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Methods of groupıng ın a flıpped classroom model: Effects on students' achıevement in differentıal calculus

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Abstract
This study aimed to raise the achievement level of students in Differential Calculus using Direct Instruction with Salazar's Grouping Method in a flipped classroom and Small Group Method. The quasi-experimental method of research was used. The study also employed qualitative and quantitative analysis relative to data generated by the Achievement Test and Math journal with follow-up interview. Within the framework of the limitations of the study, both methods of grouping revealed a significant increase on the gain scores within each group but no significant difference was obtained between groups (control and experimental). However, a slight difference of mean gain scores in the Achievement Test was revealed in favor to the experimental group. Moreover, qualitative assessments showed that both grouping methods develops self-confidence, encourages effective communication and facilitates exchange of ideas towards a common goal. The students from both groups were in favor with the sequence of the presentation of the lesson, especially with the incentives given.

Keywords: Salazar's Grouping Method; Flipped Classroom; Small Group Method

1. Introduction
In a classroom lecture, students tried to capture at an instant what the teacher says and reflect what is being said and they may miss significant points because they are trying to transcribe the teacher's words. By contrast, the use of prerecorded lectures (video) puts lecture under the control of the students: they can watch, rewind, and fast-forward as needed. Lectures can be viewed more than once and also help for those whom English is not their first language. Thus, the idea of flipping the classroom should be applied.
The flipped classroom is a pedagogical model in which they typical lecture and homework elements of the course are reversed. Short video lectures are viewed by students at home before the class session, while in-class time is devoted to exercises (www.*educause.edu/ir/library/pdf/ELI7081*.pdf.).
Davidson (1970) [3] developed at the University of Washington a teaching method called Small Group Discovery Method. That is, the class is divided into small groups with three to four members in each group. Each group discusses the problems and solve it cooperatively as a group effort during the class.
Students tend to learn more if they are in small group (3 members). Small- group cooperative learning can be used to foster effective mathematical communication, problem solving, logical reasoning and the making of mathematical connections. Cooperative learning is a classroom technique in which students work on a learning activity in small groups and received rewards or recognition based on their group performance (Dela Cruz, 2001) [4]. Moreover, Salazar's (2014) [8] enhanced the 3- members grouping into 1-2-3 member's method of grouping, named as Salazar's Method of Grouping. Results of the study revealed a significant increase on the gain scores between the two groups but no significant difference was obtained within and between groups (control and experimental). Further, qualitative assessments showed that the Salazar's Method of grouping develops self-confidence, encourages effective communication and facilitates exchange of ideas towards a common goal. He recommended a replication of his study using other teaching-learning models in different settings compared to other method of groupings.
This study explored the possible effects of small group method and the Salazar's Method of grouping in a flipped classroom model in terms of students' achievement level in Differential Calculus.

1.1 Statement of the Problem
This study used the Direct Instruction with small grouping method and Salazar's Method of Grouping in a flipped classroom to determine the effects on student's achievement level in Differential Calculus.

Specifically, this study answered the following questions;
1. What is the students 'achievement level in Differential Calculus?
2. Is there a difference in the achievement level of the students after exposing them to small groups and Salazar's Grouping Method in a flipped classroom?
3. What are the gain scores of the student's achievement level in Differential Calculus?
4. Is there a difference in the gain scores in the achievement test of students after exposing them to small groups and Salazar's method of grouping in a flipped classroom?
5. What insights are drawn from the students' journal?

Research Hypothesis
1. There is a significant difference in the mean scores in the achievement test of students exposed to small grouping and Salazar's method of grouping in a flipped classroom.
2. There is a significant difference in the mean gain scores in the achievement test of students exposed to small grouping and Salazar's Method of grouping in a flipped classroom.

1.2 Significance of the Study

The main purpose of the study is to explore the possible effects of Salazars Method of grouping in a flipped classroom model in raising the achievement level of students in Differential Calculus

Results of this study will encourage Differential Calculus teachers to use Salazar's method of grouping in teaching calculus and other subjects, if found effective,

This study is beneficial to students who valued sharing and helping others, exchange of ideas and effective communication among their classmates and in turn become fruitful citizens in this country.

Insights drawn from this study will guide mathematics teachers in teaching Differential Calculus and inspire them to conduct researches on strategies in teaching mathematics.

This study will also encourage administrators to recommend to his teachers the possibility of using Salazar's grouping method in or out a flipped classroom model.

