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A Comparison Represented in the Form of Radar of University Student Engagement in Degrees in Technologies

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Abstract. This research work aims to raise awareness of the results of the student engagement in university students of three careers in technologies, of a university in the south of Mexico, through the development of graphics that allows displaying in an adequate manner the cases under study, facilitating the interpretation of the same. To measure the student engagement was used the instrument Utrecht Work Engagement Scale for Students (UWES-S), which is composed of the dimensions, vigor, dedication and absorption. Graphs presented in this work are a graphics array correlation, a graphical representation of radial and a chart GGE bi plot. It was observed that the student engagement is in general, for this population sample, average level, identifying as predominant the dimension of dedication.

Keywords: UWES-S, Vigor, Dedication, Absorption, Student engagement.

1 Introduction

Universities in Mexico deal today to achieve good indicators of quality operating with educational models that involve the integral formation of the students to raise the quality of their educational process. It is currently considered the student is responsible for their own learning, involving the search, selection, analysis and evaluation of information, assuming a role with greater activity in the generation of his own knowledge. Therefore, it is important that the universities students feel concerned, motivated and committed to their academic process, due now are required high levels of psychological linking with the studies, i.e. academic engagement or student engagement [1]. The psychological well-being is one of the primary elements that directly affects the behavior and performance of university

students. However, there are no recent studies to determine the situation on the behavior of the students, as well as the factors that lead to the same.

The positive psychology focuses on the process of analysis of capabilities and potential of the people, with their appearance are generated theories that allow finding elements that impact in human capabilities and at its optimal performance [2].

In the field of occupational health psychology, from the positive approach, Schaufeli and Bakker [2] have developed instruments such as the Utrecht scale of engagement in the work, (Utrecht Work Engagement Scale, UWES), which allows to measure the engagement in the work. The engagement in recent years is a concept that is very used in the business environment and consulting, appearing recently studies in the academic environment [1]. In addition, Schaufeli and Bakker [2] have developed a version of the UWES for students, thus obtaining the Student engagement, because both the workplace as an engagement to involve student activities. Students like the workers perform structured activities that imply obligations and that are aimed at achieving a goal.

In the literature is found research carried out in universities at the international level where it has been implemented the UWES-S for the student engagement. Da Wedge, Soto, Gutierrez et al. [3], developed a research at the University of Vigo in Spain, in which obtained the level of student engagement and its dimensions. In Latin America, Parada and Perez [4] applied this instrument to students of a University of Chile. In Mexico, Leon, Romero, and Olea [5] applied the UWES-S to university students of engineering of the University of Sonora, obtaining the factorial validity of the instrument and the average student engagement.

An important contribution of this work is to make known through the use of the instrument UWES-S, linking psychological with the studies, namely that so dedicated, absorbed and vigorous are students, to know the level of student engagement. These indicators will detect symptomatic levels and take appropriate decisions based on the same.

In this study are developed graphical representations to display the results obtained of UWES-S. We applied a correlational analysis that measures the linear association between variables, represented in a graphical array of correlation. In a radial representation there is a comparison of the cases, where is possible to appreciate the results of the dimensions of the student engagement that involves the UWES-S. Finally, a multivariate analysis was applied, using the graphics of type GGE biplots involving the analysis of main components, allowing observation of the cases involved in this study, corroborating the results obtained in previous analyzes. The various analyzes applied in this study have been developed using the language R as a proposal [6].

Research has been found where different techniques of data analysis have been used to obtain information about the academic performance of university students, such as knowing the factors that cause students to desertion through the use of decision trees [7], the use of techniques of grouping to know the styles of learning [8], among others. Some research involves the personal factor with academic performance, data have been obtained from formal surveys, which have been applied data analysis techniques to discover the relationships between the variables involved, such as rules of association techniques [9], Classification techniques such as trees [10]. There are currently a large variety of studies

based on the use of principal components where observations are presented on the axes formed by the first two main components [11].

2 Materials and Proposed Method

2.1 Data Description

The purpose of this research is to present results of a comparison on the student engagement that present students of different grades of a population sample belonging to a school of informatics and systems, at a university in the south of Mexico. The degrees considered for this study were degree in administrative computer (LIA), degree in computer science (LSC) and degree in information technology (LTI). For convenience a non-probabilistic guided sample was used [12]. The survey of the UWES-S was applied to groups of four students per degree taking into account two men and two women, who agreed to answer the questionnaire on a voluntary basis, obtaining a total sample of 12 students, to which we had access in the period February-August 2015.

