LEARNING STRATEGY WITH GROUPS ON PAGE BASED STUDENTS' PROFILES

San San Tint[1] and Ei Ei Nyunt[2]

[1]Department of Research and Development II, University of Computer Studies, Mandalay, Myanmar
[2]Master of Computer Science, University of computer Studies Mandalay, Myanmar

Abstract

Most of students desire to know about their knowledge level to perfect their exams. In learning environment the fields of study overwhelm on page with collaboration or cooperation. Students can do their exercises either individually or collaboratively with their peers. The system provides the guidelines for students' learning system about interest fields as Java in this system. Especially the system feedbacks information about exam to know their grades without teachers. The participants who answered the exam can discuss with each others because of sharing e mail and list of them.

Keywords

Collaboration, Grade, Learning, Profiles, Feedback

1. INTRODUCTION

Thinking of participants is the first step of collaborative learning system. In this step the system used the student attributes or properties from their profiles. The properties and the values of the properties are specified by the system. The think step and pair step of the Think-Pair-Share (TPS) Strategy are measured by the clustering method such as K-means method [1-5].

Data clustering is a data exploration technique that allows objects with similar characteristics to be grouped together in order to facilitate their further processing. In the system clustering method is used to produce the groups of student participants according to their properties as shown in Table 1. The objects are the students and the initial number of cluster is specified with the random number of students [4], [6].

Cluster analysis is a formal study of methods for understanding and algorithm for learning. K-mean is the first choice for clustering with an initial number of clusters. K-mean algorithm is most widely used algorithm in data mining applications. It is a simple, scalable, easily understandable and can be adopted to deal with high dimensional data. A distance measuring function is used to measure the similarity among objects, in such a way that more similar objects have lower dissimilarity value. Several distance measures can be employed for clustering tasks. The K-Mean algorithm finds partitions with distance measuring function in the cluster which is minimized [7-9].

2. BACKGROUND THEORY

2.1. Think-Pair-Share (TPS) Strategy

Think-Pair-Share is a relatively low-risk and short collaborative learning technique, and is suited for instructors and students who are new to collaborative learning.

Think-Pair-Share technique in education is also about:

- Think about your answer individually.
- Pair with a partner and see your answers.
- Share you or your partner's answer, when called upon.

The purposes of this technique are to process information, having a communication and develop thinking among students. This strategy helps students become active participants in learning and can include writing as a way of organizing thoughts generated from discussions [6].

2.2. Think-Pair-Share Technique Role

The teacher decides upon the text to be read and develops the set of questions or prompts that target key content concepts. The teacher then describes the purpose of the strategy and provides guidelines for discussions. As with all strategy instruction, teachers should model the procedure to ensure that students understand how to use the strategy. Teachers should monitor and support students as they work. In the system the Think-Pair-Share technique will be applied as following:

Thinking: each student thinking of his/her profile attributes and answering the given questions.
Pair: Pair the students' grade and the K-means clustering result which is used students' profile. The students of grades (A-C) will be specified by using his/her exam result.
Share: Share the students' list that contains not only Grade A and Grade B with their results but also their email and original group number to communicate each other.

When the system basic level step is finished, both thinking and first part of pairing of the students who get other Grade can retry the questions next time [3].

2.3. The Main properties of Objects (7 attributes)

The objects of the system are students' data which are specified by the system. The main attributes of student information are specified as objects' properties to calculate the similarity among objects. The attributes are specified by the collaborative learning system and are calculated as k-means objects to determine the group of the participants. The attributes and values of the clustering categories are specified as following Table 1. These all attributes are belonging to the student objects which are specified by the students' data of their profile. The system is defined the students to fill their data which is belong to the following properties and values. The students' information and exam results are calculated to apply the TPS theories in this system.

Table .1 Attributes and Values for Student Objects

Attribute Name	Value 1	Value 2	Value 3
Education	Information Technology	E.P Engineering	Computer Technology
Occupation	Student	Graduate	Post Graduate
Math Skill	Normal	Grade	Distinction
Physic Skill	Normal	Grade	Distinction
Programming Skill	Learner	Developer	Expert
10^{th} standard Passed Year	2006-2013(after)	1998-2005	1990-1997
Interest in subject	OOP	Networking	Web Development

These attributes are specified for the calculation of clustering of the student objects'. There are three or five clusters to group the students. The students' attributes are calculated by the Euclidean distance function to determine the groups of students [11].

2.4. Distance Measuring Function for K-Means Clustering

The system specifies the random objects or students by using Rnd function on attributes. And get top three or five objects to specify the centroids of initial clusters. Then the system calculates the members of clusters by using the Euclidean distance function which is shown as following:

$$dist(X_1, X_2) = \sqrt{\sum_{i=1}^{n}(x_{1i} - x_{2i})^2} \quad (1)$$

The mean for a cluster is:

$$m_j = \frac{1}{|C_j|}\sum_{x_i \in C_j} x_i \quad (2)$$

Where, $X_1 = (x_{11}, x_{12}, ..., x_{1n})$

$X_2 = (x_{21}, x_{22}, ..., x_{2n})$

$|C_j|$ = number of data points in cluster C_j

2.4.1. K-Means Clustering Algorithm for the System

Input:

Let k=5 is the number of clusters to partition.
D is a database containing n objects:(n is the number of students' attributes from profile).

Output:

A set of k clusters: (including class of attributes with their member's objects.)