1.3 Scope and Limitations of the Study

This study used the Direct Instruction with small group in the seatwork stage (control group) and flipped classroom model in the Salazar's grouping method to raise the students' achievement level in Differential Calculus. A validated Achievement Test in Differential Calculus and Math Journal were used in this study.

This study was conducted at an International University-Bahrain, third trimester, AY 2013-2014. The subjects of the study were the two (2) existing section of engineering students who were officially enrolled in Math 406 (Differential Calculus with Analytic Geometry). The experiment focused on the differentiation of algebraic and transcendental functions, midterm period for four (4) meetings, a total of ten (10) hours. The researcher himself handled the experiment.

1.4 Definition of Terms

The following important terms are operationally and/or conceptually defined as to be used in this study.

Achievement in Differential Calculus - refers to the performance of the student respondents in the Achievement Test in Differential Calculus.

Achievement Level- this is the interpretations of the student scores and gain scores based on the University grading system (Student Handbook)

Achievement Test – A validated achievement test in Differential Calculus lifted from the instructional materials of the researcher.

Control group – the group of students that were exposed to Direct Instruction with small group (3 members) on the seatwork stage.

Direct Instruction- the method of teaching used by the researcher to both groups (experimental and control groups)

Experimental group – the group that was exposed to Salazar's method of grouping in a flipped classroom model

Flipped classroom –inverts the traditional teaching method, delivering instruction online outside of class and moving "homework" into the classroom (http://www.knewton.com/flipped-classroom). In this study, the lecture part used in the control group was videotaped and was used in the experimental group.

Gain Scores – it refers to the increase in score of the control and experimental groups from pretest to post test.

Math Journals - refers to the written impressions, comments and suggestions of the students in regards to the method of teaching, grouping method and incentives given as used in this study. The same also serve as the guide questions for the interview.

Informatics/Computer Science students - refers to the students officially enrolled in Math 406 (Differential Calculus with Analytic Geometry) third trimester, SY 2013-2014.

Salazar's Grouping Method in a flipped classroom. This method of grouping was used in the seatwork stage. The first stage was the individual learning, that is, the students solve the assigned problems/exercises individually. As soon as the student successfully defended his solution in class and earned the teacher signature which was counted as additional points for the students' problem sets. The student who got the correct answer was informed to select a group member of his choice and moved to the next problem. Whenever, the same group (with two members) was able to defend their solution in class successfully, each group member earned the teachers' signature. Then they selected another group member of their choice and moved to the next problem. Solving the problem was a group effort. If again, the group with three (3) members successfully defended their solution, and each group member earned the teachers' signature, and returned to stage one. This cycle continues until the end of the semester. However, membership of groups must not be the same on the next groupings. When all the students has belong to a group of two or three, the said group returned to stage one (Salazar, 2012).

This method was exposed in a flipped class room model. Selected video lectures from You Tube suited to the topics were shared thru the face book, and watched at home or outside the classroom by the students. The students were required to watch the video before attending the class. The seatwork stage was conducted in class with a short review based on the video watched.

Small Group Method–this is a variant of the Small Discovery Method applied in a different setting. On the seatwork stage, the students were grouped into three (3) members based on student choice in a regular lecture using direct instruction. Each group worked as a team. They solved an assigned problem/exercise as a group; the first two groups to solve correctly the assigned problem, each of the members earned the teacher signatures which were counted as additional points in their problem sets. The same group members worked on the next exercise/problem and throughout the whole class session. This group was the control group

2. Methods

This chapter describes the research design, the subjects of the study, instrument that were used in data collection procedures and data analysis of the study

2.1 Research Method

The research design of this study was the quasi-experimental method. In particular, nonequivalent control groups design. This study is a qualitative and quantitative experimental research. The research design of this study is shown in the diagram next page:

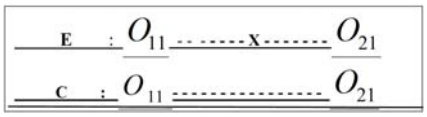

Fig 1: The Research Design

In figure 1, E and C are the experimental and control groups, respectively. The two groups were given a pretest and a posttest. The symbol X represents the experimental treatment that was given to group E.

The symbol O_{11} represents the pretest (Achievement Test in Differential Calculus) which was administered to the two groups prior to the intervention, while the symbols O_{21} represent the posttest that was given after the intervention.

2.2 Subjects of the Study

This study utilized two (2) existing classes-section CE- 12:00-2:30 p m., MW (11 students) and section CF- 7:00-9:30 pm. MW (18 students), third trimester, AY 2013-2014 in Math 406 (Differential Calculus with Analytic Geometry).

