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Simplicities and Complexities of the Effect of Collaborative Learning Contexts on Academic Achievement

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Abstract
This study was designed to find out if the effect of the collaborative peer learning context on students' academic performance would be direct or indirect A stratified random sample of 600 students was drawn from all the 4 day secondary schools in Sekondi-Takoradi. The paper-and pen questionnaire was used as the data collection tool. Through the use of multiple regression procedures, the results of the data analysis showed that the collaborative peer learning context did result in excellent academic performance of students. The results indicated, however, that the effect was indirect. First, the learning context boosted the student's self-efficacy; the boosted self-efficacy energized the student to make an extra effort to study, and the extra effort resulted in the wonderful academic performance of the student. On the basis of these findings the attention of theorists, researchers, and teachers is drawn to the need to use strategies in the classroom and in the school to boost students' self-efficacy. Teachers are also advised to draw students' attention to the need to make the effort to study hard in order to make the grade.

Keywords: Collaborative Learning; Academic Achievement, Peer Learning, Self-Efficacy.

Introduction

Few classrooms are homogeneous entities: the typical classroom is made up of students from diverse cultural, economic, ethnic, linguistic and social backgrounds. The classroom is also made up of students with diverse motivational and ability levels. So in the typical classroom there are some students who benefit from the instructional processes because the processes are consistent with their previous experience. Still there are other students who do not benefit very much because the instructional processes rather tend to inhibit their learning (Jones & Jones, 2001)..

In view of the reality pointed out above, Jones and Jones (2001) suggest that the teacher must modify the classroom environment so as to enable students to develop prosocial cooperative behaviour and culture of learning. Collaborative peer learning is one classroom management strategy usually recommended for more advanced learners such as secondary school students (Schmuck & Schmuck, 1997). What then, is collaborative peer learning?

Collaborative peer learning involves students working together to complete common tasks or master a common challenge (Fawcett & Garton, 2005). Rochelle and Teasley (1995) also see it as a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem. Pieced together, it would be plausible to describe collaborative learning as the voluntary coming together of students of diverse ability levels to study together for the purpose of maximizing their own and each other's learning (Johnson, Johnson, & Holubec, 1988).

Research grounded in the Piagetian framework shows that working together with peers leads to more enhanced learning than working alone (Druyan, 2001; Goldbeck and Sinagra, 2000). Researchers such as Johnson and Johnson (1994) and Garton (1992) working within the Vygotskian framework seem to explain the fact more clearly. According to them when students of different ability or competence levels work collaboratively together they tend to gain cognitively and in task performance. One proviso they point out is that all members of the group must actively participate in the discussion. Garton and Pratt (2001) as well as Samaha and De Lisi (2000) add that there should be active interaction, reasoning and explanation led by the more competent members of the group.

To Vygotsky (1978) learning occurs within the context of discussion because the interactive process results in individuals reorganizing and reconstructing their own thinking and understanding. Through group discussion members reason together by listening to different and better informed viewpoints. This, he says, enables individual members to recognize gaps in their own perspectives, unlearn misconceptions, and construct more elaborate conceptualizations (Fawcett and Garton, 2005).

Vygotsky's (1978) message is clear: the main feature of collaborative learning is verbal communication, and that verbalization improves understanding and performance as it encourages exchange of ideas. (Underwood, Underwood, & Wood, 2000). Effective verbal interaction also supports higher order cognitive processes when it provides elaborate explanations, questioning, listening, and giving feedback and encouragement.

Collaborative learning among peers as a learning strategy is derived from Kurt Lewin's (1948) group dynamics. The theory of group dynamics postulates that a group contains a large degree of differentiation, and as such, different members work on different tasks and are expected to accomplish different things for the group. The roles performed by individual members ensure that the task behaviours of group members are interrelated so that the group's goals are achieved. The roles are complementary in that one cannot be performed without the other (Lewin, 1948).

