant difference Between-Subjects Effects, yielding an F-value of 322.666, df= 2/99, (p<05). The Eta Square of 87 is an indication of a high magnitude of effect that classroom peer collaboration method had on the subjects. Therefore the null hypothesis which states that there is no significant effect on the effect of classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria was rejected. The

conclusion was drawn that there is significant effect of classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. The analysis revealed a degree of association between classroom peer collaboration methods on the academic achievement among secondary schools students who participated in the experimental group. The percentage of contribution for the dependent variable due to classroom peer collaboration methods was 87% as indicated in the Adjusted R Squared. However, post hoc statistics is needed to determine the level of significance between experiment and control groups.

Table 2. *Pairwise Comparisons on the effect of peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria., using pretest scores as covariate*

(I) Class	(J) Class	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
Exp. Group	Control Group	3.4*	.153	.000	3.115	3.724
Control Group	Exp. Group	-3.4*	.153	.000	-3.724	-3.115
Based on estimated marginal means						
*. The mean difference is significant at the .05 level.						
b. Adjustment for multiple comparisons: Bonferroni.						

In Table 2 above shows the Turkey HSD Multiple Comparisons on the effect of classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state,

Nigeria. The experiment group has a mean difference advantage of 3.4 compare to the control group. The implication is that classroom peer collaboration methods have effect on secondary

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school students' achievement in Ukwuani, Delta state, Nigeria. collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria.

Null hypothesis 2: There is no significant difference male and female on classroom peer

Table 3. *T-test analysis on the influence of difference male and female on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria*

	Gender	N	Mean	Std. Deviation	Std. Error Mean	Dt	t	Sig.
Class	Male	43	2.00	.00	.00	98	12.57	.000
	Female	57	1.21	.41	.054			

At .05 level of significant

The result in Table 3 shows that there is a significant difference male and female on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria., at $t(12.57)$, $df = 98$, $P > .05$, with a mean of 2.00 for male and 1.21 for female. The mean difference was .79 advantaged male. The hypothesis was therefore rejected. The implication

is that there was a significant difference male and female on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria.

Null hypotheses 3: There is no significant difference on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. on the basis of age stratification

Table 4. *Descriptive statistic on the difference on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. on the basis of age stratification*

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
12yrs	32	1.00	0	0	1	1	1	1
11yrs	41	1.73	0.44857	0.07	1.59	1.87	1	2
10yrs	27	2.00	0	0	2	2	2	2
Total	100	1.57	0.49757	0.05	1.47	1.67	1	2

Table 4 above is a descriptive statistic on the difference on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. on the basis of age stratification. The table gives categories of the subjects into 10 years, 11 years and 12 years. A

total of 100 students participated in the study. Out of this figure, 27 were of 10 years, 41 for 11 years and 32 of 12. The mean scores for the 10 years, 11 years and 12 years are 2.00, 1.73 and 1.00 respectively; with a total mean score of 1.57.

Table 5. *One-way ANOVA statistics on the difference on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. on the basis of age stratification*

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	16.46	2	8.23	99.19	.000
Within Groups	8.05	97	.083		
Total	24.51	99			

The one-way statistics revealed a significant difference between and within groups as shown in Table 5 above with $F(99.19 = df, 2/99, p = .000)$. The hypothesis which stated that there was no significant difference on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria on the basis of age stratification in the study was therefore rejected. In order to determine the actual differences between the three socio-economic subsets of students involved in the study, a posteriori test was conducted. The Turkey HSD

post hoc test in Table 4.10 below revealed that staff from 12yrs have mean difference of -.73 and -1.00 to 11yrs and 10yrs, 11yrs have mean difference of -.73 and -27 to 12yrs and 10yrs while 10yrs have mean difference of -1.00 and -.27* to 12yrs and 11yrs, respectively. All the mean differences were significant at ($p = .000$). The implication from the study was there is a significant difference on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. on the basis of age stratification.

Table 6. Tukey HSD Multiple Comparisons on the difference on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria on the basis of age stratification

(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
12yrs	11yrs	-.73*	.07	.000	-.89	-.57
	10yrs	-1.00*	.08	.000	-1.18	-.82
11yrs	12yrs	.73*	.07	.000	.57	.89
	10yrs	-.27	.07	.001	-.44	-.10
10yrs	12yrs	1.00	.08	.000	.82	1.18
	11yrs	.27*	.07	.001	.10	.44

*. The mean difference is significant at the 0.05 level.

Hypothesis one sought to find out the effect of classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. The result obtained from the analysis indicated that is a significant effect of classroom peer collaboration on students' achievement in Mathematics in secondary schools in Ukwuani, Delta state, Nigeria. This conclusion agrees with Duxbury & Haynie (2020) who found that growth been more obvious in the area of school adjustment. Results from longitudinal social network analyses imply that peer collaboration exert a positive influence on students' scores. In addition, research by Vitaro, Frank, Brendgen and Tremblay (2019) shows that verbal abuse by the teacher during childhood was related to behaviour challenges and a low likelihood of having attained an elevated school results.

Hypothesis two states: There is no significant difference between male and female on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. It was discovered from the analysis that there is a significant difference between male and female on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria. This conclusion agrees with Amede (2019) who also posits that peer effect may follow lines of disability, race, sex and family income.

Hypothesis three sought to find out the extent to which classroom peer collaboration impact on secondary school students' achievement in Ukwuani on the basis of age stratifications. From the analysis, it was discovered that there was a significant difference on classroom peer collaboration on secondary school students' achievement in Ukwuani on the basis of age stratification. This finding correlates with Amede (2022) who found that age stratifications among school children influence mastery in computer applications.

Implication for counselling

The outcome of this study would be of immense benefit to school counsellors. They would disseminate and popularise peer collaboration teaching method to mathematics teachers and encourage them to apply it in their respective schools. Credit pass in mathematics at post primary school level has been a challenge to pursuing careers in science related disciplines. The use of peer collaboration technique in teaching mathematics would facilitate better comprehension; make it less complex and subsequently record mass success in the subject.

CONCLUSION

The outcome of the study revealed that there is a significant effect of classroom peer collaboration on students' achievement in Mathematics in secondary schools in Ukwuani, Delta state, Nigeria. There is a significant difference male and female and age stratifications on classroom peer collaboration on secondary school students' achievement in Ukwuani, Delta state, Nigeria.

From the research findings, it can be concluded that students learn better in peer groups rather than general classroom teaching. They are free to express themselves and reveal their weak areas to their peers rather than to teachers. Mathematics is a broad subject, so peer learning should be encouraged in all schools, both public and private schools to enhance students' performance in the subject. Students should be encouraged to form mixed groups of boys and girls in the classroom and be encouraged to learn from among themselves, especially for those who are slow learners.

From the findings, the following recommendations were made; (1) Head teachers and heads of schools should advocate for the use of peer collaboration teaching method in all secondary schools in Delta State in particular and Nigeria in general as students' tend to learn better

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when they teach themselves. (2) Parents should encourage their children to associate with other students with good characters, and should monitor such associations to ensure that only positive knowledge are been shared among such friendships. (3) Teachers should imbibe classroom peer groups learning style as most groups tend to have positive impact on the knowledge base of students. (4) Whole schools should permit peer collaboration among students. This would make students to want to associate with fellow students especially during classes.

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