Learning Business Research: Graduate Students Performance

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Abstract
This article describes the graduate students' academic performances in a course of business research methods, where the students have been participating solving assignments and exams; which helped these students to build their own learning through basic activities: reviewing research designs, designing and analyzing surveys, examining cases of study and writing a final research report. Cross-tables were built for two categorical variables: course-type (at 2 levels of classification: "online" and "classroom"), and the 2 levels of gender; where the dependent variable was the proportion of successful students, whose final grades were A or B. The statistical analysis was performed via the Chi-square test, for which we found that the variable “course-type” was not significant (p-value=0.235), similarly the variable “gender” was not significant (p-value=0.212); furthermore, a significant correlation (p-value=0.01) was found for the variables: Final grades and Basic statistical knowledge. An analogy among the Deming’s cycle for the continuous improvement of quality, and the learning process derived in the development of learning circles.

Introduction
The online courses provide the opportunity to obtain an education when geographical, physical and/or schedule limitations exist; but some students without this kind of limitations are using this resource expecting easy classes and less assignments or less effort looking to obtain a higher grade. Thus, the online courses are real academic challenges for all professors, whose priority is to provide high-quality teaching, maintaining a professional ethics environment.

Teaching involves the transfer of knowledge and feedback at two levels: group communication and personal communication. This paper describes the students’ academic progress in an online course of business research through interactive software assignments and diverse educational homework helping each person to build his/her e-learning in a course of business research online at a small state university.

Before the communication via Internet, the “distance learning" courses were provided by correspondence (mail); technology is periodically and progressively (Jones 2002) changing our lives. Now technology combined with the Internet enables any person to have access to a never-ending process of information (Steinfield 1987). Technology and the Internet empower individuals and facilitate a more active position in the e-learning process.

Some of the advantages of taking online courses are the convenience and the flexibility for studying from any computer at any time and any where, which permits to comply with working, personal and family responsibilities; but the disadvantages most notorious are the lack of interaction with professors and classmates, the lack of updated computing equipment (hardware & software) and the lack of systematic (discipline) reading from students. The instructors/professors provide power-point presentations and audio presentations for the lessons in the chapters, but it does not make up for the lack of a lecture; because most of the power point presentations are taken directly
from the book. So, reading is an essential part in being successful in online courses. About not-
frequent disadvantages, we can mention the lack of computer knowledge from students, the slow
e-response time from professors and the lack of reading’s skills (Steen 2006). In addition, the final
exams will be held under controlled conditions of place, date and time.

e-Learning and Technology
Technology has always been the changing force for mankind (Close 2000); e-Learning looks
like every other “e” construct or concept (i.e. e-Commerce, e-Buy); the term “e” of e-Learning
meant to be electronic; and the span of electronic in the term e-Learning can include Internet and
several more electronic media technologies; of course, in this world of global communications,
other factors affecting the e-Learning activity are the teaching styles/techniques as well as the
social environment (see Figure 1) of a learner. The social environment represents the culture where
the learner was cultured (educated) and/or lives in, as well as the individuals and institutions with
whom the learner interacts, which generates his/her quality of life (Barnett 2007).
Cisco Systems is one of the largest corporations of e-Learning users (technical participants),
that explains its compromise with the e-Learning’s components as “Components can include content
delivery in multiple formats, management of the learning experience, and a networked community
of learners, content developers and experts. e-Learning provides faster learning at reduced costs,
increased access to learning, and clear accountability for all participants in the learning process. In
today’s fast-paced culture, organizations that implement e-Learning provide their work force with
the ability to turn change into an advantage” (Kirschner 2001).
In this context the differences between e-Learning and online-learning should be noted: e-Learning
represents the whole category of technology-based learning, while online-learning is
synonymous with web-based learning; in order to be more precisely, online-learning is in fact a
component of e-Learning. Thus, we can sketch a definition of e-Learning as a delivery process
of knowledge, through different electronic media technologies including internet (Pena-Sanchez
2005), intranet, extranet, satellite broadcast, audio/video tape, interactive TV, CD ROM, etc.
e-Learning helps us increase access to training and ensure that it is immediately relevant
and cost-effective. Some advantages of online-learning include: Anywhere, Anytime, Anyone;
e-Learning is available 24 hours a day, around the world. Organizations can distribute training
and relevant information (Glauser 1984) to multiple locations easily and conveniently, allowing
employees to access training at their convenience (Pena-Sanchez 2007).