Conditions necessary for the success of collaborative learning

Johnson and Johnson (1989), as well as Johnson, Johnson and Holubec, (1988) have always referred to five essential conditions that must characterize the internal dynamics of the collaborative working group. These conditions are positive interdependence, promotive

interaction, and individual accountability. Others are social skills and group processing. However, a close scrutiny of Lewin's (1948) group dynamics reveals two more essential conditions. These are perceived equal participation and shared leadership.

Positive interdependence is the recognition that one cannot achieve ones own goals unless every one else in the group achieve their objectives. Members must accept the fact that as they learn collaboratively together they swim together or sink together, depending on the total effect of their individual efforts.

The second condition, group processing, is the process of monitoring the success of the group and its members. The group must be able to reflect on how well they are working. They must do self evaluation to determine the extent to which they are making success, both as individuals and as a group.

Promotive interaction is the mutual help that members offer to one another. Members must always engage in verbal communication, ask questions, offer explanations, and through that help one another to overcome their learning difficulties.

Individual accountability is the acceptance of the fact that each member of the group is accountable to the group for tasks assigned to them. As the group monitors the contributions of individual members , free riders must be made aware of their negative tendency. Passive listeners (social loafers) must also be made aware of their passiveness. But these quiet reprimands must be made in such a way that the individuals involved would not be hurt too much. Therefore social skills must be deployed in peer collaborative learning.

Collaborative learning among peers is successful when no one is perceived as a social loafer or a free rider. Neither should some or one of the members perceive themselves to be doing virtually all the work while others merely goof and listen passively. Every member must feel that everybody is an equal participant in the group's activities.

Finally there must be perceived shared leadership. At any given time, and in any given situation, peers do different things. Therefore, ideally leadership should not be seen to the fixed in only one competent member: leadership must be seen to be diffuse and contextual.

Review of the literature

There is such a wealth of literature on collaborative learning that it would be too ambitious to attempt an elaborate review in this paper. A review of a few very pertinent ones, however, will do.

It must be pointed out, foremost, that most of the work on cooperative and collaborative learning were pioneered by Johnson and Johnson (1978; 1983; 1989), as well as Slavin (1983). All these studies make it convincingly clear that learning in the cooperative or collaborative contexts produces greater mastery of subject matter. It is also more efficacious

in inducing greater critical thinking. Johnson and Johnson (1989) in particular found that when individuals are heterogeneous in terms of intellectual ability or social class, cooperating or collaborating on a task results in more positive regard for one another. It also enhances mastery of subject matter. The more peers learn together in the collaborative context, Johnson and Johnson (1989) add, the more self-confidence they tend to gain.

Holt, Chips and Wallace (1991) used the collaborate effort to develop a sense of self-worth among students at different levels of proficiency in the English language. They also tried to use the same context to enhance the English language competence of the students. They found that the collaborative learning context boosted the students' sense of self-worth. It also engendered in the students, the feeling of positive regard for one another. Finally it enhanced the students' mastery of English.

Gokhale (1995) did a similar study at the college level. From the study it was concluded that collaborative learning fosters the development of critical thinking through discussion, clarification of ideas and evaluation of others' ideas. Gokhale added that if the purpose of instruction is to enhance critical – thinking and problem-solving skills, then collaborative learning is more beneficial.

Opare (2002) elaborated on Gokhales study using teacher training college students. He found that students who studied collaboratively with their peers achieved significantly higher in non-recall test items than those who studied individually.

The fact that collaborative learning enhances academic achievement has been found to be due to the enhanced self-efficacy that it induces in students. Self-efficacy, also called perceived ability, refers to the confidence people have in their ability to succeed in given tasks (Bandura 1997). If they feel they possess the ability to successfully perform then that task will be attempted. Individuals who possess a high degree of self-efficacy are more likely to attempt challenging tasks, to persist longer at them, and to exert more effort in the process.

In academic settings, a student's self-efficiency beliefs refer to their judgments of their ability to successfully perform academic tasks (Zimmerman, 2000). This is so because such beliefs provide students with a sense of agency to motivate their learning through the use of such self-regulatory processes as goal-setting, self-motivation, self evaluation and energy use (Wigfield & Eccles, 2000).

