



# Grouping strategies in Collaborative learning –An experimental Study

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### ARTICLE INFO

#### Article history:

Received: 3 January 2013;

Received in revised form:  
24 June 2013;

Accepted: 8 July 2013;

#### Keywords

Collaborative,  
Social factors,  
Interaction,  
Dynamic.

### ABSTRACT

In a typical class room with students of different learning styles and influences due to cultural or social factors, monitoring the individual student can be enhanced by going through their interaction with each other through a collaborative learning approach. We propose a model of two types of collaborations. The first allows dynamical grouping driven by the students' performance within heterogeneous (mixing high, medium, low marks achievers) or homogeneous (similar marks achievers). The second type consists of static groups (the students agreed to form fixed groups, not moving from one group to another group). We have applied the two types of model in constructing the knowledge for Java coding for application development through collaborative learning process in which each student has a more or less equal role in bringing out the outputs for the laboratory exercises. Our results prove that the static groups have significant effect in spite of the presence of extra encouragement for participating in dynamic grouping. This result establishes, especially in the context of rural learners in, the evidence of gaining educational benefits from the social interactions and cultural factors.

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### Introduction

Active participation for achieving the set goals of the subject objectives in a group has been strongly linked to deeper learning. For individual learners to benefit from the grouping exercise, individual learners with different characteristics must be grouped together and the selection of appropriate strategy for grouping [5] has vital role in achieving the learning outcomes through group assessments. Although there are different opinions about what learning in a group is, these views reflect that grouping learners, and the process of learning from interactions with group-members, are the basic characteristics of collaborative learning as an instructional approach. In traditional evaluating environments, even though the student might be given instructions systematically and got assessed individual work, it is possible for the student to remain passive to such an extent that it is detrimental to learning. Hence exercises are specially designed to enhance the active participation in a group not necessarily in class room but even outside. This research explores the various types of groups configured as either static/fixed or dynamic and their effective performance.

We address the problem of controlling major issues hidden or influencing factors in conducting collaborative learning assessments and their effectiveness. Group interactions, particularly for laboratory based coding and application building exercises, have the capacity to obtain the solutions easier than constructing the same by individual learner as it involves practical learning with immediate outputs. As formative assessment progresses, the dynamic group, i.e. the set of assessments in changeable grouping by a learner, is compared to a learners who participate in fixed grouping throughout the same set of assessments. The study proves that the dynamic configurations do not improve the performance of rural learners in the institutions in the city. Finally we discuss the cultural impact on the results obtained.

### Background

Our work for investigating collaborative learning is based on recent work related to learners' cognitive advancement in collaborative learning [14]. Certain degree of cognitive advancement through collaborative learning is influenced by social interaction as investigated previously [1]. Both self-esteem as well as comfortable idea generation is possible in such interactions for group assessments [2]. The impact of a learner's prior knowledge and personal intelligences on their learning outcomes in Analysis of social interaction[15] yields additional information for further motivations for the cooperative learning research.

Most of the investigations found in the literature are very much aligned to on-line teaching Also formation of dynamic groups was applied by some researchers in the class room for kids doing primary level education [5]. Hence here we extend the scope to bachelors' level courses without any technology support for configuring the groups as in previous cases.

There is no much research on the effects of conducting assessments in various types of groups in parallel so that one can compare and conclude on the recommendations on grouping strategies. Previous investigation covered three areas in the selected topic namely, the quality group interaction, building collaborative knowledge, and accessing cooperative learning. Resta [1] addressed the problems of coordinating the learners for collaborative learning by structuring the groups and monitoring them. Based on the knowledge structure of individual students, dynamic-grouping and partial-regrouping were constructed to identify suitable partners for students in a group [10]. Similar computer supported grouping are also available [11, 12, 13].

### Research Data, Variables and Tool

This cooperative learning by different types groups was tested on a sample of 37 bachelor students studying Bachelors Technology programme in Computer Science and Engineering.

**Table 1: Data variable with their explanations**

Variable Name	Expansion	Group Type and grouping criteria for this study	Assessment requirements
Ex1- <i>hom</i>	Lab exercise 1 by a group of homogeneous type.(Second row , second column in Table-2)	Homogeneous- All the students having more or less similar performance in the previous task or GPA	First exercise testing the initial concepts and generating moderate outputs covering the first learning objective
Ex2- <i>het</i>	Lab exercise 2 by a group of heterogeneous type.(Fourth row, third column)	Heterogeneous Group- All the students having different scores in the previous exercise and subject to change their membership based on the previous performance.	Second exercise with the middle level complexity covering the second and third learning outcomes
Ex3- <i>fix</i>	Lab exercise 3 by a group of fixed type. (Last entry in Table-2)	Fixed Group- All the students had not been changed throughout in their exercises.	Third exercise covering final outcome and application requirements.
GPA	Graduate Performance Aptitude		Initial measure for grouping either into any type of group.

The table of correlation between the exercise performances in each type of groups is shown in the Table-2.