Method:

arbitrarily choose k objects from D as the initial cluster centers;
Let C_t =new centroids (t=1,2,3,…,k)

x_i=arbitrarily students' attributes(i=1,2,3,…,k)
x_j=all students' attributes (j=1,2,3,…,n)
D_t =data set of distance values (t=1,2,3,…,k)
Initialize x_i=1 , x_j=1;
3) repeat j
repeat i
$d(x_i, x_j) = \| x_i - x_j \|^2$
increase i
until i <= k
choose minimum distance value and assign to D_t.
increase t
increase j
until j <= n

Compare D_t with minimize pair value and reassign each object to the cluster to which the object is the most similar based on the means value of the objects in the cluster (Ct, where t=1, 2, 3,…,k).Update the cluster means; i.e., calculate the mean value of the objects for each cluster until no change.

2.4.2. Roles of Student Profiles

In the clustering method of the system, the role of students' profiles is to calculate the groups of students. The groups of students are specified by the clustering method. Then the students answer the exam questions which are become the input of next step of the collaborative learning of the system. The next step is the calculation of paring students according to the result of their exam marks and their grades. The inputs of the first step are as shown in the following Table 2.

Table 2. Example profile table of the Students

Student Obj	Education	Occupation	Math Skill	Physic Skill	Program Skill	10th Std Passed Year	Interested in Subject
a_1	1	2	1	2	2	2	3
a_2	3	1	2	1	1	1	1
a_3	2	1	2	2	1	1	1
a_4	1	1	1	1	1	1	2
b_1	1	3	2	1	2	2	3
b_2	2	1	2	1	1	1	1
b_3	3	2	2	1	3	2	3
c_1	2	3	1	3	1	3	2
c_2	1	1	3	1	2	1	2
c_3	3	3	3	2	3	3	2

Education	1 = IT	2 = EP	3 = Computer
Occupation	1 = Student	2 = Graduate	3 = Post Graduate
Math Skill	1 = Normal	2 = Grade	3 = Distinction
Physic Skill	1 = Normal	2 = Grade	3 = Distinction
Program Skill	1 = Learner	2 = Developer	3 = Expert
10th Standard Passed Year	1 = 2006-2013 later	2 = 1998-2005	3= 1990-1997
Interested in Subject	1 = OOP	2 = Networking	3=Web

In K-means method, the number of clusters must be specified as the initial clusters' centroid. Therefore the example objects are specified from the student profile table as the initial clusters' centroid are as shown in the following Table 3. The initial cluster centroids are calculated with other objects in the student profile table by substitution of the Euclidean distance function.

Table 3. Objects from the Profile as initial Cluster

Obj	Education	Occupation	Math Skill	Physic Skill	Program Skill	10^{th} Std Passed Year	Interested in Subject
a_1	1	2	1	2	2	2	3
b_2	2	1	2	1	1	1	1
c_3	3	3	3	2	3	3	2

Table 4. Centroids for Second Iteration

Student Obj	Education	Occupation	Math Skill	Physic Skill	Program Skill	10^{th} Std Passed Year	Interested in Subject
a_1 , b_1, c_1	1.3	2.7	1.3	2	1.7	2.3	2.7
a_2 ,a_3 ,a_4 ,b_2 ,c_2	1.8	1	2	1.2	1.2	1	1.4
b_3 , c_3	3	2.5	2.5	1.5	3	2.5	2.5

Step 6
The centroid from second iteration is no change. The k-means algorithm is terminated. The cluster is illustrated with set graph as shown in fig.1.

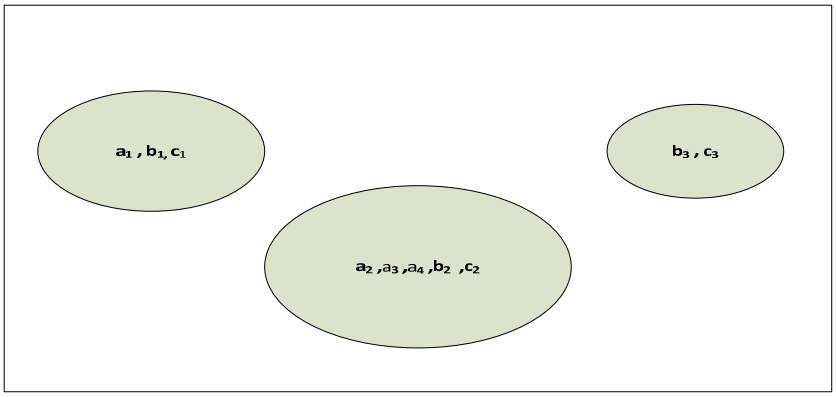

Figure 1. Clusters of Students with similar properties

2.5. Distance Measuring for New Student

The distance Measure for new student is calculated with Table 5 cetroids which are derived from k-mean distance measuring function. The derivation of new student's group is as shown in the following Table 6.

