The Use of Computers and Technology Increase Student Achievement and Improve Attitude

El uso de computadoras y tecnología para aumentar el logro estudiantil y mejoramiento de la actitud.

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ABSTRACT

This report describes how the use of technology helps lessons run smoothly for teacher and students during the first semester of 2007, with a particular focus on the use of computer technology to improve academic achievement. Is based on observations of pretests, Likert scales, posttests, and statistical analysis with certain classrooms which were chosen previously by teachers who made this project. Demographics are as follows:
Age Range: 17 to 19 (12th grade)/16 to 17 (10th grade), Sex Distribution: M & F, Ethnic Breakdown: mixed Hispanic, White, Colombian students. Location: Barranquilla, Colombia, SA, Other important characteristics (attach additional sheets as necessary) most students are from upper middle class families in Colombia. With the following design: Pre Test -Treatment- Posttest The investigation revealed that technology had a positive impact on the students because their level of motivation and performance grew up consistently. Because of available amount of computers at the school was not enough, students used simulators through internet at home, reducing the teacher's supervision, and the amount of time dedicated to the web page (with the simulator) by each student was not the same.

Key words: Technology. Computers. Achievement. Attitude.

RESUMEN

Se analiza, cómo el uso de la tecnología ayudo a los profesores y sus estudiantes durante el primer semestre de 2007, para el aprendizaje de ciertas lecciones, con un enfoque particular en el uso de la tecnología informática para mejorar el rendimiento académico. Se basa en las observaciones de las evaluaciones preliminares, escalas Likert, evaluaciones posteriores y análisis estadístico con ciertos salones de clase que fueron elegidos previamente por profesores que hicieron este proyecto. Datos demográficos son los siguientes: rango de edad: 17 a 19 (grado 12) / 16 a 17 (décimo grado), distribución del sexo: Masculino y femenino, Mixto hispano, blanco, estudiantes colombianos. Ubicación: Barranquilla, Colombia, S.A, otras características importantes (Adjunte hojas adicionales si es necesario) mayoría de los estudiantes provienen de familias de clase media superiores en Colombia. Con el siguiente diseño: Pre Test - Treatment -Post test. La investigación reveló que la tecnología ha tenido un impacto positivo en los estudiantes, debido a que su nivel de motivación y el rendimiento creció constantemente. Debido a que la cantidad de computadores disponibles en el colegio no fue suficiente, los estudiantes utilizaron simuladores de internet en sus casas, esto redujo la supervisión del profesor y la cantidad de tiempo dedicado a la página web (con el simulador) por cada estudiante no fue la misma.

Palabras Clave: Tecnología. Computador. Logro. Actitud.

INTRODUCCIÓN

Not all teachers feel comfortable using new technologies of communication and information inside the classroom, developing lessons and evaluating students' skils.

Especially for difficult subject-areas such as ours: physics, chemistry and math. Because of this, we decided to form a multidisciplinary group involving computer technology, Science and Math.

Taking into account all limitations that we have (resources, technological support provided by the school, own educational background) as well as mayor part of time students must be working lonely, we chose some simulators through regarding topics which were identified as critical issues of each particular subject.

All of these represent obstacles for students' learning and motivation, and also for getting better results from them.

As we know, we are living in a constant progress of technological development in which the use of technology is essential to be adopted into changing world.

Based on this, we are pursing more engagement in all students, using simulators in web pages in which there are applied important concepts worked on class.

Using technology in education is no longer a "new" idea. Since technology has grown and been introduced to the society, it is very important to integrate its use in education. As an instructional tool, it offers a great variety of information and skills required to succeed in life. Also it is a motivational tool that helps students to develop attitudes and skills toward learning, self-esteem, and self-confidence.

Today's technology provides teachers and students a great variety of opportunities for teaching and learning that are impossible to use with traditional methods; in fact, the use of computer technology goes beyond assisted instruction in the form of tutorials in which students interact with computers to learn knowledge and skills that allow then build reports, that include graphs, photos, tables, etc., of great appearance and quality.

"There are many factors that make computers a cognition tool" (Nogueira, 2003)

REVIEW OF LITERATURE & RESEARCH QUESTION:

Article Summary Sheet - Use Google Scholar to locate articles

Name of Article: The tutorial benefits of on-line assignments: MasteringPhysics in first year physics at the University of Sydney

Author: John O'Byrne and Richard Thompson. School of Physics, University of Sydney. j.obyrne@physics.usyd.edu.au. r.thompson@physics.usyd.edu.au

Source: MasteringPhysics, CyberTutor.

Research Question? How well do the assignments generate good quality learning activity?

Sample?

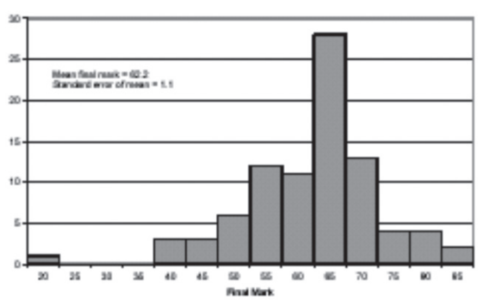
The *MasteringPhysics* system was trialled at the University of Sydney during second semester of 2004 in the PHYS 1003 (Technological) unit of study. This group of approximately 250 students, mostly from science and engineering degrees, was chosen because problem solving is an important aspect of their course. Importantly, these students had already completed one semester of physics using the paper-based assignment system. They could therefore comment on the relative merits of the two systems from the students' perspective (O'Byrne, 2004). (Table 2)

Results?

Table 2. Student ratings of the helpfulness os MasteringPhysics in problem solving in physics and understanding of concepts in physics

	MasteringPhysics did not help			*MasteringPhysics* helped	
	significantly negative	negative	neutral	positive	significantly positive
Problem solving	8%	18%	3%	55%	16%
Understanding of concepts	3%	16%	2%	67%	12%

Figure 1. Final overall results in the unit of study for students who thouht MasteringPhysics (a) helped and (b) did not help their understanding of concepts of physics.