Collaborative learning environments have been found to boost students' academic self-efficacy and performance. Zisk (1998) tried to find out if collaborative learning strategies would increase students' self-efficacy and academic achievement. He found a positive relationship between the collaborative learning environment and students chemistry self-efficacy. Chemistry self-efficacy was also found to be related to achievement in chemistry. Given the relatively limited number of studies on the relationship between collaborative

learning and self-efficacy we need further research to establish that relationship. Further research is also needed to find if the effect of self-efficacy on achievement is direct or indirect.

Numerous studies that deal with the relationship between and effect of self-efficacy on achievement have been done. These studies were not done in collaborative learning contexts. The bulk of such studies were initially done in the area of Mathematics. Alban-Metcalfe and Beverli (1981) as well as Schunk (1981) were among the first to attempt to establish that link. Following those studies, numerous ones followed. Osang (1990) and Wong (1992) tested the relationship between students' performance in mathematics on the one hand, and self-efficacy on the other. Both found that achievement in mathematics depended on students mathematics self-efficacy.

Similar studies were also done in the area of English by Everett (1991), and Randhawa (1993), as well as Pajares & Johnson (1996) and Schunk & Swartz (1993). All these studies concluded that self-efficacy is related to academic achievement. It is also predictive of academic achievement. It was following these revelations that Davis (1994) as well as Kohn (1994) claimed that if our goal is to help students to become good learners, then we must concentrate our efforts on their self-esteem.

Apparently startled by the Davis and Kohn challenge, several researchers have tried during the last decade, to establish a link between self-efficacy and academic achievement. Researchers who have sunk so much energy in the issue include Yeung and Lee (1999). Zimmerman (2000), Silver, Smith and Greene (2001), Chemers, Hu and Garcia (2001) and Akubuiro and Joshua (2004).

The results of all these studies indicate that student-held beliefs about their ability to succeed in the task (self-efficacy) are strongly and positively related to their achievement. It is rather disappointing, however, that with the exception of the Osang (1990) and Akubuiro and Joshua (2004) studies, which were both done in Nigeria in Africa, all the other studies were done elsewhere. This paper is one of the attempts to fill that lacuna.

The purpose of this paper is to find out if the internal dynamics of the collaborative learning context does improve students' academic performance and whether, if it does, the effect is direct or indirect. In other words the purpose of the study is to find out if the effect of the collaborative peer learning context on academic performance is simple or complex.

From the theory and research reviewed, the model below was derived to form the conceptual framework within which the study was conducted.