Table 5. New Student's Profile

Student Obj	Education	Occupation	Math Skill	Physic Skill	Program Skill	10th Std Passed Year	Interested in Subject
d	3	1	2	2	1	1	1

$Dist(a_1 b_1 c_1, d)$ = 3.967
$Dist(a_2 a_3 a_4 b_2 c_2, d)$ = 1.5
$Dist(b_3 c_3, d)$ = 3.354

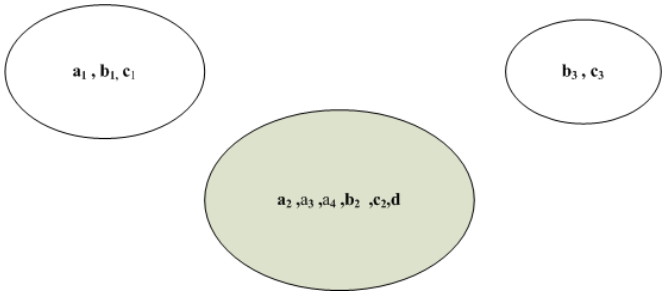

Figure 2. Cluster for new Student with Similar Properties

2.6. Pair and Sharing of Participants

The pair and sharing of participants is the final step of the system. The system thinks the participants' or students' skills both calculating the k-mean clustering method and examination method. The system decides the pair of participants with the grade of advance level students' marks. Then the system shares the similar upper levels of students' skill. The students will answer two steps of exam with their groups. The finally the students are shared among the upper two levels of groups with their examination information.

Table 6. Student Grade Table

Class of Grade	Marks	
Grade A	>=8	
Grade B	7	4
Grade C	< 4	

In the sharing stage of students, the system gives the students' information such as email addresses each other. The students will go on sharing and learning the sense or assuming on the relative subject with their mail addresses.

3. IMPLEMENTATION OF THE SYSTEM

The two main parts of the implementation system have explained as shown in the following figures. The figures demonstrate the collaborative system how to cluster the profiles and hold the examinations.

3.1. Main Page for Administrator

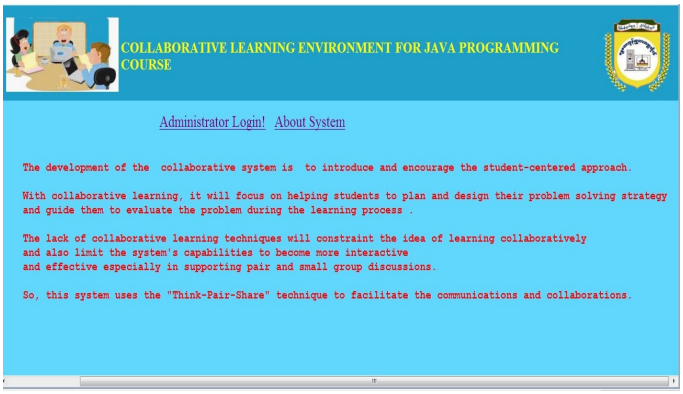

Figure 3. Main Page for Administrator

The Figure 3 is Main Page for Administrator page. In this page, there are two links such as Administrator Login and About System. Moreover the introduction of collaborative system is described on this page.

3.2. Admin Login Page

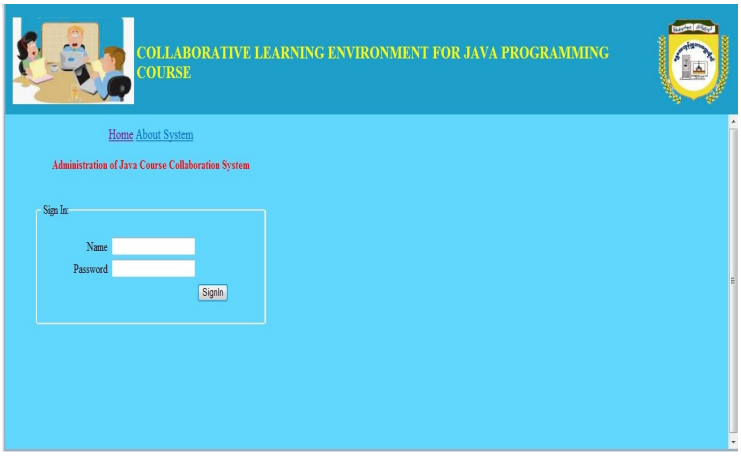

Figure 4. Admin Login Page

The Figure 4 is the Login Page for Administrator. In this page, the admin can enter into the system by using his/her name and password. There are two links such as Home and About System to join the home page and About System page.

3.3. Admin Role Page

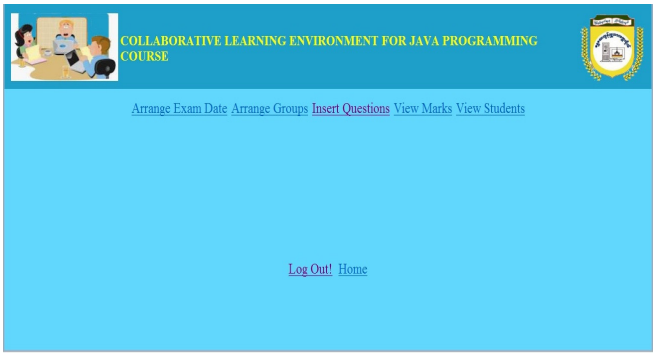

Figure 5. Admin Role Page

The Admin Role Page, Figure 5 consists of seven links such as Arrange Exam Date, Arrange Groups, Insert Questions, View Marks and View Students. Log Out! and Home links are used to connect with Admin Login Page and Admin Home Page.