Figure 1 The e-Learning process and its related factors
Since geographical and time barriers are virtually removed, e-Learning is no longer limited to a few people who can travel to a seminar or conference. e-Learning can occur throughout organizations and e-collaborative (Kock 2005) individuals, accelerating the transfer of knowledge, and transforming learning from an isolated example of qualified development into a powerful tool for managerial decisions.

The presence of interactive software facilitates the e-learning process. The major objective of interactive software for business research is to provide students with an understanding of how to interpret results and how to solve problems (basic competences) as applied to business scenarios. In general, software of this kind runs in three modes. First, using the instruct mode, the user gain an understanding of the statistical technique or methodology. Second, using the practice mode, the participant gains the mastery of the technique with hints and help available to assist his/her learning. Third, using the certify mode, the user are required to obtain his/her certificate indicating mastery of the topic without help or hints. At the end of a time-period of training, the user will be credited for each certificate earned. The total credit will be equal to a specific percentage with each certificate carrying equal weight.

*The Deming Cycle*

W. Edwards Deming in the 1950’s proposed that industrial production processes should be analyzed and measured to identify sources of variations that cause products to deviate from customer necessities or requirements. He recommended that production or business processes be placed in a continuous feedback loop so that managers can identify and change the parts of the process that need improvements. Deming created a diagram (Figure 2) to illustrate this continuous process. The Deming’s cycle for the continuous improvement of quality commonly known as the PDCA cycle; for Plan, Do, Check, Act. This methodology can be described in a few words as follows:

- **Plan**: Design and revise business process in accordance with customer requirements to improve results
- **Do**: Implement the process or plan and measure its performance
- **Check**: Monitor and measure the processes and products and report the results
- **Act**: Decide on changes or actions needed to improve the process performance

*Figure 2 Deming’s “Plan, Do Check & Act” Cycle*

Research Hypotheses

The following hypothesis uses the proportion of students getting or exceeding the final grade “B” as the dependent variable. First, we determine if any difference exist between the proportion of successful students taking an online course with respect to the proportion of other successful students registered in a classic (classroom) course. As the students receiving instruction in a classroom are more comfortable with the academic feedback and have more complex problems discussions, we would expect for these students group to have a higher proportion of successful students than for the group of students without this practice into the classroom.

Dependent Variable: Proportion of students that got (B) or better (A) final grade.

Independent Variable: Course-type of Business Research (type 1: Online, type 2: Classic or Classroom)

Research Hypothesis HA1: The population’s proportion of students receiving classroom instruction that got “A” or “B” as final grades exceeds the proportion of students receiving online instruction.

\[ H_{A1}: p_{\text{classroom}} > p_{\text{online}} \]

The corresponding null hypothesis is

\[ H_{01}: p_{\text{classroom}} \leq p_{\text{online}} \]

Next, we consider the impact of gender on business research’ learning. As men tend to feel more comfortable with computers (Frankel 1990), we expect the online software usage for the proportion of males to be associated to passing or better final grades than females also under the same online course-type.

Independent Variable: Student gender (male and female).

Research Hypothesis HA2: The population’s proportion of male students (with passing or better final grades) receiving instruction at an online course exceeds the proportion of female students (with passing or better final grades) that were also registered in an online course; this is

\[ H_{A2}: p_{\text{males}} > p_{\text{females}} \]

In this case its corresponding null hypothesis is

\[ H_{02}: p_{\text{males}} \leq p_{\text{females}} \]

Our course examinations contain a questionnaire (Appendix A) used to estimate the students’ fundamental knowledge in statistics applied to business research. The Spearman rank correlation is used to test the relationship between the students’ final grades and their basic statistical knowledge.
Thus, the null hypothesis takes the form
\[ H_{03}: \rho = 0 \]

For which, its correspondent alternative hypothesis is
\[ H_{A3}: \rho \neq 0 \]

**Data and Methodology**

**Sampling**

A random sample of size \( n = 256 \) students was used to test the previous hypotheses. The sample data corresponds to the students’ final grades reported during the academic period from Spring-2003 to Fall-2007 at an American state university where we work. In order to eliminate a source of variation due to the factor “instructors” (professors); the total sample of students was under the same instructor supervision.

**Statistical Technique**

Given that the two independent variables are in categorical (nominal) scale, the appropriated statistical technique is a nonparametric method used in case of contingency (cross) tables: the analysis is performed via the Chi-square test.

