

IMPACT OF DISCOVERY BASED METHODOLOGY ON THE PERFORMANCE OF ELECTRICAL ENGINEERING STUDENTS

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ABSTRACT

This paper studies the impact of discovery-based courses at the Electrical Engineering Department on student performance. The research uses a quantitative approach by collecting data through a 14 items-questionnaire given to Electrical Engineering students at Applied Science Private university in Jordan. SPSS software was used to analyze data and derive appropriate conclusions. The study reaches three main findings. First, Many students believe that they are benefiting more by this methodology. Second, students are more willing to attend and participate in activities during class time. Third, students feel that they obtain a deep understanding of the concepts than before.

Keywords: discovery-based, concepts, attendance, Education

1. INTRODUCTION

The department suffered for a long while from students' lack of interest and participation. The majority of the students lack motivation for many reasons, such as analytical background, wealth, and lack of jobs. To compact this issue, the Department of Electrical Engineering decided to switch its basic courses from basic lecture format into a discovery-based form.

In this format, the students are given an activity to conduct and discuss in groups and then present their results at the end of the session. Most sessions consist of three to four activities and a discussion session. Students are divided into groups of four, and each student is responsible for reporting on one activity. The teams were changed every session to avoid static team dynamics.

Students, while hesitant at the start, since they have no option, started to be more engaged and that resulted in very noticeable improvements in attendance, communication skills, and overall performance.

2. METHODOLOGY AND DATA COLLECTION

The research required gathering relevant data using questionnaires, composed of five demographic questions and nine subject-specific questions, to accurately test: the level of in-class participation, awareness about course learning outcomes and objectives. Level of taking ownership of the learning process and motivation. Researchers formulated the demographic part in a way that could relate any result gained to the demographic distribution, income level, academic year, and country of high school education and grade point average. Moreover, researchers use SPSS to analyze statistically significant relations between the different factors studied in the survey.

We collected and analyzed data during the 2016 and 2017 academic years. The study targeted Electrical engineering students. In total, 480 questionnaires were distributed, and 450 returned, thus making the percentage of available questionnaires for analysis 93.75 percent.

Distribution of the characteristics of the samples is as follows: 14.7 percent female and 85.3 percent male, with 23.8 percent freshman students, 29.1 percent sophomore students, 22.7 percent junior students, 16.2 percent senior students. 8.2% with annual family income below \$50,000, 30.4% annual income \$50,000-\$100,000, 40.6% with income of \$100,000-\$250,000 and 17.8% above \$250,000. 44.6% of the students obtained their high school education in Jordan while 53.4% were educated outside Jordan.

The paper defines five independent variables of measurement. These variables are: Country of high schooleducation, income level,academic year, attendance, student grade point average. The Dependent Variable isa Likert's Scale form question that state: discovery based classes are beneficial for me and has improved my performance.

3. RESULTS AND ANALYSIS

The first research question is the central part of the survey, which answers the research problem. 65% of the students strongly agree that they are more willing to attend and participate in class activities, 27.8% agree, 6% have a neutral/undecided view, and only 1.3% disagree. These values are comparable with the question are you willing to register for more classes delivered in this format, of which 18.8% said they are not, and 81.2% said that they are.

Cumulative percentage shows that 68% agree or strongly agree that the discovery based methodology was beneficial; 18 % of the respondents had a neutral/undecided view 11.9% disagree,and only 2.1% strongly disagree.

Of those who agreed or strongly agreed 80.4% have a grade point average of good or higher while 19.6% have a grade point average below good. 66.2% had withhigh school education in Jordan while 33.8% had their education elsewhere.

As for the question, if they believe that discovery-based methodology has helped them gain a good understanding of the concepts,55.5% agreed or strongly agreed 40.7% were undecided about studying more hours per day 3.8% disagreed or strongly disagreed. Of those who agreed 60.3% have a family income less than \$250,000, 20.6% have a family income \$100,000-\$250,000 and 20.1% greater than \$100,000. Furthermore, 40.2% of the students with a grade point average of excellent indicated that they have been studying more hours per day, compared to 58.3% of students with a very good average and 50.7% of the students with good average and 11% of the students with average below good. The above is a predictable result when we compare our findings to the literature review. Future, the percentage of students who increase their study hours, have a very strong correlation with grade point average and weak correlation with family income.

Table 1: Correlation between Variables and the Impact of discovery based classes on Electrical Engineering Students.

Variables	Correlation Coefficient	Significance	Expected Sign	Produced Sign
Do you believe that attending a discovery based class is beneficial?	0.306***	0.01	+	+
Do you beleave that attending a discovery based class inproved your understanding of concepts	0.238***	0.01	+	+
Do you attend class more regularly?	0.236***	0.01	+	+
Role of new methodology on the number of study hours.	-0.173*** 2	0.05	-	-
Relation between income level of parents and willingness to participate	0.219***	0.01	+	+

***→ $P \leq 0.01$, **→ $P \leq 0.02$, *→ $P \leq 0.05$

All variables show positive correlation and high significance level except for the “Relationship between family income and the willingness to increase study hours, which yield negative correlation and low significance level. This indicates that obtaining family income has no impact on the seriousness of the students.

Regression analysis was conducted using the above three components to test the correlation between each of the three components and the impact of accreditation. The three factors have a significant effect on the impact of accreditation 21.6% (R - Square). Those factors are X1= accreditation is beneficial, X2= willing to participate in co-curricular activities, X3= willingness to pursue graduate studies.

$$Y = a + bX1 + cX2 + dX3 \quad (2)$$

$$Y = 0.306 + 0.238X1 + 0.234X2 - 0.173X3$$

$$t \ 3.0674.5602.597- 2.255$$

$$\text{Sig:}0.0020.0000.100.025$$

Thus, these independent variables are good predictors of the impact of accreditation on students.

4. CONCLUSIONS

This paper investigated the level of impact of using discovery-based teaching methodology in Electrical Engineering basic courses on students’ performance. The results show that students are more willing to attend, to participate in activities, and are eager to put more hours studying. Also, students believe that they have a stronger understanding of basic concepts and that their grades have improved. However, the decision to pursue graduate studies seem to depend on family income and grade point average than on attending an accredited program.

5. ACKNOWLEDGMENT:

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6. REFERENCES

- [1] T. Brahimi, The Impact of Accreditation on Student Learning Outcomes, ICA-2015.
- [2] Paul A. Kirschner, John Sweller & Richard E. Clark, Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching, 2013.
- [3] E. Scanlon, K. Issroff, Activity Theory and Higher Education: evaluating learning technologies, 2005
- [4] Morgan, Alistair, Theoretical Aspects of Project-Based Learning in Higher Education, British Journal of Educational Technology, v14 n1 p66-78 Jan 1983.

- [5] J. F. Volkwein, L. R. Lattuca, B. J. Harper, and R. J. Domingo, MEASURING THE IMPACT OF PROFESSIONAL ACCREDITATION ON STUDENT EXPERIENCES AND LEARNING OUTCOMES, *Research in Higher Education*, Vol. 48, No. 2, March 2007.
- [6] Brahimi, SARIRETE, Ibrahim, The Impact of Accreditation on Student Learning Outcomes, (2016). *International Journal of Knowledge Society Research*. 7. 51-62.