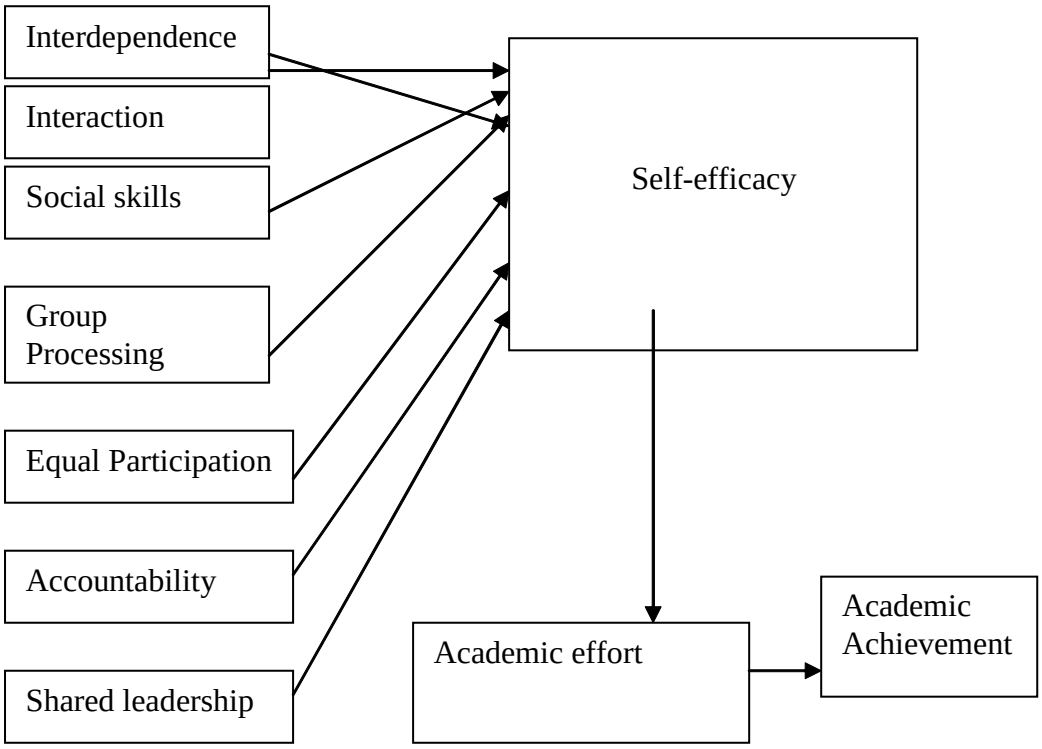

Figure 1: Model of the influence of collaborative learning on academic achievement

The research question guiding the study was whether the internal dynamics of the collaborative learning context had a direct or indirect effect on students' academic achievement.

The null hypothesis derived and tested was that

Ho: The internal dynamics of the collaborative learning context will not have an indirect effect on students' academic achievement.

The alternative hypothesis was that:

Hi: The internal dynamics of the collaborative learning context will have an indirect effect on students' academic achievement.

The point being stressed is that the focus is not on the relative strength of the effect of collaborative learning on academic achievement. The focus is on whether the internal dynamics of the collaborative learning context has an effect on academic achievement, and whether if it does, it is direct or indirect.

Methodology

In 2003, prior to his study we received word that students in the day secondary schools in the twin city of Sekondi-Takoradi were not serious with their studies. We visited all the four schools to acquaint ourselves with the academic culture of the schools. We found that the students were not doing well because they were unable to manage their time after school. So we gave them talks on the need to form collaborative peer learning groups. We also gave them talks on the form the internal dynamics of the collaborative peer learning context should take if it was to enhance learning. Sporadic visits were subsequently paid to the schools to find out if the students were really learning collaboratively.

In November 2005 we embarked on this study when we had had enough conviction that the collaborative peer learning idea had been adopted by large proportions of the students in all the four day schools in the twin city.

Research design

As pointed out earlier, the study aimed at finding out if the effect of the collaborative learning context on students' academic performance is direct or indirect. Since the study entailed a survey of students' perception of processes and situations, the descriptive survey design was deemed the most appropriate.

Sample and Sampling Technique

Data for the study came from a stratified random sample of 600 students selected from all the four day secondary schools in Sekondi-Takoradi. The Forms Two and Three classes in each of the 4 schools were purposively selected because they had been learning in the collaborative context for quite some time. Form One students were deemed not very much used to that experience, and had to be left out of the sample. Based on its enrolment, each of the four schools was given a quota. For example, Adiembra had 74, Bompeh 170, Methodist Day, 120 and Takoradi Secondary School, 236. Each stream of each class in each school was also given a quota. Separate lists were prepared for boys and girls in each steam. From the lists stratified samples of boys and girls were randomly selected.

Instrument

The questionnaire was the instrument used for collecting the data. It had three section: A, B, and C. Section A dealt with bio data while section B dealt with living arrangements and socio-economic background. Section C dealt with the internal dynamics of the collaborative learning contexts. There were also items dealing with students average scores in English and mathematics conducted for the study. The tests were based on the Senior Secondary School Certificate Exam syllabuses for each class/form. Test items for Form 3 students were based on the forms 1 and 2 syllabuses, while those for Form 2 were based on Form 1 work. The internal consistency of the instrument was assessed using the Cronbach's alpha statistic. A reliability coefficient of 0.826 was obtained, which was high.

Variables and measurement

The independent variables were those deemed to depict the internal dynamics of the collaborative learning context. They are interdependence, interaction, social skills, and group processing. Others are equal participation, individual accountability, and shared leadership. Students' perception of the internal dynamics of the groups they belonged to were measured on a 6 – point Likert scale.