3.4. Arrange Exam Date

Figure 6. Arrange Exam Date with Exam ID

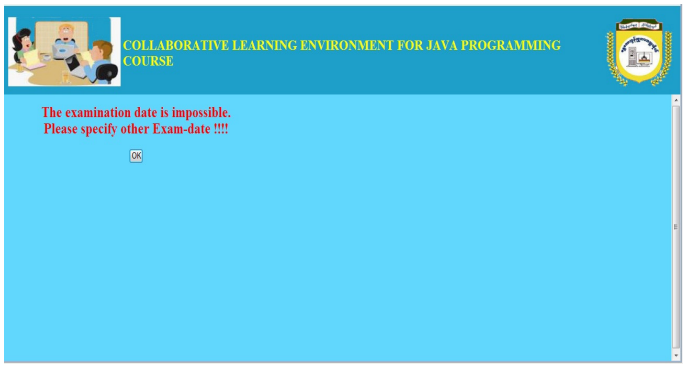

Figure 7. Error Page for Arrange Exam Date

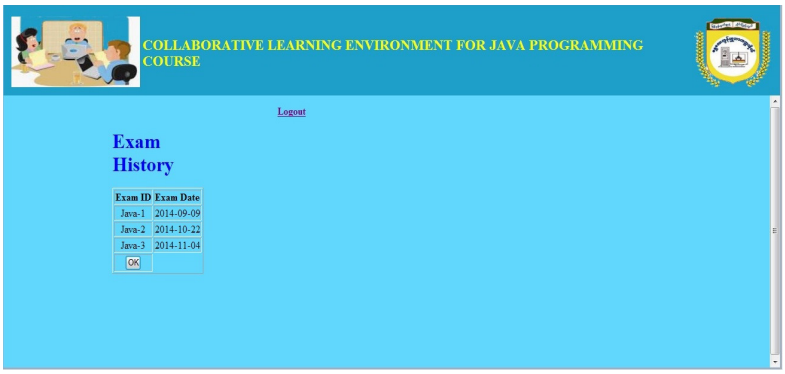

Figure 8. The New Arrange Exam Date

Above Figure 6, 7, and 8 illustrate the specification of New Exam Date. According to Figure 6 the admin needs to type Exam ID and Exam ID fields. And then press Add Date button. In Figure 7 the system replies that the exam date is pass over or impossible date to specify for the examination. In Figure 8 the Exam Date is successfully specified by the administrator and then the system displays the new Exam Date with old list.