**The Chi-square Test**

The observations of a random sample of size \( n \) are classified according to two criteria in an \( r \times c \) contingency table (Conover 1999).

\[ H_0: \text{The event “an observation is in row } i \text{” is independent of the event “that same observation is in column } j \text{” for all } i \text{ and } j; \quad \text{or } P(\text{row } i \cap \text{column } j) = P(\text{row } i) \cdot P(\text{column } j) \]

\[ H_A: P(\text{row } i \cap \text{column } j) \neq P(\text{row } i) \cdot P(\text{column } j) \]

The test statistic \( \chi^2 \) (chi-square) is defined as:
\[
\chi^2 = \sum \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}} , \quad i=1,\ldots, r; \quad j=1,\ldots, c
\]

(1)

Where, \( O_{ij} \) represents the observed frequency in cell \((i,j)\); while the term \( E_{ij} \) represents the expected frequency in cell \((i,j)\), if \( H_0 \) is really true.

\[ E_{ij} = \frac{R_i \cdot C_j}{n} \]

(2)

\( R_i \) and \( C_j \) are the sum of observed frequencies in row \( i \) and column \( j \) respectively.

The statistic \( \chi^2 \) is compared with quantiles from the Chi-square distribution with \((r-1) \cdot (c-1)\) degrees of freedom.

In terms of goodness-of-fit, the chi-square test (Cooper 2008) compares the observed and expected frequencies in each category to test either that all categories contain the same proportion of values or that each category contains a researcher-specified proportion of values.
The Spearman rank correlation coefficient \( \rho (\text{rho}) \)

This nonparametric estimated coefficient can be used to test for independence between two random variables; for which the hypotheses take the following form:

\( H_0: \) The variables X and Y are mutually independent

\( H_a: \) There is a tendency for the larger \{smaller\} values of X to be paired with the larger values of Y, or vice versa.

The nonparametric test statistic \( T_r \) is defined (Conover 1999) as:

\[
T_r = \sum [R(X_i) - R(Y_i)]^2, \quad i = 1, 2, \ldots, n
\]  
(3)

Then \( \rho \) is obtained as follows

\[
\rho = 1 - \frac{6 \ T_r}{n(n^2-1)}
\]  
(4)

The Pearson correlation coefficient

This is a parametric estimate, which is defined (Cooper 2008) as

\[
\rho = \frac{\text{COV}(X, Y)}{\text{SD}(X) \cdot \text{SD}(Y)}
\]  
(5)

Where COV represents the covariance operator, and SD is the standard deviation operator.

**Statistical Analysis**

Table 1 contains a cross-tabulation for the variables grade status (at 3 levels: passing, not passing and withdraw) and course type (at 2 levels: level 1: Classroom, level 2: Online). The corresponding test show up in Table 2.

Similarly, Table 3 is a contingency table for the variable Grade status (at 2 levels: passing and not passing grade) combined with gender; in the presence of just one level of the factor course type: only students that have been taking the online course. Its corresponding \( \chi^2 \) test is given in Table 4.
Table 1: Cross-tabulation for the variables grade status and course type

<table>
<thead>
<tr>
<th>Course Type (n=256)</th>
<th>Count</th>
<th>Status Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>Passing</td>
</tr>
<tr>
<td>Classroom</td>
<td>186</td>
<td>9</td>
</tr>
<tr>
<td>Online</td>
<td>49</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>235</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 2: Chi-Square to test $H_{01}: \ p_{\text{Classroom}} \leq p_{\text{Online}}$

<table>
<thead>
<tr>
<th>Null Hypothesis: $H_{02}$</th>
<th>Value</th>
<th>degrees of freedom</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square statistic</td>
<td>2.894</td>
<td>2</td>
<td>0.235</td>
</tr>
</tbody>
</table>

Table 3: Cross-tabulation for the variables grade status and gender

<table>
<thead>
<tr>
<th>Student Gender</th>
<th>Count</th>
<th>Course Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td>Classroom</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>Count</td>
</tr>
<tr>
<td>Male</td>
<td>119</td>
<td>76.8%</td>
</tr>
<tr>
<td>Female</td>
<td>67</td>
<td>83.8%</td>
</tr>
<tr>
<td>Total</td>
<td>186</td>
<td>79.1%</td>
</tr>
</tbody>
</table>

Table 4: Chi-Square to test $H_{02}: \ p_{\text{male}} \leq p_{\text{female}}$

<table>
<thead>
<tr>
<th>Null Hypothesis: $H_{02}$</th>
<th>Value</th>
<th>degrees of freedom</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square statistic</td>
<td>1.556</td>
<td>1</td>
<td>0.212</td>
</tr>
</tbody>
</table>

Table 5: Correlation estimate between final grades and basic statistical knowledge to test the null hypothesis $H_{03}: p = 0$

<table>
<thead>
<tr>
<th>Method</th>
<th>Correlation Coefficient Estimate</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>0.422</td>
<td>0.01</td>
</tr>
<tr>
<td>Spearman</td>
<td>0.456</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Conclusions