2.2 Scale of Welfare in the Academic Context (Utrecht Work Engagement Scale for Students, UWES-S)

Salanova and Schaufeli [13] define the engagement as "a positive psychological state characterized by high levels of energy and vigor, dedication and enthusiasm for the job, as well as total absorption and concentration in the labor activity".

Schaufeli and Bakker [2] developed the questionnaire scale Utrecht of engagement in the work, (Utrecht Work Engagement Scale, UWES), which was originally created for the Dutch population and currently has been validated at the international level. The UWES-S is composed of three dimensions that comprise the engagement: vigor, dedication and absorption. The original version of 17 items, Schaufeli and Bakker [2] indicates that: "the vigor is evaluated using six items that relate to the high levels of energy and resilience, the willingness to devote efforts, not fatigued with ease, and persistence in the face of difficulties. The Devotion is assessed through five items that relate to the sense or meaning of work, to feel excited and proud of their work and feel inspired and challenged by the job. The absorption, is evaluated using six items that relate to be happily immersed in his work and present difficulty to leave, in such a way that the time passes quickly and you forget everything around you".

Subsequently Schaufeli and Bakker [2] also developed the version of Utrecht Work Engagement Scale for Students (UWES-S), where the 17 items that originally composed this questionnaire were modified using the student approach. The following are examples of the items that make up the constructs UWES-S Schaufeli and Bakker [2]: For the dimension vigor we can mention: "I feel strong and vigorous when I am studying or go to classes, I can continue studying for long periods of time when I am very resistant to cope with my tasks such as student". For the dimension dedication: "I think that my career has

meaning, I am excited with my career, my career is challenging for me." Finally, in the absorption dimension "time flies when I perform my duties as a student, I am happy when I am doing tasks related with my studies; it is difficult for me to quit my study".

The responses of the instrument are measured according to a Likert-type scale where zero means "Never" and six "always". The original internal consistency obtained by the authors for the version UWES-S of 17 items in Dutch students was to vigor, dedication and absorption of 0.63, 0.81 and 0.72 respectively; compliance with the criterion of superiority to 0.60 for an instrument of recent development [2].

2.3 Data Analysis

A descriptive analysis was applied to the data obtained for the values minimum, maximum, standard deviation and mean, corresponding to the dimensions that make up the student engagement: vigor, dedication and absorption, as well as the student engagement as a variable.

It was also applied a correlational analysis represented in a chart that measures the degree of linear association between variables. The size of the coefficient indicates the degree of association between the variables, i.e., while close to one the greatest correlation, on the contrary is less if it is closest to zero [14].

Developed radar graph representations which compares the results obtained in the different dimensions of student engagement, as well as the value obtained at the level of engagement student, this for each case presented, as well as for the population shows grouped by race. The radar charts are based on the implementation of radial axles with common origin and scales standardized. Each one of the axis represents the value of a specific indicator [15].

With the data is also implemented a chart for a multivariate analysis: GGE biplot for each case presented with regard to the engagement of students and their dimensions. In this type of graphics are used by the combined effects of genotypes (G) and interaction of genotype-environment (IGA), that facilitate the visual identification of the genotypes and the environments of the assessment. These graphics are constructed using the first two main components, derived from the breakdown of the combined effects of G+IGA. The first component, when is highly correlated with the main effect of genotype, represents the proportion of performance that is only due to the characteristics of the genotype. The second principal component represents the part of performance due to the interaction genotype-environment [16].

3 Results

In this descriptive analysis were applied calculations to the sample of this study, corresponding to the minimum and maximum values, average and standard deviation. With a sample of 12 students of three races in technologies: LIA, LSC and LTI, in Table 1, we can observe the values obtained for the student engagement and each one of the dimensions

that comprise it. The minimum value obtained in the observations presented in the absorption with 1.3, the maximum value is presented in the dedication with 6.0. The values that are displayed in the media of the dimensions from highest to lowest are for dedication 4,767, vigor 3.983 and 3.908 absorption, finally the average of this population shows in the student engagement is a 4.233.