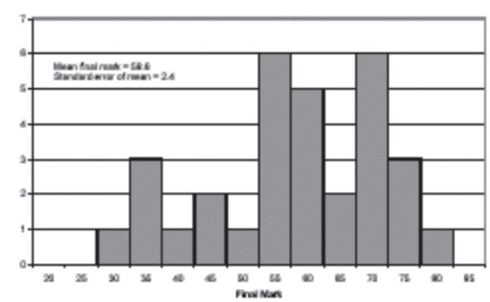


Figure 2. Comparison of MasteringPhysics assignment mark and Examination mark for the PHYS 1003 class in 2004

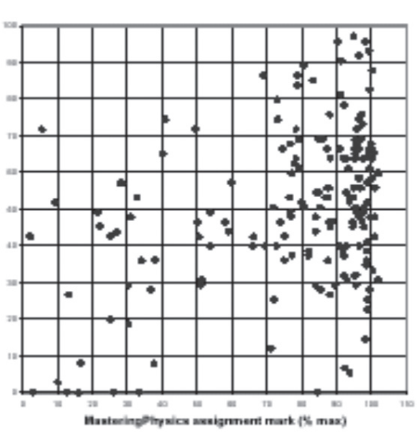
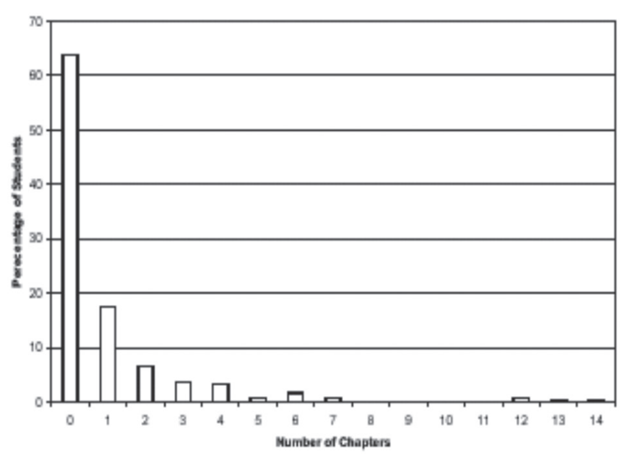


Figure 3. Percentage of students attempting some non-complusory questions from book chapters covered by *MasteringPhysics*



Implications according to author:

As described earlier, the attractions of MasteringPhysics (http://www.njctl.org/?gclid=CPTlq-bbV8sgCFc-RHwodgqUE5Q) as a teaching aid centred on its ability to deliver timely and targeted feedback to the students doing the assignments. The system of hints and the immediate feedback was generally popular with students:
'Yes, the feedback and hints assist you in the right direction and knowing that your answer is incorrect right away and getting a second chance is really, really good.'
From a technical point of view, MasteringPhysics performed well and most students adapted to it without many problems.

Table 3 illustrates our rating of the effectiveness of MasteringPhysics in the Trial against the same scale used for paper-based assignments in Table 1. Once again these are our perceptions, although in this case based on student feedback. Comparison with Table 1 emphasizes our positive view of the effectiveness of MasteringPhysics.

There were losses in going from paper-based assignments to MasteringPhysics. Short answer questions cannot be marked by the system. Group work that our paper-based assignments encourage (in principle) is perhaps discouraged (also in principle) by students working through the MasteringPhysics questions under their own login name. Students particularly noted the loss of the close alignment between questions in the paper-based assignments and those in the final examination. The 'Skill Builder' questions used in MasteringPhysics are indeed different, but the other problems are conceptually similar to examination questions. However only the 'End of Chapter' questions, used for a few MasteringPhysics questions, are like examination questions in providing no feedback. Does this reflect an assessment-driven attitude where the students use the feedback simply to complete the assignment questions and don't see assignment questions as learning?

An assessment-driven approach to learning is also suggested by the very low usage of optional tutorial questions. This is not a change however, since only a few students ever find the time to do extra questions. With most students doing some paid work alongside their university and social commitments, making time for anything beyond assessment tasks is always an issue. Usage of MasteringPhysics beyond the compulsory assignments may be easier to encourage if students use it from the start of their university physics career, as has happened in 2005.

Disappointingly, the adoption of MasteringPhysics did not make a perceptible change in the performance of students in the final examination, although this is hard to establish without using a standard examination. This lack of impact occurred despite MasteringPhysics offering

Table 3. Staff ratings of the effectiveness of *MasteringPhysics ssignments in promoting studen learning*

How well do the assignments generate good quality learning activity?		
Assignments …		***Rating / Comment***
1	capture sufficient student time and effort	√ *provided they don't simply share answers*
2	distribute student effort evenly across topics and weeks	√ *assignments every 2 weeks*
3	engage students in productive learning activity	√? *but short answer questions lost*
4	communicate clear and high expectations to students	√? *but perceived loss of exam-style questions*
How well does feedback on assignments support learning?		
Feedback is …		
5	sufficient, often enough and in enough detail	√ *tailored to the student responses*
6	provided quickly enough to be useful to students	√ *provided when required*
7	focused on learning rather than on marks or students	√ *100% possible for many students*
8	linked to the purpose of the assignment and to criteria	√ *sample solution does provide a good guide*
9	understandable to students, given their sophistication	√ *tailored to the student responses*
10	received by students and attended to	√ *used to help answer problems*
11	acted upon by students to improve their work or their learning	√? *only used to complete the assignments*

students a clearly better educational approach than the previous paper-based assignments. We suggest that the students' assessment-driven approach to learning did not allow them to take real advantage of the system, in particular by using questions beyond the compulsory assignment. We need to use MasteringPhysics encourage a new attitude among the students. We need to sell it better and have attempted to do that in a wider implementation of the system in first semester 2005.

Name of Article: Online homework: Does It Make a Difference?
Author: Scott Bonham and Robert Beichner. Department of Physics, North Carolina State University, Box 8202, Raleigh, NC 27695
Duane Deardorff. Dept. of Physics and Astronomy, CB 3255 Phillips Hall, University of North Carolina, Chapel Hill, NC 27599
Source: WebAssign, CAPA, OWL or Homework Service.

Research Question? Online homework: Does It Make a Difference?
Sample? This project was done with two large groups of an introductory calculus-based physics course (~110 students in each section) and then repeated the next semester with two sections of an algebra based course (~60 students each).

What did the researcher do? In both courses, an instructor taught the sections on the same day, trying to keep everything as similar as possible except for the homework method used. In one section students sent their work to WebAssign for grading (with resubmissions allowed), while students in the other group turned in their homework on paper to be graded by a graduate teaching assistant (TA). The paired sections were given basically the same duties, which were basically composed of standard textbook-type problems. Student learning was measured by multiple choice and written problems on exams and quizzes, along with the Force and Motion Concept Exam (FMCE) in the calculus course. Students were also surveyed, and some were interviewed. Both of these courses were multiple-section courses taught by different instructors in any given semester; students in the other calculus-based sections took the same common exams and received the same web-based assignments.

