Cooperative Learning:
Heterogeneous Vs Homogeneous Grouping

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Problem Statement

Mathews (1992) found that high-ability students prefer cooperative learning in homogeneous ability groups than heterogeneous ability groups. This means that students who are academically more inclined prefer to form a group with those who are as equal or more academically inclined rather than being grouped with a student of lower ability. This preference has important implications in Singapore schools. One of the Desired Outcomes of our education system is that students should be able to work in teams and value every contribution. Hence, we need to look into how we can add value to cooperative learning so that the students are willing to work in any teams.

Problem Questions:

1)   What are the strengths and weaknesses of heterogeneous grouping in cooperative learning?

2)   Under what situations do homogeneous or heterogeneous grouping prevail?

3)   What changes can be made to a lesson involving cooperative learning to encourage more effective outcomes of heterogeneous grouping?

Literature Review
What is cooperative learning?

Cooperation means to work together to accomplish shared goals. Within cooperative activities, individuals seek outcomes that are beneficial to themselves and to all the group members.

Cooperative learning then means a lesson where the students work together in small groups to maximize their own and each other's learning. The students work through a given piece of work as a group until all group members successfully understand and complete it. This is the underlying basis for cooperative learning. Through cooperative learning, the students recognize that they share a common fate and will participate and assist each other as every individual member contributes to the success of the groups. When any of the group members succeed, the group gains pride and they jointly celebrate thus motivating the students in the group. The students will also be more open to the idea of working in a group.

According to Johnson & Johnson (1989), in cooperative learning situations, there is a positive interdependence among students' goal attainments; students perceive that they can reach their learning goals if and only if the other students in the learning group also reach their goals.

Why use cooperative learning?

A teacher is able to shape and to construct the way a student learns through her mode and style of teaching. She is able to structure her students' learning goals and to introduce lessons in order to promote cooperative, competitive or individualistic efforts during learning.

If a competitive environment is built in the classroom, it pits students against each other in order to achieve a goal. In competition there is a negative interdependence among goal achievements; students perceive that they can obtain their goals if and only if the other students in the class fail to obtain their goals (Johnson & Johnson, 1989). The outcome of such a lesson would only result in only one or a few students attaining their goals. This is because in such an environment, students could either work hard to do better than their classmates or adopt a laidback attitude as they believe they do not have a chance to succeed.

If an individualistic environment is adopted in class, students will work alone to accomplish their own goals for their own self-interest. Students' goal achievements are independent; students perceive that the achievement of their learning goals is unrelated to what other students do (Deutsch, 1962, Johnson & Johnson, 1989).

If a cooperative learning environment is adopted in class, students will work together aiming for a common goal and that each student in the group will be accounted for when it comes to the final grading of the whole group. Johnson and Johnson (2002) recommended that for cooperative learning, it is best if heterogeneous groups with diversity in ability, ethnic background, socioeconomic status and gender are formed to maximize learning. According to Brandt (1990), when a heterogeneous group is formed by achievement, better ranges of improvements are seen rather than random placement of students.

Advantages of Heterogeneous Grouping
The reasoning behind heterogeneous grouping is that it maximizes opportunities for peer tutoring and support, improves cross-gender and cross-ethnic relations, and ensures that each group has at least one student who can do the work (Kagan, 1992).

Some of the benefits mentioned by Johnson and Johnson (1989) include increased social behaviours and improved self-esteem, attitudes toward school and acceptance of differences. Students tend to have higher self-efficacy about their chances of being successful.

Another advantage especially for high ability students is that through their explaining of subject material to their classmates, they will attain higher-level processing of the subject material themselves and remember it longer. This is known as cognitive rehearsal. This is also coherent with Vygotsky's theory where he conceptualized development as the transformation of socially shared activities into internalized processes (Woodfolk, 2001).

Disadvantages of Heterogeneous Grouping
However, some disadvantages pointed out in the research by Matthew (1992) include students having difficulty explaining the material to their group mates who do not want to listen to them, students who explained without bothering if their group mates understood their explanation at all and students who end up dominating a group or doing all the work themselves as they are concerned about the quality of the work. As a result, the students have negative attitude towards fellow group mates.

Some critics argue that such heterogeneous grouping holds back high-ability students. Matthews (1992) suggested that high-ability students learn humility and democratic values in

homogeneous groupings. When all the members are on the same intellectual level, the students cited that it affects their self-esteem positively and they have a better understanding of their abilities when they measure up against the other members. It also adds value to the group work as each of them contributes in areas where others are lacking. However, in most studies though, it has been found that high-ability students perform equally well in tests after working with heterogeneous or homogeneous groups (Hooper & others, 1989).

Another disadvantage brought up by Santrock (2004) is that when a group includes high-ability, medium-ability and low-ability students, the medium-ability students might get left out to some extent; high-ability and low-ability students might form a teacher-student relationship in these groups, excluding medium-ability students from group interaction. Santrock (2004) stated that the medium-ability students might perform better in groups where most or all of the students have medium abilities.

Heterogeneous or Homogeneous?
A teacher needs to reflect and make a decision before carrying out a lesson involving cooperative learning on whether a heterogeneous or a homogeneous grouping is most beneficial to a lesson.

