# The Courselab VLE: Its Effect on the Achievement and Students Perception Toward Learning Algebra

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**Abstract**

*Courselab, a Virtual Learning Environment was used to design classes in algebra. Its effect on the achievement of the students was tested. Pretest and posttest were given to the experimental and control groups. The findings showed that there was no significant difference in the achievement of students taught with lecture and the use of Courselab. A survey questionnaire showed that majority of the students disagree that they learned better using computer based materials. Seventy two percent agree that they learned better by reading a good textbook and with face to face discussion. Seventy seven percent agree that they learned better by listening and by reading and rereading materials. The perception of the students on the effectiveness of Courselab in learning college algebra was not favorable. Fifty seven percent disagree that it was clear how Courselab modules fitted into learning algebra and that they also disagree that the scoring system in Courselab was useful for students in preparing their subject's test. On the other hand, half of the students think that they can easily understand and deal with the interface and more than half think that the platform tools were easy for students to use. This means that Courselab was not the problem but it was learning algebra in Courselab where the difficulty was.*

## 1. Background of the Study

From the early 1990s when the internet emerged, many new tools and products have been developed to fully exploit its benefits. From the mid-1990s the Virtual Learning Environments (VLEs) have appeared with the aim of supporting learning and teaching activities. Traditionally the school has been the place where students learn from their professors. For a time in the 1990s the computer assisted instruction (CAI) in its different forms were employed to improve teaching and learning.[18] The VLE, in its new form, enables teachers to create resources faster and allows easy upload of materials to the Internet.

Digital technology has been a part of the lives of students and teachers almost everywhere. In the Philippines the use of online lessons in the schools has been increasing in these last 10 years. Teachers and students alike are participating in on-line computer conferences more frequently. Schools are clamoring to be linked worldwide with the Internet. Video games and home computers are increasingly a routine part of students' experiences.

The author of this paper has been searching for methods that are effective in learning mathematics. She has identified the use of CD Rom, the use of online lessons, the use of visual patterns such as fractals and mathematical modeling using the Microsoft excel as some means that could help in honing the student's mathematical ability and critical thinking as shown by her accomplished researches.

The blended learning which is a combination of online and the face-to-face learning method is now being used in many universities in Metro Manila. In 2011, the University of the East has

embarked on the blended learning using Moodle as the VLE (Virtual Learning Environment) and has been effective in many subject areas. Unfortunately, some students have encountered problems such as the inability to connect to the Internet, problem with their username and password which resulted to inability to open the lesson and read it before the scheduled online quiz. There were also times when they missed the quiz because they cannot connect to the Internet. The search for a another method of student centered learning goes on. In this study the VLE was the Courselab software and that lessons were not posted online but was saved in the computers of a computer laboratory.

## 2. The Courselab

The Courselab has special features to meet the needs of the different types of learner. It has different multimedia content such as texts, graphics, audio and video which are the features used to create assessment and evaluation of knowledge gathered from the lesson. It also enhances the ability to self-learn, self-test and self-report. Through Courselab one can create an interactive lesson with the use of features like the navigation button (previous and next). It contains a tab where learners can easily choose the slide which they want to explore more at their own learning pace. It can facilitate mastery by reviewing or replaying the lessons until they achieve mastery.

Courselab can be used to create tests which give instant feedback to the students. Unlike the classroom setup where they wait for answers given by teachers, Courselab with its instant answers to questions will make them more confident in assessing their individual learning level. Moreover, professors are able to assess students' learning without spending too much time marking students' work. The use of different multimedia content such as text, graphics and video is also a way to make learning more effective.

Although the lessons on Courselab could be uploaded in the web, in this study it was intended for classroom use only. This is to avoid the problem that students have difficulty downloading their lessons online since there are problems with internet connections in the country. The Courselab lessons were saved in each of the computer in a computer laboratory. However, the students were allowed to copy the lessons and use them at home. But in all class meetings the students in the experimental group viewed the lessons on Courselab in the computer laboratory during their class period. The lessons were not made available online. The intention is for the students to learn the lessons in the classroom with the use of the computer and to avoid excuses such as the inability to access lessons due to unavailable internet connection. Clarifications were done by the professor when there were questions by the students. Otherwise the students were left to themselves. Each student used a desktop to access their lesson.