The study compared the performance of students using an online homework system to those submitting their work on paper in the traditional manner (Moor F. , 2004).
Results?

Table 4. Calculus and algebra courses.

Course	Calculus		Algebra	
	Web	Paper	Web	Paper
FMCE gain	19%	20%	-	-
Test Average	78%	75%	82%	77%
Quiz Average	-	-	61%	58%
Homework score	**88%**	**72%**	63%	62%
Laboratory score	85%	84%	73%	76%
Visits to tutorial center (semester)	3.7	3.3	5.3	5.8
Time spent at tutorial center (semester)	3.6 h	3.5 h	6.8 h	8.1 h
Time spent on homework/week (hours, self-reported on surveys)	**3.3**	**2.4**	4.4 **4.4**	4.1 **3.4**

According to the authors, student performance was similar between the paper and web sections. The students from the web sections consistently performed slightly better on the tests (Table 4. calculus, 78% vs. 75%; algebra, 82% vs. 77%), but this difference was not statistically significant—no conclusions can be drawn from it. In fact, differences between calculus-based sections taught by different instructors were greater. In addition, the small difference seen in test scores is possibly because of a difference in student ability—in both courses the students in the web section had slightly better GPAs and SAT math scores. When the scores are broken down between written and multiple-choice questions, there are still no significant differences between the two homework methods. A selection of written work from the calculus course was analyzed for differences in how students wrote out the problems (use of equations, words, numbers, units, etc.).

The only significant difference found with this data is that the paper group was better at following instructions to box or circle the final answer. The FCI was given to the calculus students at the beginning and end of the semester, and the two sections had nearly identical gains. Looking at the rest of the course, the major significant difference found between paired sections was for the calculus section's homework scores—81% vs. 76%. The web section may have done better because they had the opportunity to resubmit assignments or, alternatively, because they had three short assignments a week as opposed to one long one likes their paper-based colleagues. This difference was not seen in the algebra course, where both sections had one long assignment a week. Also, the scores in the algebra web section might have been depressed because of unusually high levels of technical difficulties during the first few weeks, which caused the instructor and many of the students to develop negative attitudes towards the homework system. No differences were found in laboratory performance or in the use of the walk-in Physics Tutorial Center (Abbott, 1994).

Implications according to author:
The authors conclude that the **method of collecting and grading homework makes little difference to student performance.** There are some additional points that should be considered:

• The effort involved in grading of the paper exercises in this comparison was much more thorough than typical. All problems on all assignments were graded, including both the process and the final result.
Written comments were often given, and occasionally these were extensive. We would expect that feedback by hand or by computer is better than no feedback at all, but to what degree we can not say.

• The resources (money/time) required by using paper vs. computer homework could be significantly different, particularly in large groups. In this study, the paper-based sections employed a full-time graduate teaching assistant (15-20 hours/week). The cost of online homework systems ranges from free software (provide your own machine and content) to fully hosted systems with lots of content for several hundred dollars a semester per class. Perhaps the greatest benefit of web-based homework is that it can free up personal or monetary resources which can be devoted to other aspects of the course where they can make a greater difference.

• Although web-based systems did not seem to hinder student performance, technical problems and negative instructor attitude did make the algebra web section a more unpleasant experience than it had to be. Others have observed that having someone available to ensure that things run smoothly has a great impact on student and instructor attitudes toward the homework system.

• Standard textbook-like problems were used in this investigation; to a certain extent, these have been optimized for paper homework. Computers allow us to give types of questions that would not be possible on paper (e.g., Physlet ™ exercises 11) which could prove to be a decisive improvement over textbook problems—not because of the technology itself, but as a result of better pedagogy enabled by the technology.

According to the authors, web based homework is a viable alternative to the traditional paper-based approach. It does not bring significantly greater benefits to students, but neither does it do much worse than standard methods of collecting and grading homework. It probably will help students in courses where homework could not otherwise be assigned. Students generally respond positively to using a computer for homework and, in general, seem to take their assignments seriously. Web based homework may also allow for more pedagogically sound instruction by freeing up instructor resources for other aspects of the course, or by enabling new kinds of assignments that may be more valuable than traditional paper-and-pencil ones. Technology alone is not going to improve instruction, but web-based homework has a rightful place in the physics instructor's toolbox.

Name of Article: Training of undergraduate teachers in Nigerian universities: focus on problems of effective integration and attitude of students to computers in mathematics instruction
Author: Dr. (Mrs.) Uche N. V. AGWAGAH. Science Education Department - University of Nigeria, NSUKKA. SYSKRAFT@hyperia.com
Dr. Kamoru OLAYIWOLA USMAN. Science

Education Department - University of Nigeria, NSUKKA. EPSEELON@AOL.COM

Research Question?

• To what extent are mathematics education students exposed to the use of computer in teaching mathematics in the mathematics methods course?

• What proportion of mathematics educators own computer machines?

• What are the attitudes of undergraduate mathematics education students to computer usage in mathematics instruction?

Sample? The subjects were selected from thirty Nigerian Universities that run the mathematics education program. A total of three hundred and thirty subjects (300 undergraduate mathematics education students and 30 mathematics educators were selected through stratified random sampling. The unit of stratification was ownership of university (Federal-owned and State-owned universities).

What did the researcher do? Two sets of questionnaires – one for the students and the other for the mathematics educators were used for data collection. The questionnaire for students had 3 sections. Section sought information on personal data – students' gender and ownership of university. Section B sought information on availability of computers in education departments, and extent of exposure of students to computer usage in mathematics instruction. Section C sought information on general attitudes of students toward computer in mathematics instruction.

The questionnaire for mathematics educators also had three sections. Section A was on ownership of university. Section B was meant to collect data on availability of computers for mathematics method course, and extent of exposing students to computer usage in mathematics instruction. The items were also meant for collecting data on computer literacy level of the educators, mode of training in computer literacy and access to computer in homes. Section C sought information on problems of integrating computer in mathematics education program. The questionnaires were found to have an alpha reliability of 0.89 and 0.83 respectively. Two types of validity were assessed: face validity and content validity by a panel of 3 judges (AGWAGAH, 2003).

Results?

Moreover, very few (30 per cent) of the mathematics educators studied have access to computers in their homes (table 5). Definitely, the inability of teachers to have access to computers and the lack of opportunity to be computer literate would hamper their effectiveness in the mathematics education program. Renzulli (1998) observed that more rigorous curriculum standards, without improved curricular materials and teachers able to use them would not yield significant improved academic performance.

