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The Administration of the Costs in Virtual and Actual Education and Through the Method "Break-Even-Point". In Biology-Chemistry

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ABSTRACT: The universities, as well the public as the private, will try to implement an university policy that tries to overcome the academic, administrative, teaching and economic problems that would be found in view of the concrete fact that they ignore the behavior of those categories that explain such inconvenient. In the best of the cases, they are know problems too specific as the traditional lack of elements and equipment, the lack of training the staff of certain administrative levels, the inadequacy of locals, elaboration of modules, presentation of advises and obviously it's established a direct relation between the magnitude of these problems and the insufficiency of financial resources. This project made the application of the method "Break-even-point" (balance point) of the Costs In Virtual Education (VE) and Actual Education (AE) in University Education. The project presents the relation of fixed costs and variable costs and the influence that the number of students in the Biannual Total Cost by program has, such is the case of Education Degree: Biology-Chemistry.

1. INTRODUCTION

The ICFES (2010) (Colombian Institute for the Fomentation of Higher Education) made a methodology for the determination of the university costs in view of the necessity of having a functional tool that would allow to advance studies of cost and it would be constituted in mechanism able to produced systematized information useful for the elaboration of theories and politics about Higher Education.

In the final report of the project Deschoolarized University (Arboleda, 2011), they are presented six models of costs in Virtual Education (VE) which are: period of recuperation of the capital consistent to books, internal profitability rate, contribution to the actual net cost, equivalent annual cost, Scheneider-Sigelen cost. All applied theoretically to Virtual Education (VE), with out any adaptation to the system of costs of the University of Antioch and with out taking into account the Actual Education (Born, 2020), (Mukherjee, 2019), (Persaud, 2023), (Massy, 2020), (Jones, 2021), (Simchi-Levi, 2022), (Ellis, 2021), (Baye, 2021), (Darden, 2021), (Mubarak, 2024).

1.1 Object of study.

The object of this project is the application of the "Break-even-point", method of the costs in Virtual Education (VE) and Actual Education (AE) in the Degree in education: Biology-Chemistry. The project presents the relation of fixed costs and variable costs and the influence that the number of students in the Biannual Total Cost have in the Degree in education: Biology-Chemistry, Education Faculty, University of Antioch in the periods A to I (2014 to 2022).

1.2 Objectives

- Determine the fixed cost, the variable cost and the Biannual total cost of the Degree in education: Biology-Chemistry.
- Through the "Break-even-point" method, effect the comparison of the costs before mentioned between Virtual Education (VE) and Actual Education (AE) in the program of the Degree in education: Biology-Chemistry.

1.3 Conceptual categories.

COST: The support expenses for the functioning of the program, degree or organization, with out taking into account the individual cost and also with out taking into account the income that the students are deprived of when studying instead of working.

TOTAL COST: Is the addition of the Fixed Cost and the Variable Cost in each program, Degree.

"BREAK-EVEN-POINT": For the actual study, the break-even-point is the intersection of the graphs of total cost in AE and total cost in VE correspondent to each program, Degree, and such point indicates that in that space, the total costs are equal in AE (Actual Education) and VE (Virtual Education)).

2. METHODOLOGY

The actual study is based in the data about the university costs in the work Virtual Education (VE) in Antioch from the Theory of the Reality" (period A to I) (Vasquez, Restrepo, 2010).

2.1 Population.

The population for the analysis of education costs in Actual Education (AE) and in Virtual Education (VE) in the University of Antioch, is the following one:

In the Actual Education (AE), pre-grade, they will be taken into account the following programs, Education Degrees:

- Biology Chemistry.

In Virtual Education (VE), Pre-grade, will be taken into account the following programs, Education Degrees:

- Biology Chemistry.

BIANNUAL TOTAL COST BY PROGRAM
Biology Chemistry Degree (AE) 13´173,736

PERIOD A, 232 STUDENTS, 13,173,736 PESOS.
PERIOD B, 239 STUDENTS, 13,564,910 PESOS.
PERIOD C, 204 STUDENTS, 12,247,189 PESOS.
PERIOD D, 178 STUDENTS, 11,172,551 PESOS.
PERIOD E, 178 STUDENTS, 11,185,186 PESOS.
PERIOD F, 181 STUDENTS, 11,361,377 PESOS.
PERIOD G, 193 STUDENTS, 11,734,434 PESOS.
PERIOD H, 193 STUDENTS, 11,748,830 PESOS.
PERIOD I, 193 STUDENTS, 11,756,283 PESOS.

BIANNUAL TOTAL COST BY PROGRAM
Biology-Chemistry Degree (VE) 10´596,449

PERIOD A, 76 STUDENTS, 10´596,449 PESOS.
PERIOD B, 88 STUDENTS, 10´662,433 PESOS.
PERIOD C, 227 STUDENTS, 11´234,951 PESOS.
PERIOD D, 110 STUDENTS, 10´748,948 PESOS.
PERIOD E, 113 STUDENTS, 11´039,347 PESOS.
PERIOD F, 256 STUDENTS, 11´694,440 PESOS.
PERIOD G, 271 STUDENTS, 12´073,453 PESOS.
PERIOD H, 236 STUDENTS,11´300,845 PESOS.
PERIOD I, 236 STUDENTS, 11´597,825 PESOS.

2.3 Procedure.

To establish the costs of each program, degree, the book " (Virtual Education) in Antioch from the Theory to the Reality" was consulted, in which the total costs by semester in each program, are mentioned, as well as the number of students in each program, this for each semester period from A to I.

These costs were corrected with the inflationary and with tendency to depreciate index previously mentioned. In each semester, it's known the number of students for each program, so that there are point of the function.