In the first experiment, there were four modules, each around 7-15 slides. Each slide contains explanation of the lessons or activities, or short quiz on topics of the real number system, polynomial, special products, and factoring. The second experiment when the two groups exchanged roles consisted of three modules the topics were on fractions (simplifying fractions, fundamental operations on fractions, complex fractions, continued fractions), rational exponents or radicals (simplifying radicals, addition, subtraction, multiplication, division of radicals), functions (types of functions, addition, subtraction, multiplication, and division of functions, composition of functions, domain and range, inverse functions, graphing of functions and inverse functions). There were 10-15 slides in each module containing the lessons or activities or a quiz.

## 3. Research Problem

The paper aims to answer the following questions:

1. Is there a significant difference between the achievement pretest of the students taught with Courselab and those taught with traditional lecture method?
2. Is there a significant difference between the achievement posttest of the students taught with Courselab and those taught with traditional lecture method?
3. Is there a significant difference between the pretest and the posttest of the achievement of the students taught with lecture method?
4. Is there a significant difference between the pretest and the posttest of the achievement of the students taught with the Courselab?
5. Is the perception of students learning algebra using the Courselab more positive than those that are taught with the traditional lecture method?

## 4. Scope and Delimitation

The modules created in Courselab were limited to the topics on real numbers and their properties, rules on signed numbers, series of operations, algebraic expressions and polynomials, laws of positive and negative exponents, products of polynomials, divisions of polynomials, synthetic division, special products, factoring, simplifying fractions, addition, subtraction, multiplication and division of fractions, complex fractions, laws of radicals, addition, subtraction, multiplication and division of radicals. These topics were distributed in six modules.

## 5. Research Method

The research method was quasi experimental method for non-equivalent groups since the students in both the experimental and control groups were not randomly assigned. The first three months of the research project was devoted to the creation of the six modules.

In this study one section of college algebra students was the experimental group (taught with Courselab) and another section was the control group (taught with lecture) in the preliminary period which lasts for six weeks. The experimental and control groups exchanged roles in the midterm. The pretest in the prelim period showed that one group has higher mean score and using the t-test for independent samples the difference is significant. It was those in the control group who got higher scores in the pretest and since the result of the experiment showed that the posttest was higher in the control group it is because their pretest was already higher to begin with. Hence the experiment was repeated in the midterm to see if with the topics for midterm the two groups were equivalent to start with.

A teacher made questionnaire was the pretest and posttest to measure achievement of the students in each of the grading period. Two questionnaires to find out the students' learning perceptions were also constructed. One questionnaire was answered by each student involving the manner by which the students do well in school and the other was to find out the perception of the students on the effectiveness of Courselab in learning college algebra.

## 6. Review of Related Literature

In the last 15 years, education has benefited from a real e-revolution. Most schools and universities now have a functioning **Virtual Learning Environment** (VLE). Examples include Moodle, WebCT and Blackboard. The University of the East uses the Moodle.

The benefits of using a Virtual Learning Environment in schools are countless but some studies show that there are disadvantages. One of these disadvantages is the inability of the teachers to cope with the computer savvy youth of today. To create lessons in VLE as dynamic and versatile

as Facebook, Tumblr and Twitter is a challenge for a teacher preparing lessons in VLE.[10] Moreover, a large percentage of teachers remain reluctant and skeptical about the Internet.[16] For someone who is not familiar with technology it can be overwhelming and confusing.[20] In the secondary education the use of technology is low in mathematics and geometry courses. [8] Furthermore there is a weak correlation between students taught using VLE and lecture method. Undoubtedly, the VLEs have some potential effects on learning however there is no proof of its superiority in terms of learning outcomes. [5]

Although many have not understood the VLE completely it has been used widely in the virtual world gaming, the virtual worlds in education and in the training of employees in the industries [13]. By the use of VLE students begin to take responsibility for their own learning, and are motivated to correct their work.[15] Greater understanding of mathematical concepts is facilitated by the teacher–student interactivity in VLE in subjects calculus and basic statistics.[7] Web-based technology has a dramatic impact on learning and teaching.[19] With regard to attitude, the posttest attitude scores between students taught with VLE and traditional method groups are significantly different in favor of the students taught with VLE.[14] However, another study found that there is no statistically significant change in students' attitudes towards mathematics and computer except for acquiring computer confidence.[2] Consequently, the success of a VLE depends to a considerable extent on student acceptance and use of an e-learning system.[21]