The overall group mean was computed to ensure the comparability of the control and experimental groups at the start of the experiment.

2.3 Instrument Used

Qualitative and quantitative data were gathered using the following instruments:

*Achievement Test in Differential Calculus***.** A validated Achievement Test (teacher-made test) lifted from The Calculus 7 (Leithold, 1996) [6]. An item in the test represents each topic, which includes differentiation of algebraic and transcendental functions, implicit differentiation and higher derivatives. The test consisted of ten (10) problems, two (2) marks each with twenty (20) as the highest possible score.

Furthermore, the said instrument was subjected to a dry-run to the lone section in Math 501- Integral Calculus with Differential Equations and the same instrument was validated by the instructor of the said subject and the concurrent head of the mathematics and science department of the University.

The researcher made a scoring rubric written on the Achievement Test and answer key with corresponding marks before marking. The test was checked and graded by the researcher using the University Grading System. The same was re-checked by the internal moderator of the said subject.

Table 1: Achievement Test Scores Descriptions

University Grading System*			
Score	**Grade Ratings**	**Grade Range**	**Achievement Level Interpretations**
20	96-100	1.00	Excellent
18- 19	86-95	1.25-1.50	Very Good
14- 17	69-85	1.75-2.25	Good
10- 13	50-68	2.50 -3.00	Fair
Below 10	0-49	5.0	Failed

*University Student Handbook SY 2011-2012

With respect to the working description of the gain scores on the achievement test scores, the following correspondence was used.

Table 2: Gain Scores Descriptions

Gain Scores	Achievement Level Increase Descriptions
17-20	Very High Increase
13- 16	High Increase
9 - 12	Average Increase
5 - 8	Low Increase
1 - 4	Very Low Increase

Math Journals – this instrument is adapted from Salazar (2014) [8], which is the source of qualitative data to determine insights in regards to the method of teaching used by the researcher. Prompts focused on the method of teaching specifically on the grouping method used and the incentives given. The students were encouraged to answer the questions in paragraph or outline form in English. This served to validate the results of the quantitative assessments.

Interviews. The interview was used to validate the results of the quantitative assessment of the students. This also served as a source of qualitative data on the students. The interview was conducted informally by groups to increase the rapport in the discussion and minimize shyness among the interviewees. The interview questions focused on the method of teaching, grouping method and incentives given with follow-up questions. The Math journal served as the guide questions to confirm their answers.

2.4 Data Collection

Two (2) existing classes in Math 406 (Differential Calculus with Analytic Geometry) as regular load of the researcher was the source of data collected. However, matching was done to ensure comparability in terms of the mathematical ability of the students based on the result of the pretest. By lottery, the control group and the experimental group was determined.

As soon as the treatments were assigned, the researcher conducted an orientation on the processes of the study. Then, the pretest was conducted after the orientation. The researcher himself taught the two classes.

Prior to the conduct of the experiment, a try-out was done for one(1) meeting, to familiarize and as much as possible make the students feel at ease with the new method. The Math journal was given after the posttest. To motivate them to answer the questions on the journal, the researcher give an incentive of additional marks if they answered all the questions. The posttest was considered as a problem set.

To control other factors that might influence the outcomes of the study, the amount of time for conducting the two classes were two and one-half hours. Both groups were provided with course specifications and instructional materials thru the e-learning (moodle), and PowerPoint presentations. The methods of grouping and the method of instruction differ.

2.5 The Intervention

Direct Method of Instruction was used in both groups. Moreover, a flipped classroom setting was used in the

experimental group. They were requested watched the You Tube videos before they report to class. The videos were shared by the researcher thru the face book. On the seatwork stage the Salazar's method of groupings was used in the experimental group while small grouping (3 members) was used in the control group.

The sequence of activities for both groups is outlined below:

I. *Introduction/Review* –setting the stage for learning.
II. *Development* – explaining/deriving the formula and giving illustrative examples
III. *Guided* Practice- solving a problem with the student on the board, the teacher just acted as a secretary.
IV. *Closure*- making a summary on the lesson emphasizing the important points.
V. *Seatwork* –a set of problems were given to the control and experimental group.