An example of the items on internal dynamics (perceived equal participation) is as follows:

(a) In the group I belong to each member is given a specific task to perform at given times.
(b) In the group I belong to a member is tasked from time to time to look for some information to share with the group.
(c) In the group I belong to each member has something to contribute. The response categories are Always '6' Most of the time '5', Some of the time, '4', Occasionally, '3', Seldom, '2', and Never, '1' All the three responses were pooled together to form the variable, equal participation.

The dependent variables are scores in the English language and mathematics tests, which were used as proxy for academic performance. The scores were grouped and coded as 39 and below '1', 40-49, '2', 50-59, '3', 60-69, '4', 70-79, '5', and 80 and above, '6'.

The mediating variables are general academic self efficacy and academic effort. Academic self-efficacy, it is believed, influences motivation, academic effort and achievement. Self-efficacy was measured with the items:

(a) "My membership in the group has made me realize that I am capable of learning and making an excellent grade".
(b) "… I am capable of reaching the highest academic level".
(c) "… I am academically as good as the other smart ones". The response categories are Totally agree '6', strongly agree, '5', Agree, '4', Disagree, '3', strongly disagree, '2', and disagree totally, '1'. All the three items were pooled together to form the variable, self-efficacy.

Academic effort, the second mediating variable, was measured by the number of hours the student claimed he/she spent studying on his/her own in a week. The number of hours spent studying were grouped and coded on a scale of 1 to 6.

Data Collection

For the purpose of data collection all the students in the sample in each school were assembled together, and the purpose of the study was explained to them. They were taken through all the questionnaire items, and anything that was not clear was explained. They were also taken through how to respond to the items. They were than left on their own to independently respond to the items. The questionnaires were retrieved from each school after a week.

Data Analysis and Results

The literature suggests that it is desirable that members of the collaborative peer learning group perceive the internal dynamics of the group in positive terms (Lewin 1948). Against this background the respondents were asked to indicate whether or not in their perception, the groups they belonged to had those characteristics. Respondents perceptions on the various characteristics are presented in Table 1.

Table 1: Frequency and percentage distributions of respondents' perception of the internal dynamics and their self-efficacy

Internal Dynamics	Positive Perception		Negative Perception	
	Frequency	%	Frequency	%
Interdependence	539	89.8	61	10.2
Interaction	466	77.6	134	22.4
Social skills	530	88.3	70	12.7
Group Processing	522	87.0	78	13.0
Equal Participation	499	83.2	101	17.8
Accountability	506	84.3	94	15.7
Shared Leadership	505	84.2	95	15.8
Self-efficacy	542	90.3	58	9.7

The data in Table 1 shows clearly that an overwhelming majority of the respondents perceive the internal dynamics of their groups in positive terms. They are also self-efficacious.

Testing the hypothesis

The hypothesis tested was that the internal dynamics of the group would not have an indirect effect on academic performance.

Multiple regression analysis procedures were adopted to test the hypothesis. First, students' performance in English was used as the dependent variable. Results of the analysis are shown in Table 2.

The multiple regression analysis involved testing of three models. In the first model the score in English was regressed on the internal dynamics (independent variables). As Table 2 shows, the variables that explain performance in English, in order of importance, are perceived equal participation, group processing, perceived individual accountability and social skills.

Table 2: Results of the multiple regression analysis on English (Standard errors are in parentheses)

Variables	Model 1	Model 2	Model 3
	Beta	**Beta**	**Beta**
Interdependence	.029 (.061)	.011(.061)	.034(.054)
Promotive Interaction	.071 (.066)	.027(.067)	.031(.059)
Social Skills	.125(.055)*	.109(.054)*	.048(.048)
Group Processing	.138(.058)*	.087(.058)	.045(.052)
Equal Participation	.363(.058)*	.278(.061)**	.074(.056)
Individual Accountability	.127(.059)*	.148(.059)**	.095(.052)
Shared Leadership	.061(.066)	.045(.066)	.042(.058)
Self-efficacy		.235(.056)**	.169(.050)**
Academic effort			.484(.042)**
Constant	.502	.571	3.59