Students' motivation for mathematics appeared to be positively related to the combination of lessons made for the whiteboard and availability of these lessons on the VLE.[12] A study shows that there is statistically significant additional learning gains of students using a combination of self-paced software and class-paced textbooks compared with students using a traditional curriculum.[19] In a neuroscience and experimental science courses it was found out that raw average scores were significantly higher for the students in the VLE compared to those in the conventional classroom setting. [4]. In higher education institutions, there has been an increase in communication, incorporation of collaborative pedagogical models with the use of VLE. There is a sense of connectedness, of shared passion and a deepening of knowledge to be derived from ongoing interaction.[6] [8]

Interaction with a VLE depends on a number of factors, including student learning style and motivational approach, and the design and functionality of the VLE: First, the content of work needs to be relevant, useful and at the correct level for the student; Second, any technology based support needs to be easy to use; and Third, students need to be initiated into using the full range of VLE capabilities from the outset of their learning journey.[3] The Courselab claims to possess these qualities. Some lessons created in the Courselab are on CDROM primarily because it enables teachers to share this resource easily among themselves. This way there would be no need to download the software or print materials. CDROM also saves teacher's time who do not have to make demonstration many times to different classes. The use of CDROM can be optimized as it can be shared among students and be used at any time.[1]

While computers are an important part of education, they cannot replace the natural world. How a stream's ecosystem works can be seen through a computer, but to get a full and authentic understanding, students must take a trip to a stream, and perform their own observations and tests. The hypothetical cyber-realistic demonstrates only a limited view of natural life. [17]

## 7. Analysis of Data

**Results of the First Experiment**

To answer the question whether there is a significant difference between the mean scores of the pretest and the posttest in both groups the paired t-test was used using SPSS 17.5 program.Table 1 shows that at the start of the experiment the control group had higher mean score and this is significant using the t-test for independent samples (table 3) but more dispersed scores and at the end of the experiment the control group was less dispersed with higher posttest results.

. **Table 1 Paired Samples Descriptive Statistics Prelim Experiment**

| Group | | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Experimental pre-test | 12.50 | 36 | 4.123 | .687 |
| | Experimental post-test | 19.00 | 36 | 4.548 | .758 |
| Pair 2 | Control pre-test | 14.97 | 39 | 4.749 | .760 |
| | Control post-test | 20.28 | 39 | 3.845 | .616 |

Table 2 shows that there is a significant difference in the mean scores of the pretest and the posttest of the experimental group and similarly a significant difference in the mean scores of the control group. This means that the experimental group learned significantly with the use of the Courselab modules and the control group learned significantly from the lecture method as well.

**Table 2 Paired Samples Test Prelim Experiment**

| | | Paired Differences | | | | | T | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 95% Confidence Interval of the Difference | | | | |
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | | | |
| Pair 1 | ExptPre - ExptPost | -6.500 | 3.982 | .664 | -7.847 | -5.153 | -9.794 | 35 | .000 |
| Pair 2 | Contpre - Contpost | -5.308 | 3.812 | .610 | -6.544 | -4.072 | -8.694 | 38 | .000 |

Using the two tailed test of the independent t-test, Table 3 gives $p=0.019<0.05$ for equal variances assumed and the value $p=0.018<0.05$ for equal variances not assumed. In both cases there is a significant difference between the pretests of the two groups. It is to be noted that the two groups were not equivalent at the start of the experiment for there was a significant difference between the pretests of the two groups.

**Table 3 Independent Samples Test Prelim Experiment**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 95% Confidence Interval of Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Lower | Upper |
| Pretest Prelim | Equal variances assumed | 1.858 | .177 | -2.400 | 73 | .019 | -2.47436 | -4.52870 | -.42002 |
| | Equal variances not assumed | | | -2.414 | 72.739 | .018 | -2.47436 | -4.51716 | -.43156 |

To test whether there is a significant difference in the posttest of the experimental and control groups the Analysis of Covariance was used with the final examination as a covariate. The pretest of the two groups shows that the mean scores were not equivalent since the two groups were not randomly assigned to the two sections. The covariate was included in the analysis to control for the differences on the independent variable. The primary purpose of the test of the covariate is that it evaluates the relationship between the covariate and the dependent variable, controlling the independent variable (i.e., for any particular group).

Before conducting an ANCOVA – the homogeneity-of-regression (slope) assumption was first tested. The test evaluates the interaction between the covariate and the independent variable in the prediction of the dependent variable. A significant interaction between the covariate and the factor suggests that the differences on the dependent variable among groups vary as a function of the covariate. The interaction source is labeled pretest*final exam (Table 4). The results suggest the interaction is not significant, $F = .590$, $p = .857$. That is, $p$ (.857) $\geq$ (.05). Based on this finding, ANCOVA may be used (Table 6).