The results of this study indicated that generally, the mathematics education students have positive attitudes towards the use of computers in mathematics instruction. They believe that computer can greatly improve learning in mathematics; the use of computers in mathematics instruction can have a significant motivating effect on students; computers offer a cost-effective way of individualizing mathematics instruction; with the use of computers, the teacher can cover a lot of work to be done within a short time; the learning of mathematics would become easier; computers are very important and necessary in mathematics instruction; and computers would help to increase socialization among students in the mathematics classroom. However, on the negative aspect, the students in addition to believing that some mathematics topics cannot be taught with computers and computers cannot be useful for teaching for understanding in mathematics believe that integration of computers in mathematics instruction will threaten the job of teachers. This result supports Harbor-Peters (1997) finding that Nigerian Secondary school teachers are not in support of the use of computers for fear of being displaced from job.

Implications according to author:

It has been found that computers are not widely available in the Nigerian Universities for the training of undergraduate mathematics teachers, and the student teachers are not exposed to the computer usage in mathematics instructions. Also, very few of the mathematics educators are computer literate, and have access to computers in their homes. If the Nigerian government should achieve its goal of integrating the computers into education especially mathematics education in Nigerian schools, then the teachers must be empowered through training in the use and application of the new technology. The authors therefore make the following recommendations.

1. The government should adequately fund the universities in Nigeria. Besides, industries and some "well-to-do Nigerians" should be involved in the funding of higher education in Nigeria.

2. Mathematics educators should be supported to attend at least one international conference on the teaching and learning of mathematics every year.

3. Universities should form linkages/exchange programs with Universities in the developed nations so as to help train the mathematics educators in the areas of using computers in teaching mathematics.

4. Universities should restore oversea training for their lecturers, so as to be exposed to current methods and materials for teaching and learning of mathematics.

Recent comparisons of traditional mathematics instruction to its computer-assisted counterpart also yielded positive learning results related to the use of technology, including commercially available problem-solving software (D. Fletcher, 1990), (Djang, 1993).

Similarly, studies by the Cognition and Technology group at Vanderbilt University of their video series entitled "The Adventures of Jasper Woodbury" showed positive results (Cognition and Technology Group at Vanderbilt University, "The Jasper Series as an Example of Anchored Instruction: Theory, Program Description, and Assessment Data," Educational Psychologist , 1992).

This series itself is of particular interest to library media specialists: each "adventure" is a fifteen- to twenty-minute story that embeds all the information students need to solve a particular mathematical problem; students need not only mathematical skills but skills in identifying, evaluating, and using information to reach their solutions. The series thus provides a strong example of the ways in which information skills are inherent in the contemporary curriculum and can be linked to achievement in curricular areas (Neuman, 1996).

This link is underscored by the findings of a more recent study that suggests supplementing the Jasper videos with a variety of contextual tools and follow-up activities will help students apply their learning to new situations (Barron, 1995).

RESEARCH DESIGN

Research Planning Sheet Number 1
Research Idea from Web #3: Use of computer technology
Research Question: Will the use of computers and technology increase student achievement and improve attitude?
Rate your research question on a scale from 1 (low) to 4 (high)
Feasible:
Clear:
Significant:
Ethical:
Shows a relationship Y or N

Definitions of terms: Underline the terms in your research question that you believe will require definition. Write each term below and provide their operational definitions. Use additional pages as necessary.

a. Computer technology:
b. Achievement: Based on teacher test
c. Attitude: Based on Likert Scale
Specific type of Research: Interventional
General Type of Research: Interventional

1. Our Hypothesis is: The use of computers and technology will increase student achievement

and improve attitude.
What kind of study?
What is your idea here? (Intervention)
What is the independent variable or the experimental variable? Computer & Technology use.
What is the dependent variable? Achievement and attitude.

Data Collection Matrix
What am I measuring? (Dependent or Outcome Variables)
How am I measuring?
From whom am I collecting Data?
Research Questions: 1. Computer use achievement and attitude.
Sources (From whom will you collect information?): Students

Research Planning Sheet Number 2
Part A
Sampling Plan:
1. My intended sample (subjects who would participate in my study) consists of (tell who and how many):
24 students in 12th grade (9 in regular group and 15 in advanced group).
36 students in 10th grade (17 in 10th A and 19 in 10th B).

2. Demographics are as follows:

a. Age Range: 17 to 19 (12th grade)/16 to 17 (10th grade)
b. Sex Distribution: M & F
c. Ethnic Breakdown: mixed Hispanic, White, Colombian students.
d. Location: Barranquilla, Colombia, SA
e.Other important characteristics (attach additional sheets as necessary): most students are from upper middle class families in Colombia.

3. The type of Sample
Simple Random: Convenience XX
Stratified Random: Purposive
Cluster Random

4. I will obtain my sample by: Teacher convenience (Table 5)

Threats to Validity
Hawthorne
Mortality
Prior Knowledge
Tutoring
Novelty

Research Planning Sheet Number 3
Data Analysis:

1. How will I analyze my data? (Consider the

Table 5: Teacher convenience

<table>
<tr><th>Pre Test</th><th>Treatment</th><th>Post test</th><th></th></tr>
<tr><td>Pre test A & P
Physics and Lab II
(12th Grade)</td><td rowspan="3">50% of the classes will receive the treatment in a unit. 50 % will serve as a control group. In second unit the Control group gets the treatment and the treatment serves as the control.</td><td>Post Test A & P
Physics and Lab II
(12th Grade)</td><td rowspan="3">Hawthorne effect
Mortality
Prior computer knowledge
Technology at home
Tutoring
Some students are in two classes</td></tr>
<tr><td>Pre Test A & P
Pre-Chemistry
(10th Grade)</td><td>Post Test A & P
Pre-Chemistry
(10th Grade)</td></tr>
<tr><td>Pre Test A & P
Math (10th Grade)</td><td></td></tr>
</table>

use of descriptive display. (Bar graphs, scatter plots, percent table, other): Bar graphs, Vassar stats & R Language Program

2. Which comparative technique will I use?
Independent Samples
Level of significance : 0.05
t-test (s)
df : n-2

3. How will I use qualitative techniques to enhance understanding?

Observations	X
Interviews	X

4. How can I share my results? With whom?
Other Staff members, volunteer faculty members, another school, being published in specialized magazines.

ACTION PLAN FOR MASTERS PROJECT

Research Question:
Will the use of computers and technology increase student achievement and improve attitude?