3.5. Arrange Groups

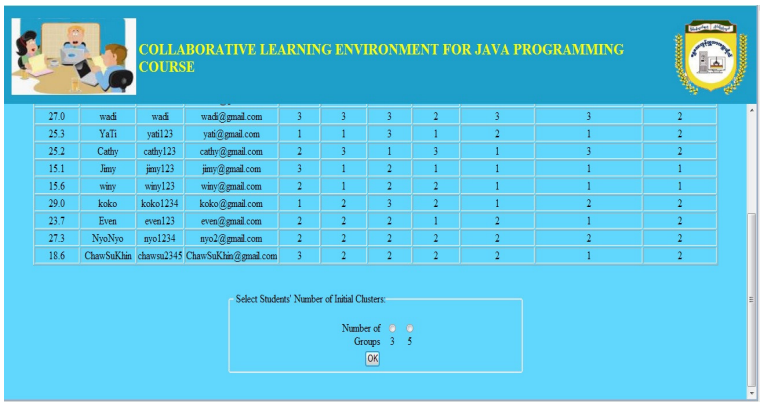

Figure 9. Arrange Group with Initial Group Numbers

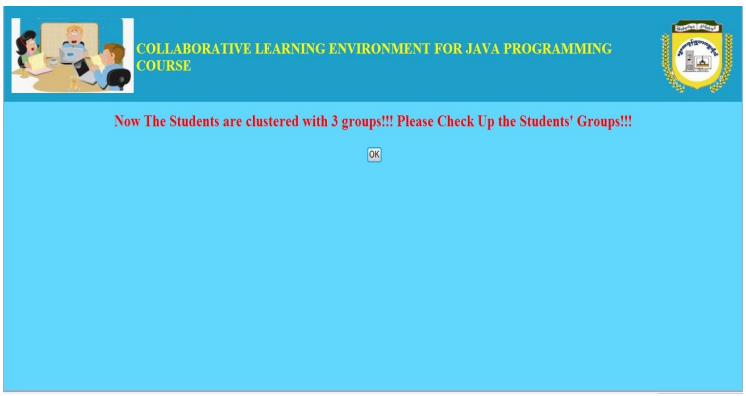

Figure 10. Arrange Groups with Initial Cluster Number

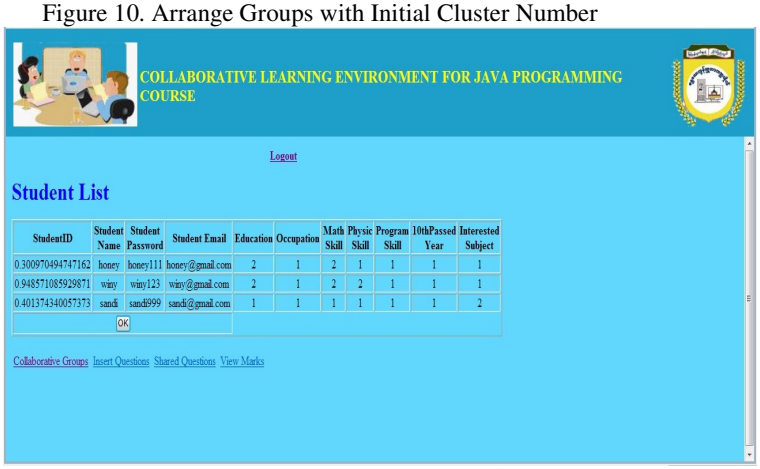

Figure 11. Arrange Groups with Random Students' profile

Figure 12. Arrange Groups with Students' Profiles List

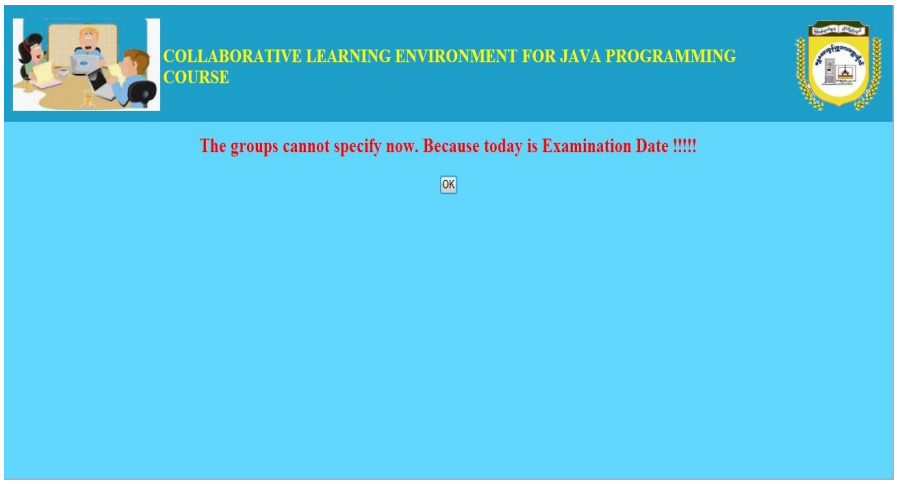

Figure 13. Error Page for Arrange Groups

From Figure 6 to 12 are shown the Arrange Groups. The system shows the arrange groups numbers for initial clusters as shown in Figure 10. Figure 11 and 12 show the three random students' profiles to calculate the groups of students who are signed up the system. If the exam is hold on today, then the administrator cannot specify the groups. Figure 12 shows the students' profile records with their groups. The error message as in Figure 13 will be shown.

3.6. Insert Question Page

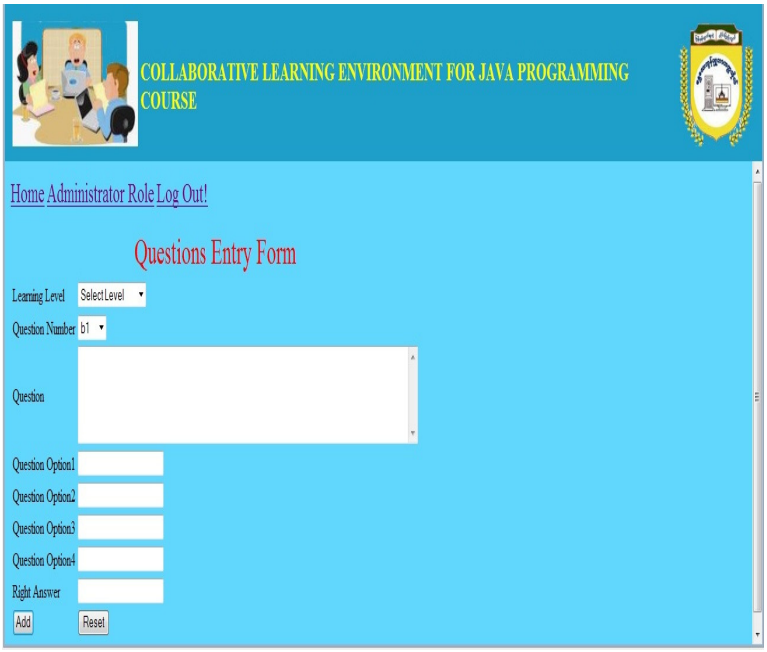

Figure 14. Question Entry Form

The admin can add question by using Question Entry Form as shown in Figure 14 and the administrator fills this form and press Add button. Then the system saves the question to the database.

3.7. View Marks Page

Figure 15. View the Student List With their exam Marks

Figure 16. Error Page for View Marks

The administrator can view the students list with their exam marks and groups as shown in the Figure 15. When the students are grouped next time and the exam date has been specified or the new examination is not hold yet, the error page for View Marks will be displayed as shown in Figure 16.

3.8. Student Main Page

Figure 17. Student Main Page

Student Main Page as shown in Figure 17 represents the students or participant of the Collaborative Learning System. The student can enter into the system by using the Student Login link. About System link is used for the description bout the Collaborative Learning System.

3.9. Student Login Page

Figure 18. Student Login Page

Figure 18 shows the login page for student by using their names and passwords. If there is no exam for the student today, the system shows Message as shown in Figure 19. Moreover, the exam date is not specified, then the system will display the old shared groups' list with student as in Figure 20.