According to Davidson (1990), when assigning groups, the teacher needs to look at the task that would be given. If the task involves working on a specific skill, procedure, or set of facts, homogeneous groups are useful. The teacher will then be able to address the low-ability students as a group when one of the members raised a question. The teacher will also be able then to have an idea on where the students are weak in collectively as a group and address the matter accordingly.

However, when the task involves working on open-ended problem-solving tasks and learning how to communicate, heterogeneous groups are most appropriate. The students will learn best communicating with students of different abilities when trying to solve a problem where there is more than one correct answer as every member will be able to contribute in the brainstorming of potential solutions without taking into account if a member is of high-ability or low-ability. However, there has not been much research done on this subject matter.

Possible Changes for Effective Heterogeneous Grouping
For a heterogeneous group to work, the teacher has to proactively encourage group work by structuring the task to be given in such a way that cooperation is not only helpful for academic success but is necessary (Johnson & Johnson, 1991).

The main key to successful cooperative learning is to keep the group as small as possible. The teacher would then have to identify the combinations of students that are likely to be most productive.

Next, the teacher must give the group members one or more common goals to work towards and provide clear guidelines about how to behave in the group. This will include informing the groups all the rules of working in the group such as refraining from insulting or yelling at others or helping those who need it. Students must also be taught their responsibilities and obligations to the group.

The teacher will then have to consistently monitor the groups' activities to ensure that the interactions are productive and socially appropriate. However, the teacher has to try not to

intervene into their discussions too much as students tend to talk less when a teacher is present (Cohen, 1994).

At the end of the lesson, the teacher would then have the groups evaluate their effectiveness in working as a group. By analyzing, the group will then discover their strengths and acknowledge their weaknesses and try to improve on those weaknesses. The teacher should reinforce any group success that she has observed to motivate the groups (Ormrod, 2000).

Implications on Adolescent Development in Singapore
It is important that heterogeneous mixing is encouraged in schools and the simplest way of doing so is in the classroom itself. This is to prevent issues of elitism among the high-ability students and to prevent issues of low self-esteem among the lower abilities students.

In Singapore, where the only resource is the human population, human resource development is therefore of premium importance. Training students to work effectively in heterogeneous groups and helping them value the diversity that exists in the classroom is essential for their future seamless integration into the multi-racial, multi-lingual and multi-religious workforce where interdependence amongst people of various abilities and diverse backgrounds is crucial for success.

Thus, the teacher plays a very important role in ensuring effective interaction of students in their respective groups through careful planning of the lessons she has created.

Research Proposal
Davidson (1990) claims that heterogeneous groups are most appropriate when the task given is an open-ended problem-solving task where there is no one right answer only. Apart from that, there has not been much research on the type of tasks that encourages heterogeneous grouping.

In this research proposal, we will focus only on one topic in Chemistry and the tasks given will be based on 'Acids, Bases and Salts', one of the topics to be covered in the O' Level syllabus. No matter what tasks are given, group successes must be rewarded to encourage heterogeneous groupings (Ormrod, 2000). All other changes that have been mentioned earlier for effective cooperative learning will be done during the process of this research.

Research Questions
1)   What is the impact of different tasks (games & simulations, problem-solving or case-based instruction) on a heterogeneous group?

2)   What is the impact of the outcome of each task on improving the performance of high-ability, middle-ability and low-ability students?

Sample
A random sample of 60 upper secondary school students will be taught key concepts of the topic on Acids, Bases and Salts. The students will be separated into three groups of 20 where two groups will work on a task specifically designed by the teacher (Experimental groups) whilst another sample of 20 students, who have been taught the key concepts of the topic but will not be put through any tasks, will serve as a control group.

Procedure

Students will sit for a class test to assess the respective abilities of each student. Next, the students will be grouped accordingly in groups of 4 comprising 1 high-ability student, 2 middle-ability students and 1 low-ability student. At the end of the project, the students will sit for another class test that is similar in the level of difficulty as the first test for assessment. The control group will sit for both tests at the same time as the experimental group.

Results of every group will be analysed in two ways: Comparison of the effects of the different tasks given on the groups and Comparison of results of each student's pre- and post-activity.

Predicted results

It is predicted that students who were put through cooperative learning by doing different tasks (experimental group) will do better in the test than those who did not do any activity (control group). It has been proven that students who participate in activities involving cooperative learning do learn more than those who do not. It is also predicted that students who were put through problem-solving activities will show a significant increase in results compared to the other two tasks as it requires a much deeper processing skill of the task at hand and application of their prior knowledge to solve a problem.

As for results of each individual student, results of students in the control group would not show any increment as no pre-emptive intervention was taken to help the students to improve. As for students who worked on the different tasks, they would show some improvement in their second test results as they had time to learn to apply the concepts in an activity-based task. However, it would have to be seen which tasks would be most beneficial for a heterogeneous group.

Implications of Predicted Results

If the predicted results were found, it would suggest that heterogeneous grouping in cooperative learning is indeed effective with proper structuring of lesson and activity by the teachers. This would also mean that teachers would have to be more comfortable with using school time for such activities and not view it as taking up too much time from them covering the syllabus.

The teachers would have to be open to attending proper training in creating proper cooperative learning lessons in order to be able to create a cooperative learning lesson that will fully benefit both the students and the teachers. Creative assessment practices must also be developed by teachers to document all achievement of meaningful outcomes for the students (Shevin, Ayres & Duncan, 1994).

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