Table 1. Descriptive statistical population study sample.

Variable	Minimum	Maximum	Mean	Standard Deviation
Vigor	1.5	5.7	3.983	1.4708
Dedication	2.2	6.0	4,767	1.2787
Absorption	1.3	5.8	3.908	1.4171
Engagement Student	2.2	5.8	4.233	1.2759

A scale was created to qualify the student engagement, i.e. a table with values set, that allow evaluating the observations of an individual or group of individuals [17]. It is also possible to use other methods to calculate the levels of engagement with the UWES-S, refer to Schaufeli and Bakker [2].

Table 2. Scale proposed to measure the UWES-S.

Category	**UWES-S**	**Vigor**	**Dedication**	**Absorption**
Very Low	Score < 2.20	Score < 2.80	Score < 2.50	Score < 2.70
Under	2.20 ≤ score < 3.30	2.80 ≤ score < 3.80	2.50 ≤ score < 3.50	2.70 ≤ score < 3.60
Middle	3.30 ≤ score < 4.70	3.80 ≤ score < 5.20	3.50 ≤ score < 4.50	3.60 ≤ score < 4.70
High	4.70 ≤ score ≤ 6.00	5.20 ≤ score ≤ 6.00	4.50 ≤ score ≤ 6.00	4.70 ≤ score < 6.00

Using the previous scale can be interpreted for this population shows that the average vigor 3.983 and 3.908 absorption, is medium, i.e. the students feel regularly vigorous and absorbed, even more dedicated because they obtain a value considered high, with a 4,767, are motivated, consider that his career has meaning, are excited and proud of their studies. Finally, the student engagement is of 4.233 indicates that present a mid-level engagement, regularly feel committed.

In a study carried out in Mexico to a group of engineering students from the University of Sonora, average values were found for vigor, dedication and absorption of 3.43, 3.99 and 3.09 respectively [5]. Therefore, when comparing the results, it is obtained that to the north and south of the country; the highest score is obtained in the dedication, followed by vigor and finally absorption. Student engagement is similar in these populations of university students.

3.1 Correlational Analysis of the Dimensions of the Student Engagement

The correlation analysis is represented by a chart of matrix where you measured the degree of association between the dimensions that comprise the student engagement of the population sample under study. The method used is the Pearson correlation coefficient, which is a measure of the linear relationship between two quantitative variables [18], the significance level is 0.01. In Figure 1 are shown that the resulting correlations between variables vigor, dedication and absorption are close to one, which indicates that there is a degree of important relationship between these variables, so that the instrument used to measure the student engagement is suitable for this population sample.