Salazar's Grouping Method. The first stage is the Individual Learning. As soon as the student successfully defended his solution in class and earned a signature, he was told to select a group member of his choice and preceded to the next problem. Whenever, the same group (with two members) was able to defend their solution in class successfully, each group member earned a signature. Then they must select another group member of their choice and moved to the next problem. Solving the problem was a group effort. If again, the group with three (3) members successfully defended their solution, and each group member earned a signature, and then returns to stage one. This cycle continued until the end of the semester. However, membership of groups must not be the same on the next groupings. When all the students have belong to a group of two or three, the said group returned to stage one. The accumulated signatures were counted as additional points to the students' scores in the problem sets (assignments).

Small Group Method. In the seatwork stage, the students were group into three (3) members according to their own choice. This served as their permanent grouping throughout the study, except when some of the group members are absent. Thus, re-grouping was done.

The posttest was administered after the experiment. The math journal was given a day before the posttest. As soon as the students submitted their Math journal, follow-questions were asked (interview) to the subjects of the study.

2.6 Data Analysis

Both quantitative and qualitative analyses were done to determine the achievement level of the respondents who were exposed to the two groups. The quantitative data were derived from the math journals and follow-up interview results.

The pretest scores of the two groups were used to determine the comparability of the subjects. Wicoxon Sign Rank Test and Mann-Whitney Test, both non-parametric test was used to test the significance difference between and within groups pretest, posttest, and gain scores in the pretest and posttest.

The Vassar Stats: Website for Statistical Computations(http://vasssarstat.net was used in the statistical computations..Hypothesis was tested using 0.05 level of significance.

3. Results & Discussions

The following discussion presents the results of the analysis of the student scores in the achievement test in Differential Calculus. It describes the effects of the Grouping Methods on the student's achievement level. This result is supported by the qualitative data gathered from the math journal and follow-up interview.

3.1 Achievement Level

It can be gleaned from the table in the below, that both groups (control and experimental) has a mean score in the pretest and posttest of 0.42 and 1.1 respectively with a grade equivalent of 5.0, a failure grade. 100% of the students in the control and experimental group failed, in fact only one student got a score of five (5) out of twenty (20), the rest zero in the control group.. While in the experimental group, two (2) students got a score of five (5) and six (6) and the rest zero. Therefore, the two groups are comparable at the very start of the study.

Further, the posttest in the control group obtained a passing mark of (2.75) with a mean score of 12 and the experimental group obtained a passing grade (2.5– interpreted as fair) with a mean score of 12.9. A gain score of 11.58 (interpreted as average increase) was obtained by the control group while the experimental group achieved also an average increase of 11.8 marks. Similar results was obtained inSalazar's study (2014), although the respondents and subject area were different.Table 3 below presents the results of the pretest and posttest of the two groups.

Table 3: Comparison of Raw Scores in the Achievement Test

Raw Scores	Pretest						Posttest					
	Control Group			Experimental Group			Control Group			Experimental Group		
	f	%	ITP	f	%	ITP	f	%	ITP	f	%	ITP
20										2	20	E
18-19										0	0	VG
14-17							4	33	G	2	20	G
10-13							5	42	F	3	30	F
Below 10	12	100	FL	10	100	FL	3	25	FL	3	30	FL
Total (Mean)	12	100	FL (0.42)	10	100	FL (1.1)	12	100	F (12)	10	100	F (12.9)
Grade Equivalent			5.0			5.0			2.75			2.5

Legend: **ITP** – Interpretation-**E**- Excellent:**VG**- Very Good ;**G** – Good ; **F**-Fair; **FL**- Failed

Student's math journal revealed some reasons on their performance on the achievement test followed by their answers during the interview.

A student in the control group commented: *"It's very good method to interact with students to understand the lesson"*.

When this student was asked to explain about this remark: *He said" Dr. we can share our ideas to our group member, and helping them"*.

On the other hand, a student in the experimental group remarked: *" The grouping method is a good idea for math subjects because it gives to share other people those who are slow no understand, so its give them opportunity to improve"*.

This was also observed by another student, that there exist language barriers which hinder them to understand the lesson. He remarked:*"Many students lack English language skills"*.

That's why, in class, they have a choice to explain their solutions in Arabic or English. But most of them preferred to explain their solutions in Arabic.

One student commented: *"The You Tube videos are very helpful, because it can be replayed many times until we understand. But, it would be better if personalized videos were recorded, rather than videos of other lecturers from nowhere"*.

These observations confirm the advantages of using videos in a flipped classroom environment (http://www.knewton.com/flipped-classroom).