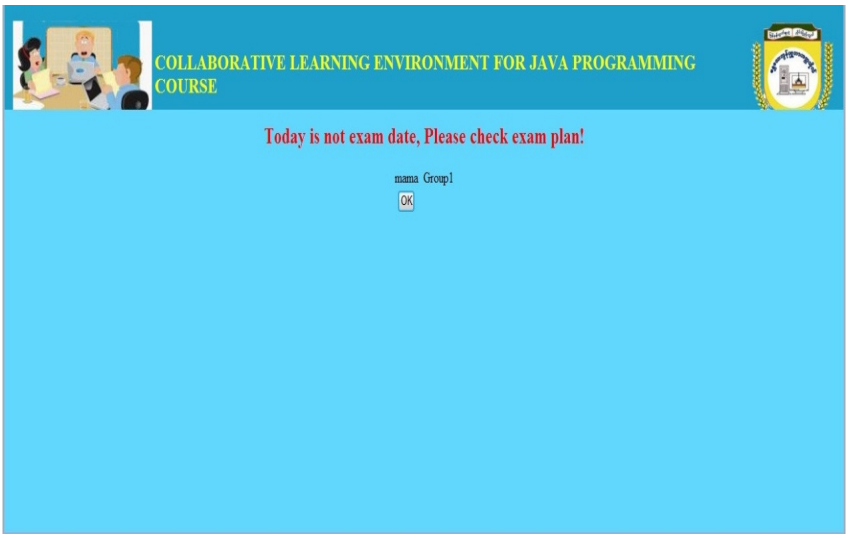

Figure 19. Error Page for Exam Date

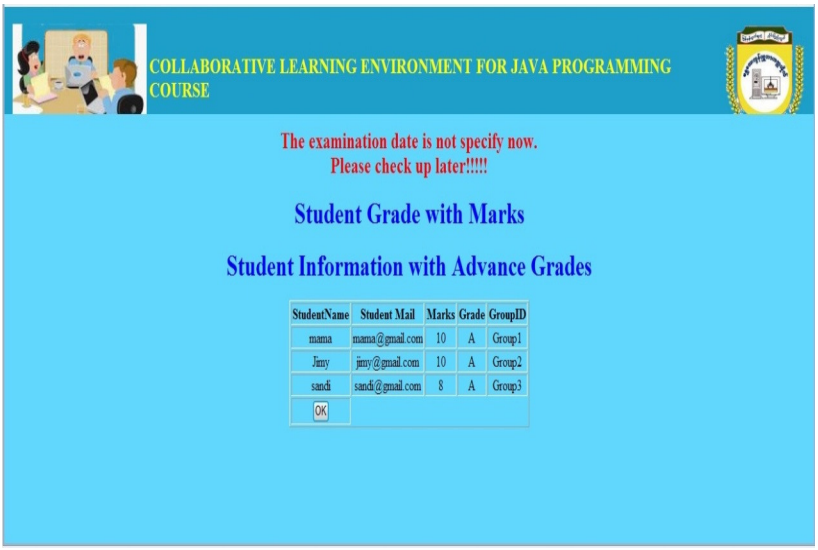

Figure 20. Student Group List Page

But the system shows the past student grades with their groups list to the login student. If the student has completed the past exam, and the grade is high then he/she can see the same students' groups. If the student is new for this system, he/she must fill the form as shown in Figure 21. If today is the exam date, the new student cannot enter the exam pages as in Figure 22.

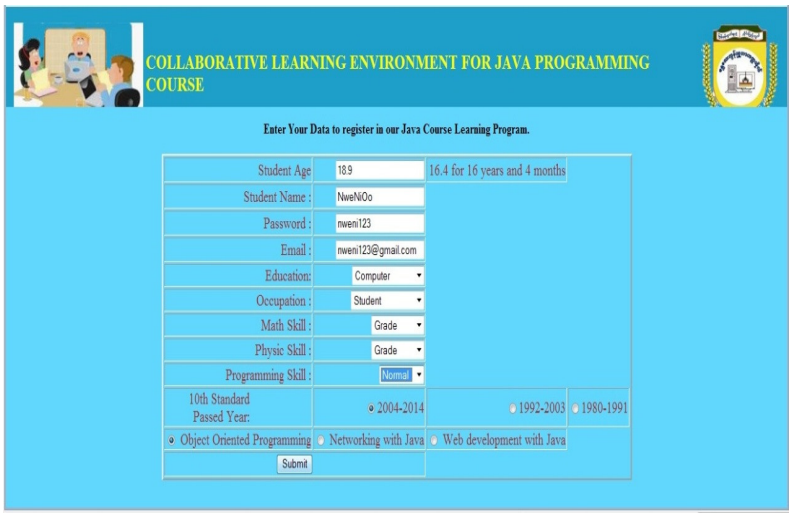

Figure 21. Student Sign Up Page for New Student

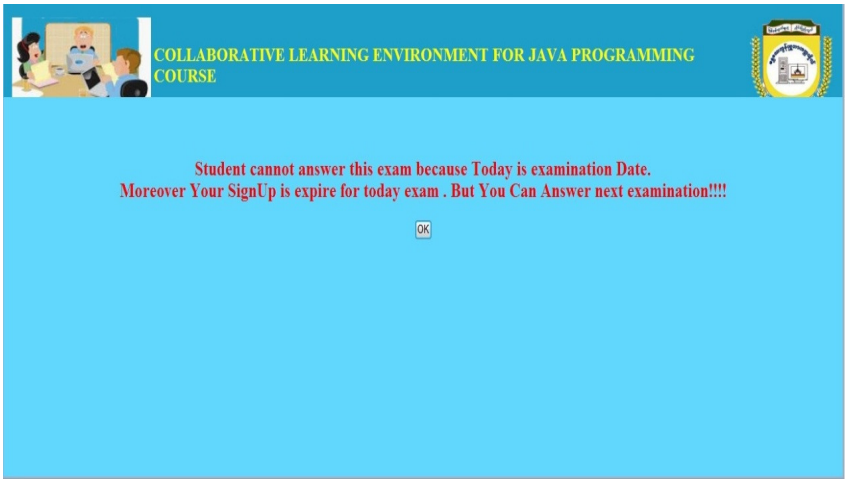

Figure 22. Error Page for New Student's Logo in

3.10. Grouping and Pairing Students

In this part the student can see the examination entrance page to participate the exam with their groups. Figure 23 shows the entrance page for student to enter the examination. At first, the student can answer basic level of exam and can send his/her answers by pressing the submit button as in Figure 24. Then the system display basic level marks and grade of student as shown in Figure 25. If the student's grade does not reached at specified level, the student must answers the basic level again. If the students log out at the end of basic level, the system shows the basic grade. When the student re-enters again to the system, the system shows the message as shown in Figure 26. If the student's the grade reaches at specified level, the student can answer the advance level as the next step. After finishing the exam, the student can see his/her grade with his/her marks. If the student reached at the specified level, he/she can see the shared list with his/her name as shown in Figure 28. But the student did not reach at specified level, his/her name does not appear in upper list.