**Table 4 Tests of Between-Subjects Effects Checking if Final Exam can be A Covariate**

Dependent Variable: Posttest

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 815.467[a] | 33 | 24.711 | 2.021 | .017 |
| Intercept | 68.680 | 1 | 68.680 | 5.618 | .023 |
| Pretest | 142.245 | 14 | 10.160 | .831 | .633 |
| Final Exam | 74.383 | 1 | 74.383 | 6.085 | .018 |
| Pretest * Final Exam | 101.018 | 14 | 7.216 | .590 | .857 |
| Error | 501.200 | 41 | 12.224 | | |
| Total | 30325.000 | 75 | | | |
| Corrected Total | 1316.667 | 74 | | | |

Table 5 shows that the underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by $F(18, 56) = 1435$, $p = .152$. That is, $p$ (.152) > α (.05).

**Table 5 Levene's Test of Equality of Error Variances[a] Prelim Experiment**

Dependent Variable:Posttest Prelim

| F | df1 | df2 | Sig. |
|---|---|---|---|
| 1.435 | 18 | 56 | .152 |

In the first experiment of this study, the relationship between the covariate and the dependent variable is significant, F(1, 55) = 7.003, p=.011 < .05. Had this not been significant, the question then would be on the appropriateness of the selection of the covariate since the covariate must be linearly related to the dependent variable.

The results shown in Table 6 are as follows: The group source (pretest on the SPSS output) evaluates the null hypothesis that the population adjusted means are equal. The results of the analysis indicate that this hypothesis should be accepted, $F(1, 55) = 1.468$, $p = .139 > .05$. Therefore there is no significant difference in the mean of the posttest of the two groups.

**Table 6 Test of Between Subject Effects**

Dependent Variable: Posttest Prelim

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 714.449[a] | 19 | 37.603 | 3.434 | .000 |
| Intercept | 463.790 | 1 | 463.790 | 42.358 | .000 |
| Final Exam | 76.683 | 1 | 76.683 | 7.003 | .011 |
| **Pretest** | **289.261** | **18** | **16.070** | **1.468** | **.139** |
| Error | 602.217 | 55 | 10.949 | | |
| Total | 30325.000 | 75 | | | |
| Corrected Total | 1316.667 | 74 | | | |

**Result of second experiment**

The experiment was repeated and the two groups were interchanged roles, ie., the control group became the experimental and the experimental the control group. Table 7 shows that the mean score of the pretest of the control group was 6.32 while that of the posttest was 19.26 a difference of 12.94 with a standard deviation of 2.16 in the pretest and 4.69 in the posttest. Scores in the posttest was more dispersed than that of the pretest. On the other hand the pretest of the experimental groups was 6.79 and the posttest was 20.5 a difference of 13.71 with standard deviation of 2.25 in the pretest and 3.58. The difference in the standard deviation was less in the experimental group as compared to the control group. This means that the experimental group was less dispersed in the posttest than that of the control group.

**Table 7 Paired Samples Statistics Midterm Experiment**

| | | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | pretest control | 6.3235 | 34 | 2.15632 | .36981 |
| | posttest control | 19.2647 | 34 | 4.69241 | .80474 |
| Pair 2 | pretest exptl | 6.7619 | 42 | 2.25031 | .34723 |
| | posttest expt | 20.5000 | 42 | 3.57669 | .55189 |

Table 8 shows the test of significance between the pretest and posttest of thecontrol group and that of the experimental group using the t-test for dependent samples. The t-value of the paired differences of the pretest and posttest of the control group was -16.07 which was significant at the 0.05 level of significance. Similarly the t-value of the paired differences of the experimental group was -18.69 which was significant at the 0.05 level of significance. This means that the two groups learned significantly from the teaching method each had receive.