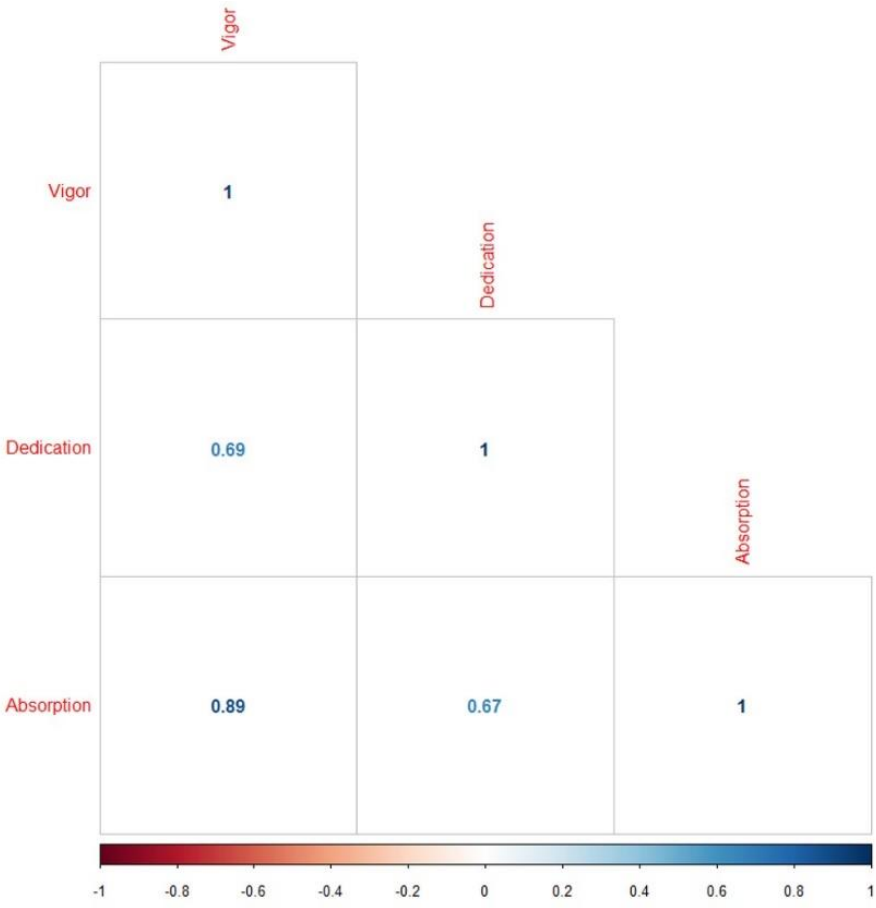

Fig. 1. Chart of correlation matrix of the dimensions vigor, dedication and absorption of the UWES-S, Source: (Self-realization, 2016).

3.2 Representation of Radar

Developed representations of radar charts where is displayed the comparison of the results of the student engagement, and their dimensions of vigor, dedication and absorption, taking into account the sample population by career and individual cases.

Figure 2 shows the result of the student engagement by careers, each one of them corresponds to an axis and in its scale presents the level obtained in the student engagement. You can see graphically that the students of LSC presented a greater engagement student, followed by the students of the career of LIA and finally the students of LTI. In the same way, it can be seen that this population shows in general highlights the level of engagement and on the contrary the lowest level as presented in the absorption.

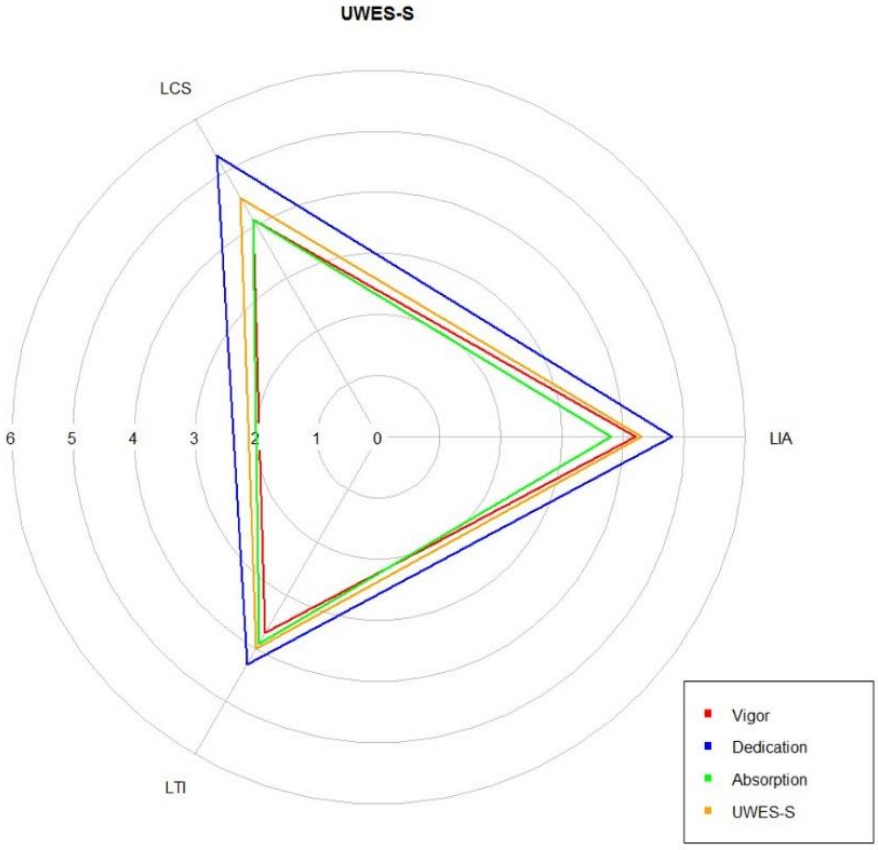

Fig. 2. Radial representation of the dimensions vigor, dedication, absorption and UWES-S, by degree, obtained from the students of the races in LIA, LSC AND LTI (Source: Self-realization, 2016).