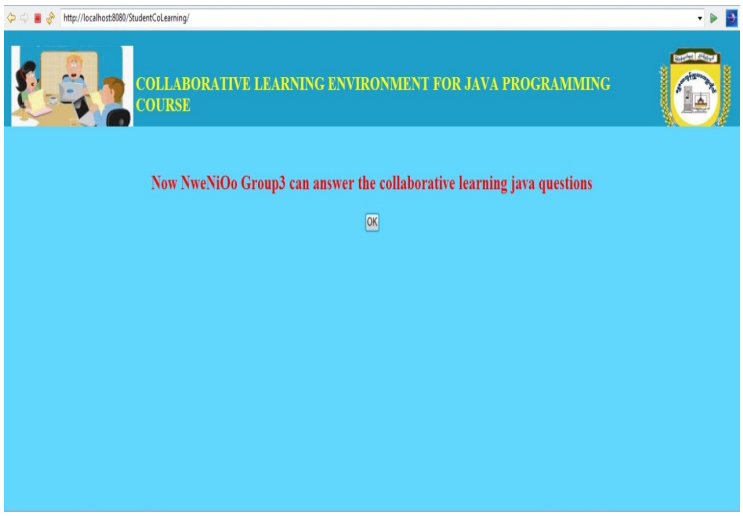

Figure 23. Entrance Page for Student Examination

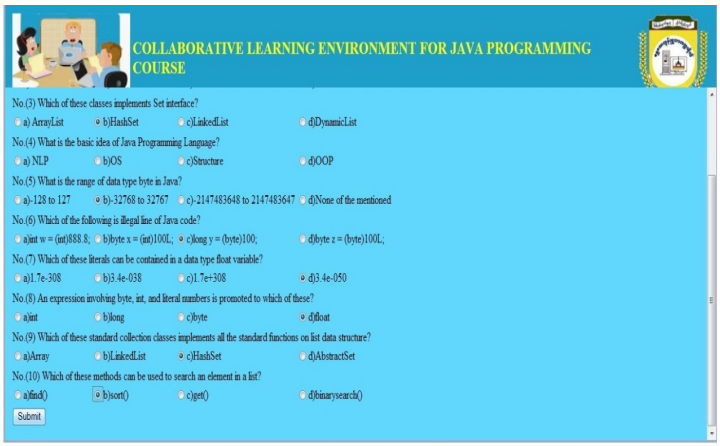

Figure 24. Basic Level Examination Page

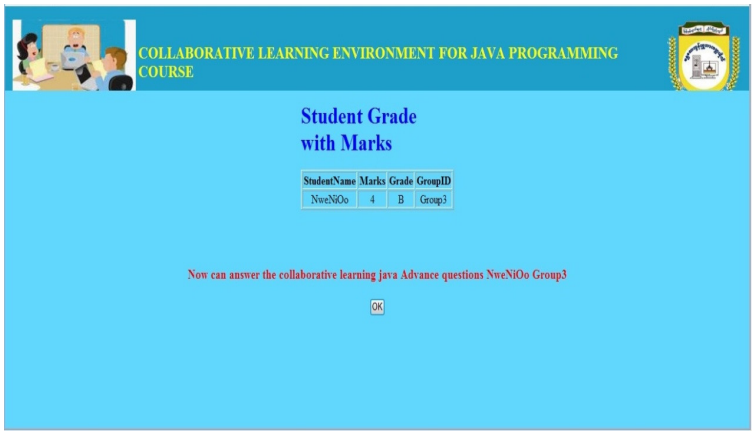

Figure 25. Basic Level of Student's Marks, Grade and Group

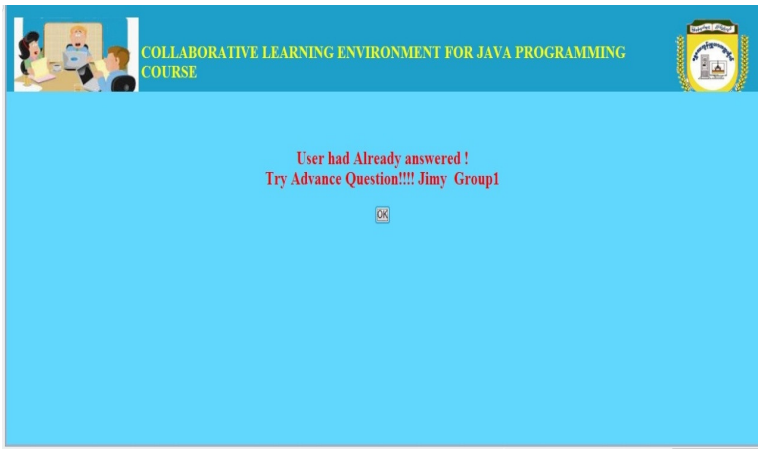

Figure 26. Student who does not answer the Advance Level yet

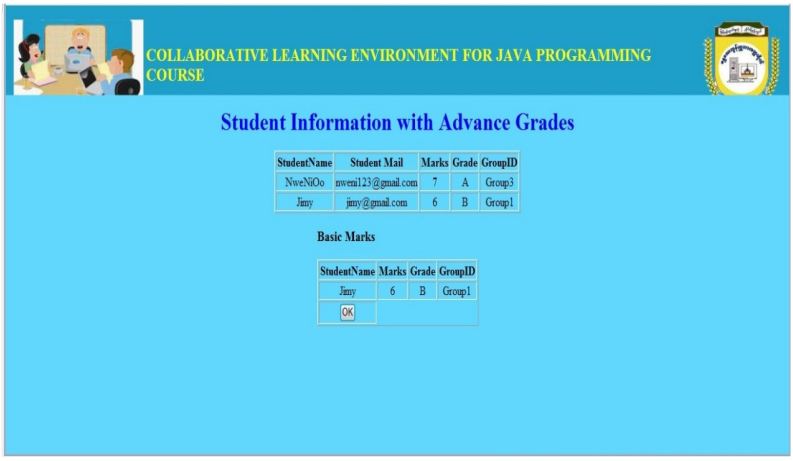

Figure 27. Students' Information with Advance Grades

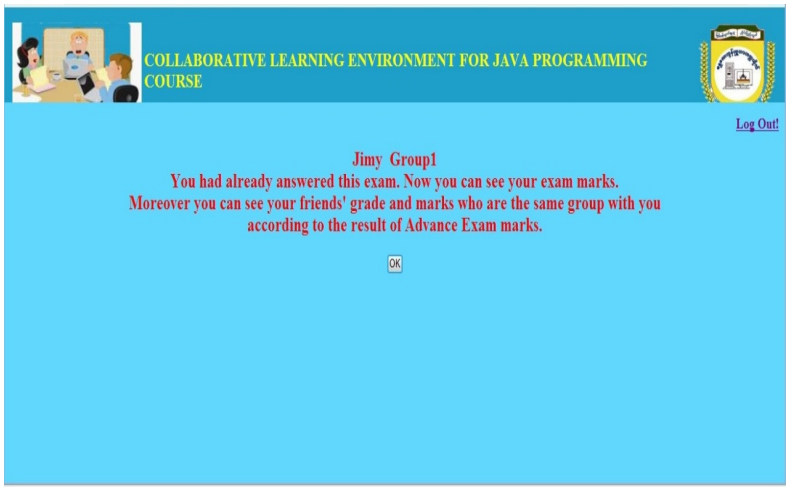

Figure 28. Error Entrance of Student who answered all questions

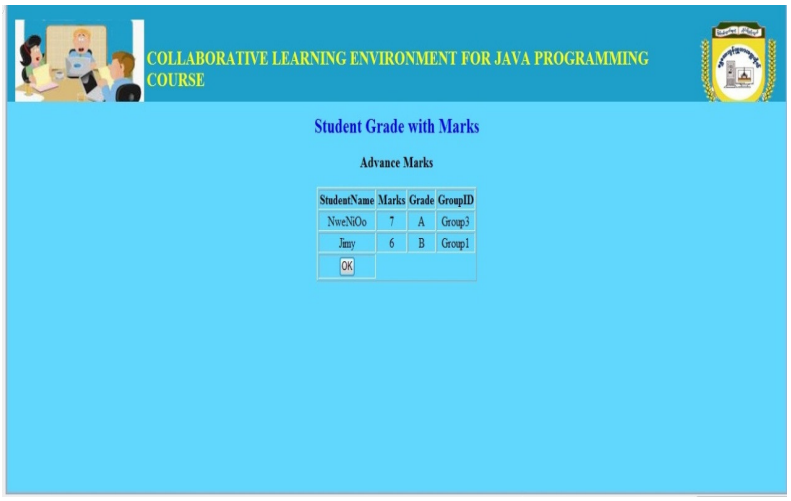

Figure 29. Student Grade with Marks

In Figure 28, there is a Error Entrance of Student who answered all questions. If the student had answered all questions and passed level, he/she can see the message as in Figure 28 when he/she enters to the system again. In Figure 29, the student can see only the groups of students who get the similar grade with him/her.

4. CONCLUSION

This system aims at the students in order to promote active learning in computer based learning environment. A well-known collaborative learning technique, the “Think-Pair-Share” is applied because it has simplicity and suitability to be implemented in a collaborative learning environment. This system provides the benefits to specify the grades and group of the students by using K-mean clustering algorithm and also improves the students' learning without difficulties to find out their interest fields.

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Authors

She is Associate Professor, Head of Department of Research and Development II in University of Computer Studies, Mandalay, Myanmar. Her research areas include Information Retrieval, Cryptography and Network Security, Web Mining and Networking. She received her B.Sc. (Physics), M.Sc.(Physics) from Yangon University, Myanmar and M.A.Sc.(Computer Engineering) and Ph.D.(Information Technology) from University of Computer Studies, Yangon, Myanmar.Author studied computer science at the University of Computer Studies, lasho, Myanmar where she received her B.C.Sc Degree in 2011. She received B.C.Sc(Hons:) in computer science from the University of Computer Studies, Lasho, Myanmar in 2012. Since 2012, Author has studied computer science at the University of Computer Studies, Mandalay, Myanmar where her primary interests include web mining, graph clustering, grouping and web log analysis.