3.2 Difference in Scores in the Achievement Test

Table 4 below, revealed that there is a significant difference on the student scores in the achievement test before and after exposing them to Enhanced Group Moore Method of Grouping and Small Group Method. However, results of the posttest between groups revealed that there is no significant difference of the scores in the achievement test. This results shows that both grouping methods are effective in raising students scores in the achievement test in Differential Calculus. Similar studies (Salazar, 2014; Ali, 2011) [8, 1] confirms that these methods of groupings are effective in raising students' achievement in Mathematics

Table 4: Difference of the Scores in the Achievement Test

Group and Test Compared		n	Sum of Ranks	Test Used	Z–critical value	z-observed value	Decision
Within Groups	Pretest vs Posttest (control group)	12	W=-78	Wilcoxon Sign Rank Test	-3.04	0.0024	*significant
	Pretest vs Posttest (experimental)	10	W=-55		-2.78	0.0054	*Significant
Between Groups	Posttest (control) vs Posttest (experimental)	12 vs 10	U^A =61.5	Mann-Whitney Test	-0.07	0.9994	Not Significant

** Significant at 0.05 level of significance*

3.3 Gain Scores within Groups

Table 5 below,exhibited an increase of scores in the Achievement test in both group after exposing them to Salazar"s Method of Grouping and Small Group Method

Table 5: Gain Scores within Groups

Gain Scores Range	Control Group			Experimental Group		
	f	%	ITP	f	%	ITP
17-20	0	0	VH	0	0	VH
13-16	5	42	H	5	50	H
9-12	6	50	A	5	50	A
5-8	1	8	L	0	0	L
1-4	0	0	VL	0	0	VL
Total (Mean)	12	100	A (11.58)	10	100	A (11.8)

Legend: ITP – Interpretation ; VH – very high increase ; H – high increase A - average increase ; L – low increase ;

As seen in table 5 above, both groups (control and experimental) obtained an average mean increase of 11.58 and 11.8 respectively.

Only 42 % (5 out of 10) obtained an increase within the range of 13-16 and 50% (6 out of 12) obtained an increase within the range of 9-12 in the control group, while in the experimental 50% (5 out of 10) got a high increase (score range 13-16) and average increase (score range of 9-12). This result indicates that involvement in cooperative learning is a strong predictor of student's academic performance as revealed in Ali's study (2011) [1].

3.4Comparison of Gain Scores

Results of the Mann-Whitney Test (Table 6) revealed that there is no significant difference in the gain scores in the achievement test of students exposed to Salazar's Method of Grouping in a flipped classroom environment and Small Group Method. However, a slight difference in the mean gain score (Table 5) was observed in the experimental group, credited to flipped classroom. These advantages of flipped classroom were stressed in Hamdan study (2013) which was revealed in the present study.

Table 6: Comparison of Gain Scores

Group and Test Compared	n	Sum of Ranks	Test Used	z-critical value	z-observed value	Decision
Control Group Gain Scores vs Experimental Group Gain Scores	12 10	U^A =62.5	Mann-Whitney Test	-0.13	Z=0.8969	Not Significant

** significant at 0.05 level of significance*

3.5 Insights Drawn from Students Math Journal and Interview

The following are insights drawn from students Math Journal and interview in terms of the researcher method of teaching, method of grouping and incentives given.

Method of Teaching Used

The students from the two groups (control and experimental) had written the following impressions and comments.

A student from the control group had written on his journal: *"The grouping method is good because we can discuss our solutions in Arabic and can move around to other groups for help, especially our intelligent classmates belong"*.

However, a student commented: *Permanent grouping of three members is unfair, because I for one belong to a group in which all of us does not know – maybe rotation of group members must be considered"*.

While from the experimental group, a student said in his math journal:*The grouping method is excellent; we have the chances to be group with other classmates and to help them. Also, the turnout of grouping is fast which means more signatures for us. The videos in the face book were very helpful as review materials for us"*.

Moreover, a student cited some disadvantages of the method of grouping:*I don't like to be grouped with them (arabs).* When asked why? *Because we are amazing.* Maybe because of cultural differences. Nevertheless, they were encouraged to belong to a group.

Some students commented on the incentives given:*"The incentives given is a good idea, however, some of the students are just copying the solutions and answers in order to get the incentives"*.

This was controlled by the teacher by asking question before giving the incentives or asking them to explain their solutions in class.

One student was thankful of the incentives given:*"Am very thankful because we can add more points in our problem set. I will be very happy if this points will be added to our long exam score"*

The incentives given served as a motivating factor to students to participate in class.