In Figure 3, is shown the chart that corresponds to the cases presented in this study, identified by the acronym of the career to which they belong LSC, LIA and LTI, followed by the letter H or M, for men and women respectively and finally by a number which identifies them. In general, women have a level of dedication, vigor, and absorption more frequent and with values higher than men. One of the representative cases is the LSCM2, which presents the highest level of dedication of the population sample, followed by vigor and absorption, both at levels equal. Another interesting case is LIAM2 that is approximately the same levels in the student engagement and in all the dimensions of which it is composed. Two cases that behave very similar are those of two students of different races LSCH1 y LTIH2, since they present levels of vigor and absorption lower than the dedication and a level of student engagement under.

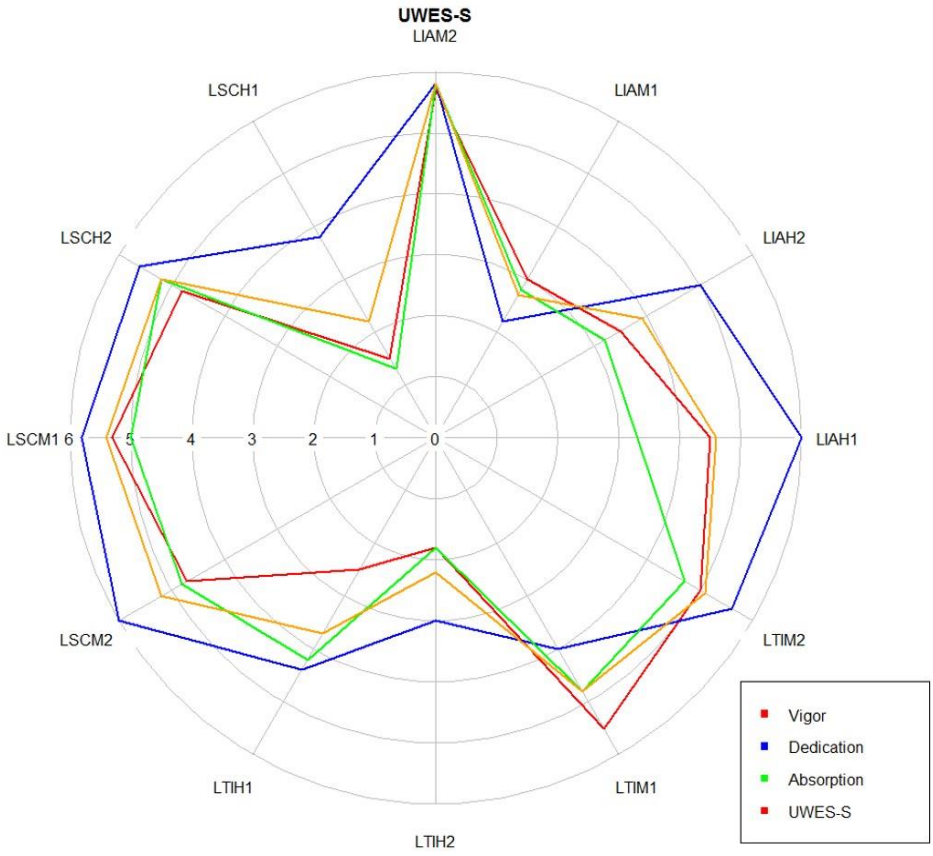

Fig. 3. Radial representation of the dimensions vigor, dedication, absorption and UWES-S, obtained by cases of students of the careers in LIA, LSC AND LTI (Source: Self-realization, 2016).

3.3 Multivariate Analysis: GGE Biplots

Presented below is a multivariate analysis through a graph of type GGE biplot for each case of this population sample, with regard to the engagement of students and their dimensions.

In Figure 4, can be observed the genotypes (G), which are the students, where they continue to identify by the career, gender and an additional number only, it also identifies to the interaction of the genotype-environment (IGA), such as the student engagement and its dimensions of vigor, dedication and absorption. The graph allows viewing the first two main components, derived from the breakdown of the combined effects of G+IGA [16]. The first principal component explaining 87.72% and the second main component the 9.08%, so the variability explained by the two shafts is greater than 50% [16], so that with a 96.8% are considered valid interpretations presented.