List the steps to you will take to implement your action research project then complete your timeline below:

1. Search for some bibliographic references in order to support the project 1 per group member.

2. Check software applications and computational tools which are going to support the research.

3. Choose the appropriate software according to our goals in each specific lesson. Be more specific.

4. Because of this project involves interdisciplinary areas each teacher will select the lesson in which the software will be applied. Treatment group and control group will be chosen by random selection.

5. After choosing lessons and groups, a schedule will be designed to apply the pre test & Likert Scale survey.

6. When we will have collected the pre scores, each teacher will implement the treatment supported by the technology consultant (Computers teacher).

7. Then, the post test & Likert Scale will be administered to the students.

8. The process will be repeated a second time with the whole process being reversed where the control group becomes the experimental and the experimental becomes the control group.

9. With both scores (pre & post) collected both groups serving as control and experimental, a statistics calculation will be done to compare results and determine whether the treatment is effective or not.

Step	Resources	Person Respon	Needs	Anticipated Completion Date	Actual Completion Date
Pre-Test (R Group). Likert Scale Technological Support Pos-Test (R Group) Pre-Test (AP Group) Technological Support Pos-Test (AP Group). Likert Scale Analysis and Conclusions	http://www.edumedia-sciences.com/es/node/90-propiedades-de-la-materia http://www.edumedia-sciences.com/es/node/357-reacciones-quimicas	Gilberto	Cmputers, Videobeams Chemistry laboratory room	Feb 05, 2007	May 18, 2007
	http://www.schools.utah.gov/CURR/mathsec/Core/Secondary-I.aspx https://www-math.umd.edu/secondary-mathematics-education.html	Marco	Cmputers, Videobeams	Feb 05, 2007	May 18, 2007
	http://www.edumedia-sciences.com/m103_l3-lente-espejos.html http://www.edumedia-sciences.com/m103_l3-lenses-and-mirrors.html http://www.retena.es/personales/lpastord/applets/optica/lentes/lentes.htm Technological Support t-TEST http://faculty.vassar.edu/lowry/VassarStats.html STATISTICAL INFERENCIAL	Pablo	Cmputers, Videobeams Science laboratory room	Feb 05, 2007	May 18, 2007
	http://www.robeson.k12.nc.us/Page/5217 http://battlefieldhs.schools.pwcs.edu/modules/cms/pages.phtml?pageid=85077&SID	Luis	Computer room	Feb 05, 2007	May 18, 2007

LIKERT SCALE

Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	**1. I like Physics & Lab.**
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	2. Working in a group makes me learn better.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	3. Physics & Lab classes are interesting.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	4. The thing I learn in Physics & Lab I can use it in my life.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	5. When I am in Physics & Lab class, time goes quickly.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	6. Physics & Lab assignments make me think.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	7. Math and Science are related.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	8. I am confident when I am solving problems.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	9. I feel like I make a useful contribution in Physics & Lab class.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	10. I solve Physics & Lab exercises quickly.

Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	**1. I like Math.**
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	2. Working in a group makes me learn better.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	3. Math classes are interesting.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	4. The thing I learn in Math I can use it in my life.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	5. When I am in Math class, time goes quickly.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	6. Math assignments make me think.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	7. Math and Science are related.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	8. I am confident when I am solving problems.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	9. I feel like I make a useful contribution in Math class.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	10. I solve Math exercises quickly.

Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	**1. I like Chemistry & Lab.**
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	2. Working in a group makes me learn better.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	3. Chemistry & Lab classes are interesting.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	4. The thing I learn in Chemistry & Lab I can use it in my life.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	5. When I am in Chemistry & Lab class, time goes quickly.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	6. Chemistry & Lab assignments make me think.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	7. Math and Science are related.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	8. I am confident when I am solving problems.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	9. I feel like I make a useful contribution in Chemistry & Lab class.
Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**	10. I solve Chemistry & Lab exercises quickly.

FINDINGS

T-TEST

In many experimental and quasi-experimental designs researchers need to compare mean scores of two groups to see if their treatment made a difference. The t-Test provides a statistical way to see if the difference between the two sample means is greater than what would be found by chance alone if there were no real differences in the larger population. Data must be on an interval or ratio scale –that is, it must represent an amount of something. The t-Test cannot be used with nominal data (categories such as political party or gender) or ordinal data (rank order).

There are two slightly different t-Test formulas, depending on whether the samples are independent or nonindependent. Independent samples are those in which members of one group are not related in any systematic way to members of the other group. Examples include two different sections of a civics class, two randomly formed groups of students, or two different teams for which members are chosen randomly. Nonindependet samples are ones formed by some kind matching. The most common type is comparing pre-test and pos-test scores from the same group of people. These samples are definitely matched since the pre-test and pos-test scores are from the same people. If samples are nonindepndent, you can expect some kind of correlation between them, so you must use the t-Test for nonindependent samples.

DATA ANALISYS: PHYSICS AND LAB II (Mr. PABLO)

http://faculty.vassar.edu/lowry/VassarStats.html
PHYSICS AND LAB 2 (REGULAR Group)
VassarStats Printable Report / t-Test for Independent Samples
Mon Apr 2 08:39:30 EST 2007

Values entered:

count	X_a	X_b
1	28	100
2	14	43
3	57	71
4	28	57
5	00	57
6	00	43
7	43	86
8	14	71
9	14	57

Summary Values

Values	X_a	X_b
n	9	9
sum	198	585
mean	22	65
sumsq	7254	40923
SS	2898	2898
variance	362.25	362.25
st. dev.	19.0329	19.0329

Variances and standard deviations are calculated with denominator = n-1.

$Mean_A$ - $Mean_B$	t	df
-43	-4.79	16

P	one-tailed	0.0001
	two-tailed	0.000200

VassarStats Printable Report / t-Test for Correlated Samples
Mon Apr 2 09:23:25 EST 2007

Values entered:

count	X_a	X_b	X_a - X_b
1	28	100	-72
2	14	43	-29
3	57	71	-14
4	28	57	-29
5	00	57	-57
6	00	43	-43
7	43	86	-43
8	14	71	-57
9	14	57	-43