T**able 8 Paired Samples Test Midterm Experiment**

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 95% Confidence Interval of the Difference | | | | |
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | | | |
| Pair 1 | pretest- posttest control | -12.94 | 4.70 | .805 | -14.58 | -11.30 | -16.07 | 33 | .000 |
| Pair 2 | pretest- posttest experimental | -13.74 | 4.76 | .735 | -15.22 | -12.25 | -18.69 | 41 | .000 |

The mean score of the pretest for the control group was 6.32 while that of the experimental group was 6.76 a difference of 0.44 which was not significant at the 0.05 level of significance (Table 9) while the posttest of the control group was 19.26 and the experimental group was 20.5 a difference of 1.24 which was not significant either in the 0.05 level of significance (Table 12). However the mean difference was higher in the posttest than in the pretest by 0.8. This means that the experimental group using the courselab had learned better than the control group. To test whether the pretests of the control and experimental groups were significantly different the t-test for independent samples was used. The experimental group had mean score equivalent to 6.7619 while the control group had mean score of 6.3235 a mean difference of 0.4384 (Table 12). To find out if this difference is significant the t-test for independent samples was used.

**Table 9 Group Statistics**

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pretest Midterm | Experimental | 42 | 6.7619 | 2.25031 | .34723 |
| | Control | 34 | 6.3235 | 2.15632 | .36981 |

Table 10 gives the p value of .392 which was greater than 0.05 for equal variances assumed and the p value of .390 which was also greater than 0.05 for equal variances not assumed. In both cases the two groups were not significantly different.

**Table 10 Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Pretest Midterm | Equal variances assumed | .039 | .845 | .860 | 74 | .392 | .43838 | .50959 | -.57699 | 1.45375 |
| | Equal variances not assumed | | | .864 | 71.873 | .390 | .43838 | .50727 | -.57288 | 1.44964 |

As in the first experiment before conducting the ANCOVA – the homogeneity-of-regression (slope) assumption was first tested. The interaction source was labeled pretest*final exam (Table 11). The results suggest the interaction is not significant, $F = 1.970$, $p = .076$. That is, $p$ (.076) $\geq$ (.05). Based on this finding, ANCOVA may be used.

**Table 11 Tests of Between-Subjects Effects second Experiment**

Dependent Variable:Posttest

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 764.815[a] | 19 | 40.253 | 4.377 | .000 |
| Intercept | 274.794 | 1 | 274.794 | 29.882 | .000 |
| Pretest | 173.717 | 7 | 24.817 | 2.699 | .018 |
| Final Exam | 225.973 | 1 | 225.973 | 24.573 | .000 |
| Pretest * Final Exam | 126.822 | 7 | 18.117 | 1.970 | .076 |
| Error | 514.974 | 56 | 9.196 | | |
| Total | 31520.000 | 76 | | | |
| Corrected Total | 1279.789 | 75 | | | |

Table 12 shows that the underlying assumption of homogeneity of variance for the one-way ANCOVA has been met – as evidenced by $F(11, 64) = 1.462$, $p = .168$. That is, $p$ (.168) > α (.05). Furthermore, this relationship is significant, F(1, 55) = 7.003, p=.011 < .05. This means that there is a relationship between the covariate and the dependent variable. Thus the covariate was appropriately chosen.

Table 12 Levene's Test of Equality of Error Variances[a] Midterm Experiment

Dependent Variable: Posttest

| F | df1 | df2 | Sig. |
|---|---|---|---|
| 1.462 | 11 | 64 | .168 |

The results shown in Table 13 are as follows: The group source (pretest on the SPSS output) evaluates the null hypothesis that the population adjusted means are equal. The results of the analysis indicate that this hypothesis should be accepted, $F = 30.28$ , $p = .122 > .05$. Therefore there is no significant difference in the mean of the posttest of the two groups.

**Table 13 Tests of Between-Subjects Effects Midterm Experiment**

Dependent Variable:Posttest

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 637.993[a] | 12 | 53.166 | 5.219 | .000 |
| Intercept | 520.014 | 1 | 520.014 | 51.046 | .000 |
| VAR00004 | 308.468 | 1 | 308.468 | 30.280 | .000 |
| **VAR00002** | **178.850** | **11** | **16.259** | **1.596** | **.122** |
| Error | 641.797 | 63 | 10.187 | | |
| Total | 31520.000 | 76 | | | |
| Corrected Total | 1279.789 | 75 | | | |

## 8. Findings of the Study

The seven modules of the courseLab (real number system, polynomials, special products, factoring, fractions and rational exponents, functions) were created in the first semester SY2014-15. There were two experiments done in the second semester. Two sections of dentistry students were the subjects of the study. In first one and a half months known as the preliminary period, one section was taught using Courselab and the other taught with the lecture, class discussion method. In the next one and a half months known as the midterm period the two groups exchanged places, the experimental group became the control group and vice versa. The results of the second experiment confirmed the findings of the first experiment.