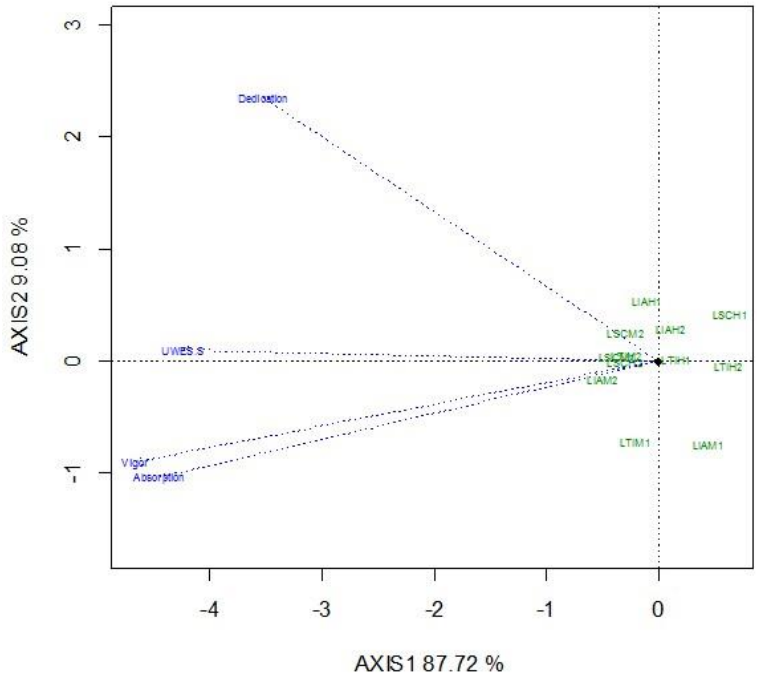

Fig. 4. GGE biplot graphical dimensions vigor, dedication and absorption and UWES-S, Source: (Self-realization, 2015).

The graphics GGE biplots are interpreted in terms of distances between elements and orientation of the axis; this allows us to get an approximate way, from the chart, the values of all the variables for each case [16]. For the description of the results have been considered the cases with most representative values (ends), and can be seen in Chart other cases with

features close to these. The variable absorption takes high values for the majority of the cases, and lowers for cases that are in the opposite direction as LSCH1 and LTIH2. The variable vigor is characterized by high values in a general way in the cases presented and low in cases LSCH1 and LTIH1. The dimension dedication has low values in cases LIAM1 and LTIH2. Considering the cases not common, LSCH1, LTIH2 and LIAM1 are characterized by low values in the student engagement (UWES-S).

4 Conclusions

In this work was given to know the university student engagement of a population sample of three degrees LIA, LSC and LTI from a University of the South of Mexico. It is important to know aspects from the psychological point of view that directly assist in the formation of the university students, and measures can be taken to support them. The student engagement is a positive psychological state that is characterized by high levels vigor, dedication and absorption. The instrument UWES-S, allows knowing the engagement student, in a practical way, obtaining successful outcomes, since it has been validated at the international level. This work has focused on presenting results of student engagement, highlighting the visual aspect, which allows you to easily identify the elements involved in the same. For this is developed various graphical representations that allow to know from different perspectives the results.

We developed a correlation analysis, represented in a graphical array correlation, where it was found that there is a correlation between all the dimensions of the student engagement. In a radial graph representation were compared the races and the cases submitted, resulting dimension of dedication is the more present in university students, they are motivated, and feel that his career has meaning. This study concludes with a multivariate analysis, using a chart GGE biplot, where are displayed all the cases involved in this study and may be observed the student engagement and its levels, on the basis of the distances.

Finally, to carry out these analyzes with graphical representation, it was found that university students feel regularly vigorous and absorbed, highlighting the dedication, are excited and proud with his career, since regarded it as a challenge. Its engagement presents a student average level, regularly feel committed to their studies.

It is proposed to continue with studies related to the student engagement, in other universities, developing graphical representations to obtain results of a set of data, from different approaches to facilitate the understanding of the results.

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