Exercise/Group Type	Exercise 1	Exercise 2	Exercise 3
Fixed	0.027	0.542	0.245
Hom	0.431	0.328	0.315
Het	-0.198	-0.109	0.436

**Table 3: p-Values obtained by FTEST**

Participating Groups	Hom-het	Fix -hom	Fix -het
p-value	0.066291	0.113991	0.723842

The performance is measured by their code implementation, debugging and running the java classes efficiently. Missing values in the data (less than 2%) due to sickness or unforeseen reasons were considered and filled by mean. The fixed or static group marks were recorded for all the lab exercises and for the dynamic groups, not only the marks but also the details of group reconfigurations was recorded. There were 23 different groups all together of size less than 5 members. The performance indicators were calculated both by individual elements (individual GPA, interaction within the group as indicated by the fellow members) as well as group elements (net output). We populated all the instances in attribute relation flat file format and fed into SPSS software tool to get the final findings.

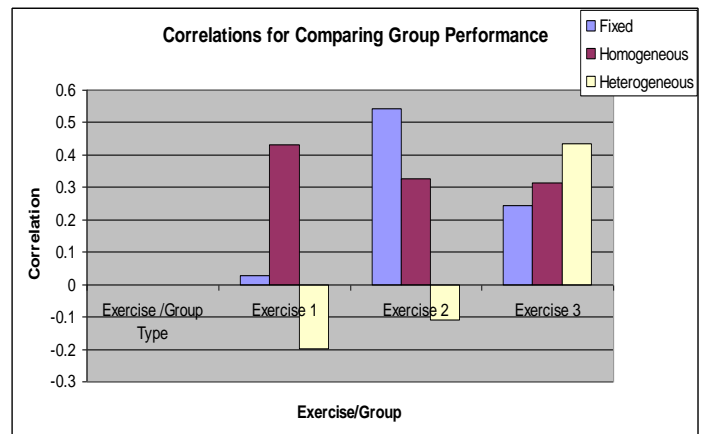
This research work was conducted in two stages. In stage one, at the beginning of the semester the climate for cooperative learning by communicating clear instructions, creating either self generated or based on rules for grouping and motivating for being ready to be a member of any group were made. Moreover the code of cooperation, inter team communication and reflection on interdependence of members were set out. In stage two, monitoring the team by ensuring everyone's contribution to the final results and reconfiguring the groups by the previous performances were carried out. Hence the success of the study greatly demanded the instructor's attention in balancing all the group characteristics carefully. During the initial formation of grouping the students' status and preferences were obtained and used for entry in a particular type of group.

### Main Results:

#### Groups Design

We follow a simple procedure where as complex techniques are available in [10] to group individual learners for a particular collaborative learning activity. Here it is based on the criteria dividing a set of learners into groups introduced as shown in Table 1.

The groups were designed as in the following sections.



**Dynamic Grouping:** We constructed different groups of learners going through three assessment tasks with the possibility of having membership changing with respect to the performance in the previous performance. For the task1, the groupings were done based on GPA initially. As formative assessments progressed, the group performance is assessed by individual learner's contribution as well as the group's achievement.

**Fixed (Static) Grouping:** These group's members are fixed in a group and not allowed to change their membership for all the three tasks.

#### Research Hypothesis

The purpose of the investigation was to examine the effectiveness in design of various types of groups and the suitability of assessments in a sequence and their inter-dependence. The important research findings answer the following hypothesis here considered are:

The dynamic groups are significantly different from the fixed groups in their performance.

The groups within dynamic groups i.e. heterogeneous and homogeneous are significantly different in their performance.

p-values obtained by FTEST (Fisher's z-test) for comparing each groups are shown in Table-3. The results are as our expectation as the last two columns clearly shows that there is significant difference between heterogeneous and fixed groups. The reasons are the advantages the students have in the women's colleges at Gulf countries for degree courses as follows. They move among the group of friends from first year to final year and their performance synchronized very much with social interactions they have been going through all along their under graduate studies. These points may not be true in other countries as they have lesser degree of bonding factors. Hence changing these inherent patterns shows strong relationship to their performance as they move or work in different groups.

Moreover there is significant difference between the dynamic groups as we see the pvalue when comparing between homogeneous and heterogeneous types. (Table 3, pvalue for Hom-het is 0.066291)

Hence changing the groups has significant influence in the learners' performance irrespective whether they are grouped heterogeneously or homogeneously.

#### **Conclusions:**

In this paper, we have described types of groups to do collaborative learning, which incorporates styles of performance

progression. Progressive scores are taken into account by automatically forming heterogeneous cooperative learning groups and monitoring learners' interactions. In addition to the implementation of the proposed model, future work includes evaluating the method of incorporating learning styles for group formation. As a proof-of-concept study the data presented here is for small sample sizes. It is our intention to continue this work with larger groups of students and also including the learning style model in designing the groups [16] to provide further support for the results obtained above.

#### **Acknowledgements:**

The author of the paper would like to thank management of Bharath University for the support and encouragement for this research work.

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