Most of the students considered the subject difficult, and one student said: *"The teachers expects us to be good in our algebra, absorbs all what he explained in his presentations. He gives limited examples and the rest as seat works"*.

The students are expected to download the notes in the moodle and print it as much as possible which serves as their instructional guide. They were also requested to ask questions or clarifications in regards to pre-requisites skills, especially on algebra.

This was also found out in Salazar's study (2012, 2014, 2015) [7, 8, 9] that students had poor background in algebra. According to him, it is not that the student does not learn, it's because the students are not ready to learn.

Furthermore, here are some of the general comments:*"I believe that Dr. Douglas is trying his best to help us understand the lesson. He is very accommodating when a student asked a question or help on how and why? Most of my classmates do not attend the class regularly and some just affixed their signature and go. I always heard him saying, you are old enough and you are responsible of what you are doing"*.

And lastly, *"Two hours and a half class is too long teacher for a math subject! Too much teacher!!!."*

The student responses to the Math Journal and Interview disclosed that they have tried their best to at least earn the incentives.. They have developed the value of sharing and helping others. It promoted effective communication and exchange of ideas towards a common goal. The incentives made the seatwork enjoyable. This students comments were also revealed by the Salazar (2012, 2014, 2015) [7, 8, 9] series of studies.

The findings of this study are presented below following the sequence of the research questions in the statement of the problem.

1. The pretest results of the two groups in the Achievement test showed mean scores of 0.42 and 1.1 for the control group and experimental groups, respectively. Both mean scores fall in the category of FAILURE. That is, they totally don't have any idea on how to differentiate functions even if the formulas are given except for three (3 out 22) students.

   However, the Achievement Test mean score in the control group improved from 0.42 to 12. That is from 5.0 to 2.75, a passing grade.. However, in the experimental group, the achievement test mean score improved from 1.1 to 12.9, that is from 5.0 to 2.5, a passing grade.
2. Comparing the test scores within groups (experimental and control groups) revealed that there is a significant difference between pretest scores and posttest scores in both groups. But, no significant difference was obtained in comparing the posttest scores between the control and experimental group.
3. In the gain scores obtained within groups, the control group obtained a mean gain score of 11.58 interpreted as average increase while the experimental group revealed 11.8 mean gain score which is interpreted as a average increase.
4. A no significant difference of the gain scores between the two groups was revealed by the Mann-Whitney Test.
5. The following insights were drawn from the students' math journal and follow-up interview:

They felt that Differential Calculus is difficult even before the prelim period. They had poor background in the prerequisite subjects (algebra, trigonometry). Both groups were in favor of the sequence of presentation of the lesson used in this study especially on the incentives given. But on the shared you tube videos; they experimental groups suggested personalized recorded videos of their professor.

The Salazar's grouping method encouraged them to solve problems by themselves, share and help others in the next stages. The incentives served as a driving force to solve the problems on the seatwork stage.While in the control group, cooperative learning took place. They have to solve the problem as a group effort. The incentives served also as their motivation to solve the problems assigned to them.

4. Conclusions

It is therefore possible to raise the achievement level of the students in Differential Calculus using any grouping method used in this study.

Although, the result revealed a failure mark on the pretest but a significant increase of the gain scores was achieved in the posttest. Specifically, an average increase was gained by both

groups which obtained a passing mark of 2.75 and 2.5 (control and experimental group, respectively). Insights drawn from the students' journal
that can contribute more in raising students achievement in Differential Calculus deserves an attention.That is using flipped classroom model in which the students can put the teacher lecture in control.

5. Recommendations

On Poor Preparation in Differential Calculus. It is recommended that there must be a strong foundations on students pre-requisite skills, specifically on algebra. College Algebra must be five (5) units' subjects. Engineering and Computer science students must not be combined with business students in College Algebra. Remedial Math for engineering and computer science must be different with the business students. Strict implementation on the policy of accepting new students must be considered.

On Future Researches. For future researches, the following could be considered;Use of homogeneous or heterogeneous small grouping according to ability levels, gender type, reverse order of grouping used in this study, or other types of grouping. Use of large samples (two sections with 40 students for each group).
Implementation of Salazar's Method of Grouping or Small Groupings in other basic mathematics courses must be considered.
Replication of the present study using video captured lecture in a regular or flipped classroom model.
Calculus is viewed by the students as the most difficult mathematics subjects most students. Unless a strong foundation on its pre-requisite skills is achieved, the students' performance in Differential Calculus will still be low. The students are interested to learn, but they are NOT ready to learn.

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