Our conclusion supported by a nonparametric statistical analysis through the Chi-square test is that the population proportion of successful students (that got passing or better final grades: A or B) in a course of Business Research does not depends on how these students decided to take their course instruction: online or in a classroom (p-value=0.235 in Table 2); in other words, for the students that got passing or better grades: the proportion (92.5%) of students registered online does not differ significantly to the proportion (91.6%) of students that were receiving their instruction through a classic manner in a classroom. A confirmation of this conclusion was obtained via the z-test (Cooper 2008) for two proportions (z-test p-value=0.4227), where p1=186/203 and p2=49/53; thus, the data does not support the research hypothesis HA1.

From Table 4’s information, our conclusion is that we don’t have sufficient evidence (p-value=0.212) to support the 2nd research hypothesis (the data does not support HA2) about the gender effect on the students’ academic performance (measured through their final grades) if they have been taking an online course; which means: the proportions of males and females students do not show a significant difference. This is, the proportion of students registered in an online course that got passing or better final grades does not depends on how these students were classified according to their gender (female or male).

The majority of successful students have been reading and completing their business research’s assignments; student’s discipline in combination with his/her basic foundations in Statistics (statistical skills) is the key of success in a course of business research, independently on the manner on how these students decided to take their course instruction: whether online or in a classic way at a classroom.

Table 5 shows a significant correlation between the variables: students’ final grades and their basic statistical knowledge (p-value=0.01); therefore, there is conclusive empirical evidence about the pattern between both variables, which exhibit a positive linear trend.

If we overlap the Figures 1 and 2, will be easier to understand the benefits of the PDCA cycle into the learning process:

1. The continuous improvement of quality (Kulkami 2002) in a manufacturing process is analogous to the continuous improvement of efficacy and efficiency in a learning process. Thus, the continuous improvement of learning’s quality (efficacy and efficiency) is also a never-ending process.

2. Learning circles development: The endorsement toward an active engagement from the students during online and/or class sessions: individual academic participation, team activities, promotion of critical thinking, academic diversity in groups of collaboration and a continuous quality (efficacy and efficiency) improvement on the learning process. Where, efficacy (effectiveness) of learning is the degree to which desired academic objectives (measurable outcomes) of learning are achieved; meanwhile, efficiency of learning is the ratio of the outputs of learning (knowledge and skills) to the associated efforts (cost and/or time) of producing those.

3. The learning circles can be implemented as the departure point for learning communities.
Recommendations

Given that “e-learning” can be viewed as a process in which the learners increase their skills and knowledge (see Figure 1); by experience, we can say that the lack of skills as a self-didactic is a critical factor for to be a successful online student. Therefore, before to initiate an online course, we recommend reinforcing such abilities: habit for reading, reduction and/or elimination of distractions, optimal time-planning to meet the academic prerequisite, etc.

Business Research courses are difficult because they contain formulas and it would be better to see an instructor explain its interpretations and applications during the lectures than to read about the subject matter in the textbook. If a Business Research course needs to be taken online due to geographical limitations, work restrictions and/or scheduling conflicts; then, we recommend that the students should be prepared to do a systematical activity of reading and studying several hours per week for such online course.

Directions for Further Research

These findings should influence both administrators and educators about their choice for some software and/or technology to support academic learning (Hilton 1999). As educators, we all should seek the most effective and efficient tool for basic academic competences, as well as for e-collaborative tasks (McEntee 1997).

It is hoped that this paper will foster more research into the relationships between software diversity, e- communication (Clyde 1999) and academic tasks for e-Learning purposes, so that more effective and efficient decisions will occur both in universities and organizations (Sitkin 1992).

As reference of the importance of e-communication: Second-by-second, the number of organizations making use of e-mail are shown an expanding increase in a geometrical form. According to a study, the following results were evaluated:

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of e-mails being sent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>101 billion e-mails were sent</td>
</tr>
<tr>
<td>2000</td>
<td>2.6 trillion e-mails were sent</td>
</tr>
</tbody>
</table>


This is an increase of almost 26 fold over a five year period.

Appendix A

Questionnaire: Define and provide an example or an application in Business Research for each one of the following 10 fundamental statistical concepts:

<table>
<thead>
<tr>
<th>1. Mean</th>
<th>6. t Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Median</td>
<td>7. Chi-Square Test</td>
</tr>
<tr>
<td>3. Mode</td>
<td>8. p-value</td>
</tr>
<tr>
<td>5. z Score</td>
<td>10. Regression</td>
</tr>
</tbody>
</table>
References