In the first experiment using the t test for independent samples, there was a significant difference between the pretests of the experimental and control groups. Hence the two groups were not equivalent in achievement in the topics of the first experiment from the very start. This does not look good because to start with the experimental and control groups are expected to be equivalent. On the other hand, comparing the pretest and posttest of both the experimental and control groups the result is that both had a significant difference in the mean scores. This means that the two groups learned significantly with the Courselab modules in the experimental group and the lecture method in the control group. Using the Analysis of Covariance it was found that there was no significant difference in the mean of the posttests scores of the two groups.

In the second experiment using the t-test for independent samples the two groups were not significantly different in the pretest. This seem to be a better experiment to start with because the two groups were equivalent before the start of the experiment. The pretest and the posttest of the two groups were significantly different. This means that the two groups learned significantly from the courselab modules for the experimental group and the lecture method for the control group. Using the Analysis of Covariance with the final examination as a covariate, there was no significant difference in the mean achievement scores of the posttest of the two groups.

This study was also interested in finding out the perception of the students on the effectiveness of courselab. The data was taken after the second experiment had been conducted. It is to be noted that perception could be affected by the type of learner these students were. A questionnaire was given to the students to answer which involves the manner by which the students do well in school. Almost 50% do not have any preference for diagrams and use of multimedia. Majority of the students disagreed that they learn better using computer based materials. Seventy two percent agreed and strongly agreed that they learned better by reading a good textbook. These only shows that this particular group of students was not used to using computer in studying instead they prefer using a hardcopy of a textbook. This group learned better with face to face discussion. Seventy seven percent agree and strongly agree that they learned better by listening. Seventy two percent agreed and strongly agreed that they learned better by reading and rereading materials (by this is meant reading a hardbound book).

The other questionnaire given to the experimental group in the midterm asked them to evaluate the Courselab. Their responses were tabulated according to the questions asked. Fifty seven percent disagree that “It was clear how Courselab modules fit into learning Algebra”. Fifty seven percent agree that “The program is very effective for students in preparing the test and measuring student’s progress”. Fifty seven percent disagree that “the scoring system in courselab is very useful for students in preparing their subject’s test”. To the statement, “the students can easily understand and deal with the interface (e.g., is the screen layout clear and easy to interpret?)” 48% or almost half agree and strongly agree while only 32% disagree or strongly disagree and only 19% is neutral. To the statement “the platform tools are easy for students to use”, more than half or 59% agree or strongly agree while only 16% disagree and only 24% are neutral. This means that

courselab was not the problem but it was learning algebra in courselab that was the difficulty. To the statement, "It is easy for the students to answer the questions in the tests designed in courseLab", 38% agree or strongly agree while only 24% disagree or strongly disagree and 38% is neutral. Here it can be seen that although the students had a harder time learning algebra through Courselab the tests designed was easy to answer.

Another reason for the negative perception on use of Courselab as VLE in learning algebra was the learning style of the students. Among the students in the experimental group 57% were auditory and only 40% were visual. On the other hand the control group comprised of 32% auditory and 41% visual. It can be deduced that more than half of the students were auditory in the experimental group. This could justify why in general they prefer the lecture method than the use of VLE.

## 9. Contribution of this paper

Education is facing a period of transition from the traditional method of teaching and learning to electronic based learning. Despite resistance from some educators the VLEs cannot be stopped in evolving. This is because the evolution of technology grows exponentially. Educators have to change mindset. The future is becoming more and more technology-centered. Yet the traditional classroom cannot be totally abandoned and be replaced by the virtual classroom. A combination of both will be more effective.

The traditional method is based on the concept of knowledge transfer. Educators claim that learning is better if it is student-centered. Teachers are better facilitators of learning. The educational field therefore is faced with exposure to learning technology as a new concept on teaching and learning.

There are pedagogical barriers to be overcome when teaching and learning take place in VLEs. There are organizational aspects to consider when teaching in VLEs. To be a good teacher does not only mean being a good educator but one has to be a good organizer and designer of information, communication, didactical implementation and media integration. When international and inter-cultural students are present, the teacher's tasks become more complex.

This study may be replicated to evaluate the Courselab in other mathematics subjects other than algebra. The lessons designed in Courselab maybe uploaded and tested whether online contents would make a difference in the achievement of the students. All the features of the Courselab must be incorporated in the lessons. Students can be set to work according to their individual abilities and needs, and can access the network from home as well as in the university. With Courselab students develop independent learning skills and have more control over how and when they work.

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