TC = FC + vD; WHERE TC = Biannual total cost by program.
FC = Fixed cost
v = Marginal cost (pending)
D = Number of students.

MODALITY AE , ECUATION:4´429,506.55+38,011.69 D, CORRELATION : 0.9985605877,
BREAK-EVEN-POINT: D=178 Students, TC=11´211,850 pesos
MODALITY VE, ECUATION: 10´161,843.13+5,884.75D, CORRELATION: 0.9284145945,

BREAK-EVEN-POINT: D=178 Students, TC=11´211,850 pesos
AE, Fixed Cost: 4´429,507
AE, Variable Cost: 6´782,350
VE, Fixed Cost: 10´161,843
VE, Variable Cost: 1´050,004

3. ANALYSIS

In the passage of time Period – Semester A to I in the University of Antioch, in the modalities AE and VE, referred to costs, the following analysis is presented.

In AE the linear regression is TC = 4´429,506.55 + 38,011.69 D with a coefficient of correlation r_1 = 0.9985605877 significant with "alpha"= 0.05, n-2 g. L., and so the theoretical value in Glass statistical of r = 0.666, g. L. n-2 al "gamma"= 95% bilateral, is lower than the value found r_1= 0.9985605877 (p<0.01).
A Fixed Cost (F.C.) 4´429,506.55
A Marginal Cost v_1 = 38,011.69 that is the slope of the linear regression.
Where v_1 represents the necessary cost for one more student in the axis D.
By equivalence in Bi-variant Regression the proof of the slope and of correlation are equivalent.
The coefficient of correlation r_1 = 0.9985605877, indicates a good positive direct linear relation between Y (TC= Biannual Total Cost by Program) and X (D=Number of students. With a coefficient of determination r_1^2 = 99.71%, expresses the proportion of total variation in the values of the variable Y (TC=Biannual Total Cost by Program) that can be considered or explained by a linear relation with the values of the variable X (D= Number of Students).

In VE the linear regression is TC= 10´161,843.13 + 5,884.75 D with a coefficient of correlation r_2 = 0.9284145945 significant with "alpha"= 0.05, n-2 g. L.. and so the theoretical value in Glass statistical of r = 0.666, g. L. N-2 al "gamma"= 95% bilateral, is lower than the value found r_2= 0.9284145945 (p<0.01).
A Fixed Cost (F.C.) = 10´161,843.13
A Marginal Cost v_2 = 5,884.75 that is the slope of the linear regression.
Where v_2 represents the necessary cost for one more student in the axis D.
By equivalence in Bi-variant Regression , the proof of the slope and of correlation are equivalents.
The coefficient of correlation r_2 = 0.9284145945, indicates a good positive direct linear relation between Y (TC=Biannual Total Cost by Program) and X (D= Number of students. With a coefficient of determination r_2^2 = 86.20%, expresses the proportion of total variation in the values of the variable Y (TC=Biannual Total Cost by Program) that can be considered or explained by a linear relation with the values of the variable X (D=Number of students).
When the linear regression of AE is intersected with the linear regression of VE, it forms the Break-even-point (B.E.P.), where in this point TC and the number of students (D) are equal in AE and VE.
Linear regression in AE: TC = 4`429,506.55 + 38,011.69 D Ec. (1)
Linear regression in VE: TC = 10`161843.13 + 5,884.75 D Ec. (2)
Equating TC in equations (1) and (2)
4`429,506.55 + 38,011.69 D = 10`161843.13 + 5,884.75 D

$$D = \frac{5´732,336.58}{32,126.94} = 178.43 \text{ aprox. } 178$$

D = 178 Students
TC = 11´211,850
In the Break-even-point (B.E.P.), it corresponds a TC = 11´211,850 constant pesos with regard to period A, a D = 178 Students, a variable cost (V.C.) in AE of 6´782,350 constant pesos with regard to period A, a Variable Cost (V.C) in VE of 1´050,004 constant pesos with regard to period A.
Concluding, if the number of students is more than 178 the Biology Chemistry Degree of **VE** is less expensive than the one of **AE**.

4. CONCLUSIONS

In the programs **AE**, the linear regressions were in the way $TC=(FC)_1 + v_1D$, where TC is the biannual Total Cost by program, D is the number of students, $(FC)_1$ is the independent term and indicating a fixed cost, v_1 is the marginal cost (slope).

Referent to the coefficients of correlation (larger than 0.9) were found significant with "alpha"=0.05, n-2 g.L., and so the theoretical value in Glass statistical tables of r=0.666, g.L. n-2 to "gamma"= 95% bilateral, is lower than the found ($p<0.01$), by equivalence in bi-variant regression, the proofs of the slopes and the correlations are equivalent.

In the programs **VE**, the linear regressions were in the way $TC=(FC)_2 +v_2D$, where TC is the biannual total cost by program, D is the number of students, $(CF)_2$ is the independent and indicating a fixed cost, v_2 is the marginal cost (slope).

Referent to the correlations coefficients (larger than 0.9) were found significant with "alpha"= 0.05, n-2 g.L., and so the theoretical value in Glass statistical tables of r=0.666, gL. n-2 to "gamma"=95% bilateral, is lower than the found. ($p<0.01$).

By equivalence in bi-variant regression the proofs of the slopes and of correlations are equivalent.

When the linear regression of the respective program of AE intersects with the linear regression of the respective program of **VE**, forms the "Break-even-point", where in this point TC (biannual Total Cost by program) is equated.

Concluding, if the number of students is larger than the assigned abscissa in the break-even-point in the programs analyzed of **VE**, then they are less expensive than the ones from **AE** in the period A to I.

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