Summary Values

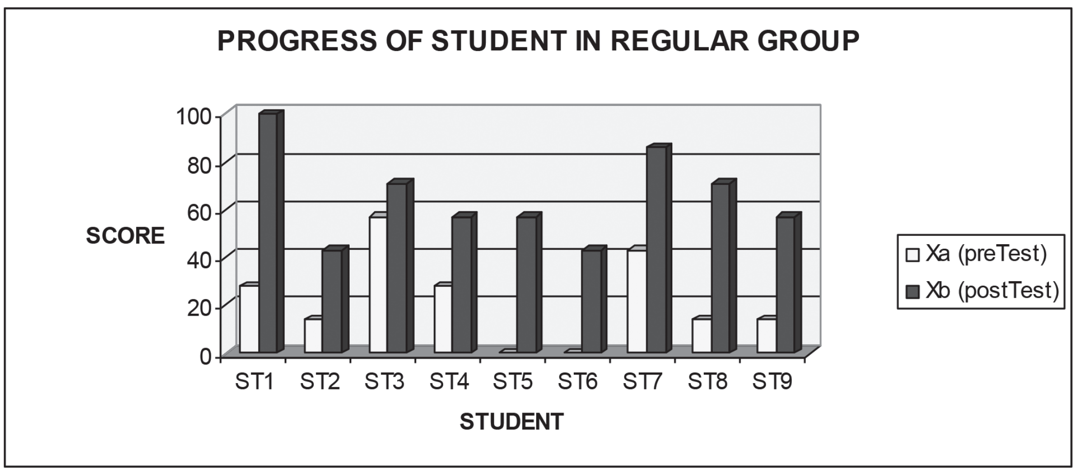
Values	X_a	X_b	X_a - X_b
n	9	9	9
sum	198	585	-387
mean	22	65	-43
sum_sq	7254	40923	19107
SS	2898	2898	2466
variance	362.25	362.25	308.25
st. dev.	19.0329	19.0329	17.557

$Mean_A$ - $Mean_B$	t	df
-43	-7.35	8

P	one-tailed	<.0001
	two-tailed	<.0001

Variances and standard deviations are calculated with denominator = n-1

Figure 4. Progress of student in Regular Group.



PHYSICS AND LAB 2 (AP Group) - VassarStats Printable Report
t-Test for Independent Samples - Mon Apr 2 09:05:09 EST 2007

Values entered:

count	X_a	X_b
1	14	86
2	00	100
3	43	86
4	0	86
5	14	71
6	14	71
7	14	86
8	29	86
9	57	100
10	29	71
11	57	100
12	29	86
13	43	86
14	57	100
15	43	100

Summary Values

Values	X_a	X_b
n	15	15
sum	443	1315
mean	29.5333	87.6667
sumsq	18601	116895
SS	5517.7333	1613.3333
variance	394.1238	115.2381
st. dev.	19.8526	10.7349

Variances and standard deviations are calculated with denominator = n-1.

$Mean_A$ - $Mean_B$	t	df
-58.1333	-9.98	28

P	one-tailed	<.0001
	two-tailed	<.0001

VassarStats Printable Report - t-Test for Correlated Samples
Mon Apr 2 09:21:45 EST 2007

Values entered:

count	X_a	X_b	X_a - X_b
1	14	86	-72
2	00	100	-100
3	43	86	-43
4	00	86	-86
5	14	71	-57
6	14	71	-57
7	14	86	-72
8	29	86	-57
9	57	100	-43
10	29	71	-42
11	57	100	-43
12	29	86	-57
13	43	86	-43
14	57	100	-43
15	43	100	-57

Summary Values

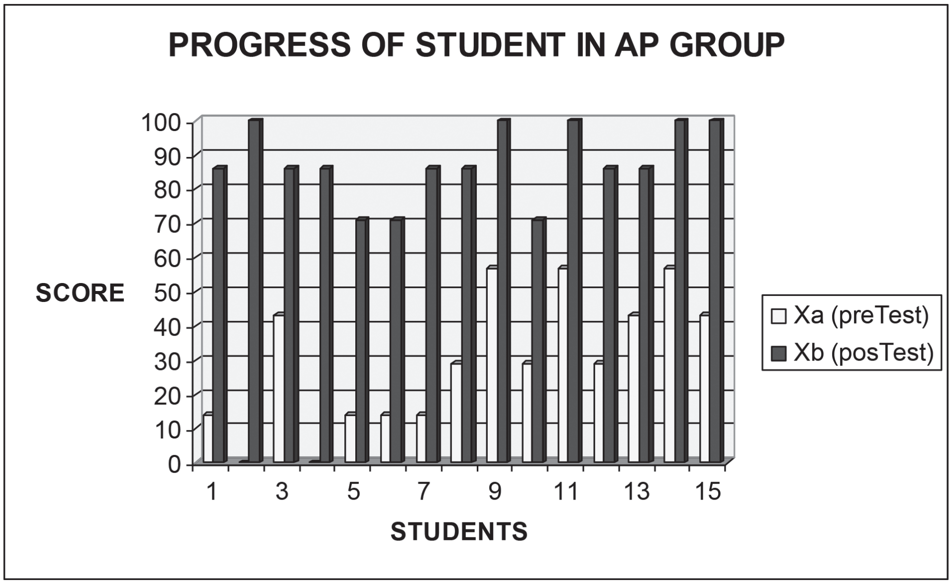
Values	X_a	X_b	X_a - X_b
n	15	15	15
sum	443	1315	-872
mean	29.5333	87.6667	-58.1333
sum_sq	18601	116895	55018
SS	5517.7333	1613.3333	4325.7333
variance	394.1238	115.2381	308.981
st. dev.	19.8526	10.7349	17.5779

Variances and standard deviations are calculated
with denominator = n-1.

$Mean_A$ - $Mean_B$	t	df
-58.1333	-12.81	14

P	one-tailed	<.0001
	two-tailed	<.0001

Figure 5. Progress of student in AP Group



LIKERT SCALES

Figure 6. Likert Skill Pre-Test AP Group.

	I	II	III	IV
LSK1	3	3	6	3
LSK2	1	2	3	9
LSK3	2	2	5	6
LSK4	0	0	10	5
LSK5	2	4	5	4
LSK6	1	0	3	11
LSK7	2	1	3	9
LSK8	3	4	7	1
LSK9	2	5	6	2
LSK10	6	7	2	0