R^2 =.767 R^2 =.773 R^2 =.822
Adjusted R^2 =.765 Adjusted R^2 =.770 Adjusted R^2 =.820
* p <.05 ** p <.01

In the second model self-efficacy was entered into the equation to serve as a mediating variable. The theory here is that the independent variables, (the internal dynamics) do not influence academic performance directly, and that they do so indirectly through self-efficacy. When the variable self-efficacy entered the equation the coefficients of all the salient independent variables (except accountability) shrank. The amount of shrinkage of the variables are equal participation (76.6%), group processing (63%) individual accountability (116.5%), and social skills (87.2%). The coefficient of the variable, group processing even became non significant. What all the resultant shrinkages and non significance mean is that the independent variables do not directly influence academic performance. They do so only when self-efficacy is present.

In the third model the variable academic effort was entered into the equation, and the result was that all the coefficients of all the independent variables lost their statistical significance. This means that the explanatory power of the independent variables are shared with the mediating variables. That is, the independent variables affect performance only when the mediating variables are present.

As an elaboration, the multiple regression procedures were repeated on Mathematics. The results of that exercise are presented in Table 3.

Table 3: Results of the multiple regression analysis on Mathematics (Standard errors are in parentheses)

Variables	Model 1	Model 2	Model 3
	Beta	**Beta**	**Beta**
Interdependence	.076(.074)	.045(.075)	.004(.053)
Promotive Interaction	.310.089)**	.358(.087)**	.163(.062)**
Social Skills	.131(.068)*	.094(.066)	.035(.047)
Group Processing	.003(.0.70)	.034(.068)	.122(.049)**
Equal Participation	.555(.085)**	.508(.083)**	.202(.060)**
Individual Accountability	.181(.074)*	.156(.072)*	.149(.057)**
Shared leadership	.140(.065)*	.021(.066)	.020(.047)
Self-efficacy		.435(.072)**	.128(.053)**
Academic effort			.756(.035)**
Constant	1.539	1.582	

R^2 =.571 R^2 =.597 R^2 =.796
Adj R^2 =.566 R^2 Adj R^2 =.592 Adj R^2 =.792
* p <.05; ** p < . 01

As in the case of the analysis of the data on English when the mediating variables entered into the equation the coefficients shrank. In the case of the variable group processing the coefficient was aided to expand and become statistically significant. All these mean that the independent variables in themselves do not explain academic performance. They do so only when the mediating variables are present.

Summary, Discussion and conclusion

The purpose of this study was to find out whether or not the internal dynamics of the collaborative peer learning context affects academic performance. Specifically the study was designed to find out if the internal dynamics of the collaborative peer learning context affects academic performance directly. The results of the data analysis have shown that the internal dynamics do influence academic performance. This study thus supports findings made in previous studied. This effect of collaborative learning on academic performance is not direct though. They do so through the mediating role of self-efficacy and academic effort

We therefore reiterate our theory that the collaborative learning context does not directly affect students' academic performance. The issue is not all that simple. It is a complex process in which the internal dynamics first enhance self efficacy which in turn ignites and sustains the effort students make in their studies. This increased and sustained effort to study results in mastery of subject matter. Eventually mastery of subject matter ends in good grades or enviable academic performance.

The results of this study thus set the records straight to the effect that mere membership of a collaborative peer learning group in itself will not produce improved academic performance. It will produce such a result only if the context makes the participant efficacious. The self efficacy engendered must energize the student to learn hard in order to make the grade.

Therefore, the attention of theorists, researchers and teachers is drawn to the fact that students learning collaboratively is not enough guarantee of improved mastery of subject matter. Learning in that context must enable the students to realise what they are capable of doing. Attention is also drawn to the fact that students cannot master subject matter unless they make the effort to do so.

Finally, this paper supports the call by Davis (1994), Kohn (1994) and Akubuiro and Joshua (2004) on teachers, parents, and all stakeholders to help boost the academic self-efficacy of students. They should also encourage students to make the effort to study in order to master subject matter.

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