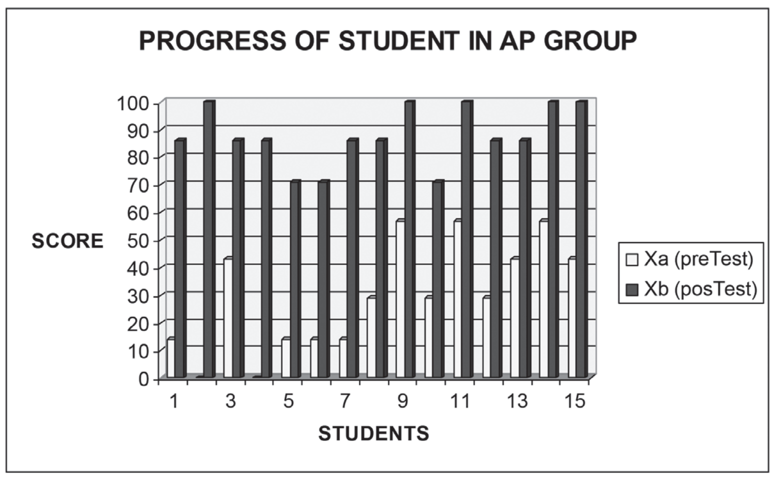
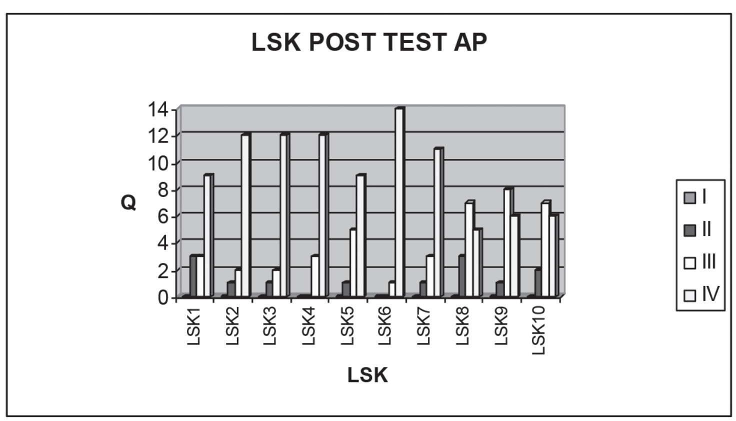


Figure 7. Likert Skill Post-Test AP Group.

	I	II	III	IV
LSK1	0	3	3	9
LSK2	0	1	2	12
LSK3	0	1	2	12
LSK4	0	0	3	12
LSK5	0	1	5	9
LSK6	0	0	1	14
LSK7	0	1	3	11
LSK8	0	3	7	5
LSK9	0	1	8	6
LSK10	0	2	7	6



R Language Program

DESCRIPTIVE STATISTIC

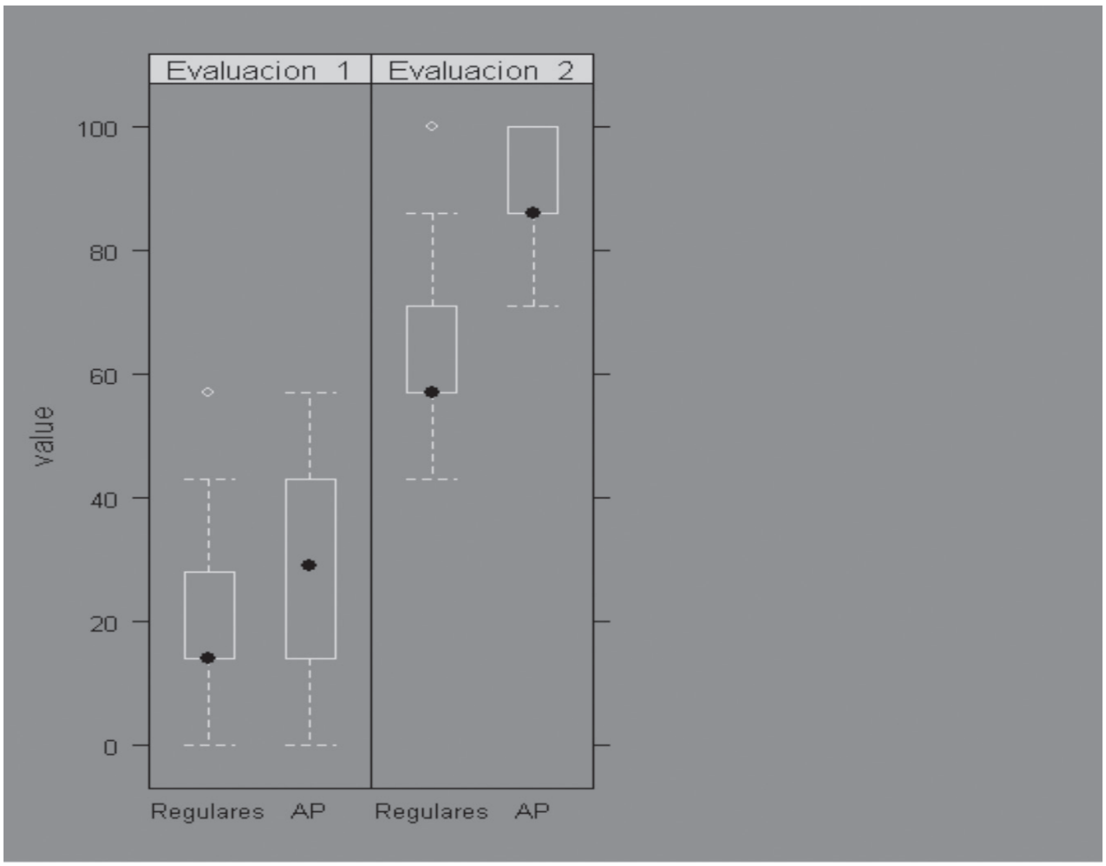
```
trellis.device(color =FALSE )
calificaciones<-read.table("Estudiantes.txt")
calificaciones$V1<-factor(calificaciones$V1,
labels=c("Regulares","AP"))
calificaciones$V2<-factor(calificaciones$V2)
dimnames(calificaciones)[[2]]<-
c("Grupo","Sujeto",paste("Evaluacion",c(1,2)
,sep="_") )
Evaluacion<-c(1,2)
library(reshape)
datos<-melt(calificaciones,id=c("Grupo","Sujeto"))
bwplot(value~Grupo |variable,data=datos,layout = c(4,1))
# mediana de los grupos
datos1<-subset(datos, subset=datos$Grupo=="Regulares")
datos2<-subset(datos, subset=datos$Grupo=="AP")
by(datos2$value,datos2$variable,median)
by(datos1$value,datos1$variable,median)
```

STATISTICAL INFERENCIAL

```
library(xtable)
library(lattice)
library(reshape)
calificacion<-read.table("Estudiantes.txt")
dimnames(calificacion)[[2]]<-c("grupo","sujeto","ev1","ev2")
datos<-calificacion
datos$grupo<-factor(datos$grupo,labels=c("Regulares","AP"))
Y<-as.matrix(datos[,-c(1,2)])
ni<-as.numeric(table(datos$grupo))
s<-length(ni)
t<-ncol(Y)
n<-sum(ni)
X<-matrix(0,nrow=n,ncol=s)
for(i in 1:s){
ind<-cumsum(ni)
if(i==1){ X[1:ind[i],1]<-rep(1,ni[i])}
else{X[(ind[i-1]+1):ind[i],i]<-rep(1,ni[i])}
}
A<-matrix(c(1,-1),nrow=1)
A
C<-matrix(c(1,-1),nrow=2)
C
D<-matrix(0,s-1,t-1)
D
#A<-diag(2) #matrix(c(1,1),nrow=1)
#C<-matrix(c(1,0,0,-1,0,1,0,-1,0,0,1,-1),nrow=4)
#D<-matrix(0,2,3)

Bg<-solve(crossprod(X))%*%crossprod(X,Y)
Qh<-t(A%*%Bg%*%C-D)%*%solve(A%*%solve(crossprod(X))%*%t(A))%*%(A%*%Bg%*%C-D)
Qe<-t(C)%*%(crossprod(Y)-t(Bg)%*%crossprod(X)%*%Bg)%*%C
wilks<-det(Qe)/det(Qh+Qe)
pillai<-sum(diag(Qh%*%solve(Qh+Qe)))
U<-sum(diag(Qh%*%solve(Qe)))
# usando MANOVA
# se ubican las columnas y1, y2, y3 e y4 en una matriz llamada datos
datos2<-as.matrix(datos[,-c(1,2)])
# se define el factor  y se llama grupos
grupos<- datos$grupo
# Las diferentes estadisticas
summary(fit ,test="Wilks")
summary(fit ,test="Pillai")
summary(fit ,test= "Hotelling-Lawley")
summary(fit ,test= "Roy")
# recuperar las matrices E y H
# la matriz E  y la matriz H
M<-summary(fit)$SS
H<-M$grupos
E<-M$Residuals
#################################################
## Hipótesis de paralelismo con MANOVA ##########
#################################################
#ejemplo
datos<-t(diff(t(as.matrix(calificaciones[,-c(1,2)]))))
ajus<-manova(datos2~calificaciones$g )
summary(ajus,test="Wilks")

##################################################
## Prueba para la diferencia entre los grupos    #
## equivalente a prueba t de dos muestras sobre  #
## los totales desde cada sujeto                 #
##################################################

calificaciones<-read.table("Estudiantes.txt")
dimnames(calificaciones)[[2]]<-c("grupo","sujeto","ev1","ev2")
Grupos<-factor(calificaciones$grupo)
datos2<-rowSums(calificaciones[,-c(1,2)])
anova(lm(datos2~ Grupos))
ajus<-manova(as.matrix(calificaciones[,-c(1,2)])~calificaciones$grupo)
summary(ajus,test="Wilks")
```

This work was done by using the statistical tool of Longitudinal Data because the responses (grades in this case) are obtained from the same fellows (students), that is to say there should be a correlation between the first and second note in the time, since it is carried out by the same fellow (student), which favors the application of this technique. T techniques of students applied in some texts, are not convenient since they imply or it assume that a grade of an individual is independent to the following qualification, what induces to an error since it is the same individual, a correlation should exist in the time what in this case would be the development of his knowledge through the time.

DESCRIPTIVE STATISTIC



This graph of Box plots shows that the level of both groups (AP and R) is always superior on the second evaluation; this suggests that a statistical difference exists among the groups when using technological support.

STATISTICAL INFERENCIAL

In this study, a comparison between the groups is done by using Wilks Statistics, observing the following results:

Source of variation	Degrees of freedom	Wilks	Value F	Value P
Groups	1	0.5897	7.3058	0.003905
Errors	22			

This value P indicates a significant difference among the groups, what implies that Wilks show us that between the groups Regular students and AP a very significant difference exists. Another test very used to determine differences among the groups it is the test of Pillai,

Source of variation	Degrees of freedom	Pillai	Value F	Value P
Groups	1	0.4103	7.3058	0.003905
Errors	22			

The value of the test of Pillai (0.4103) shows us a significant difference among the evaluated groups. Another test is the statistical of Hotelling-Lawley, the obtained result is the following one:

Source of variation	Degrees of freedom	Hotelling-Lawley	Value F	Value P
Groups	**1**	**0.6958**	**7.3058**	**0.003905**
Errors	**22**			

Finally these results can be corroborated by a Variance Analysis, like it is presented in the following chart

Source of variation	Degrees of freedom	Adds of square	Square half	Value F	Value P
Groups	1	5130.2	5130.2	5.9208	0.02354
Errors	22	19062.4	866.5		
Total					

For a level of significance of 0.05, it implies that a statistical difference exists among the groups of students evaluated by the use of the two types of methodology.

DISCUSSION AND ACTION PLAN

Technology has become such an integral part of society, it is necessary to integrate its use in education in a variety of ways.

Today's technology can provide teachers and students with opportunities for teaching and learning that were impossible in the past. Computers in the classroom develop important skills.

Computers makes understanding how to use them essential.

The ability to locate information, distinguish the important from the unimportant, think critically, work effectively in groups and present information in many types of media are all aided by the use of computers in the classroom.

It is not yet clear how much computer-based programs can contribute to the improvement of instruction in American schools. Although many researchers have carried out controlled evaluations of technology effects during the last three decades, the evaluation literature still seems patchy. For most technologies, results are available only at selected grade levels, in selected subjects, and on selected instructional outcomes. The literature is too uneven for sweeping conclusions about the effectiveness of instructional technology. Nonetheless, results are consistent enough for some tentative conclusions in some areas.

It is also clear that instructional technology often improves teaching programs in mathematics and in the natural and social sciences.

Computer tutorials in natural and social science classes also have had an almost uniformly positive record of effectiveness.

Science educators often think of simulation programs as advances over tutorial programs.
Teachers therefore may need to use some care in deciding when to use simulations, which simulations to use, and how to use them.

The important thing for instructors to remember is that although an online environment is different from face-to-face instruction, the goal of creating a stimulating, interactive learning environment for students is the same, regardless of the context.

Computers in schools help students accomplish their schoolwork both effectively and efficiently. Critical thinking, problem solving, independent learning skills, content knowledge, and the ability to compete in the work force are all enhanced.

The use of technology today both inside and outside of the classroom improves student achievement in a positive way. Teacher and students work hard to use the technology to help lessons run smoothly for all. Technology does have its ups and downs but there is one thing for sure that it keeps students interest. The use of strategies, computer programs, strenuous training, and technical support is a great way to achieve this goal. Technology advances everyday allowing students and teachers to have more options in learning.

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