



Web Application for the Evaluation of Teacher Work Stress in the “Atahualpa” School of Ecuador

Fernández Villacrés Gustavo Eduardo^{1,2} ,
Gualpa Jaramillo Guillermo Gonzalo^{3,4} , Arcos Naranjo Gissela Alexandra^{1,2} ,
and Guerrero Aguilar Lorena Fernanda^{5,6} 

¹ Instituto Superior Tecnológico España, Ambato, Ecuador
{gustavo.fernandez, gissela.arcos}@iste.edu.ec

² Bolívar y Castillo, Ambato, Ecuador

³ Universidad Nacional de Chimborazo, Riobamba, Ecuador
ggualpa@unach.edu.ec

⁴ Av. Antonio José de Sucre Km, 1 1/2 vía a Guano, Riobamba, Ecuador

⁵ Unidad Educativa Bolívar, Ambato, Ecuador

⁶ Calle Sucre y Lalama, Ambato, Ecuador

Abstract. The objective of this project was: “To evaluate the work stress of the teachers of the Atahualpa Educational Unit, through the use of a web application with client-server characteristics designed for this purpose”. The software was developed applying the SCRUM methodology and free software tools such as PHP, Apache and MySQL were used. Once the software was developed, the research methodology was applied. The study was framed in a quale-quantitative research paradigm. The techniques used were a teacher survey and a principal interview. We worked with a population of 107 teachers and the sample was not calculated. The results obtained after performing the electronic stress assessment using the software developed were: 1% showed medium and high emotional exhaustion, 7% were high and 9% medium in terms of depersonalization (temporary feeling of “getting lost”, feeling “different”, “strange” or “like in a dream”), and 18% were low and 12% medium in terms of personal fulfillment. In conclusion, it can be said that: the developed software helps a lot in the automatic evaluation of work stress, since specifically in the case study the work stress of teachers is minimal, but it is necessary to improve the aspects of personal realization on the part of teachers and to reduce the existing depersonalization.

Keywords: Application web · job stress · teachers

1 Introduction

Occupational health can be defined as the set of activities aimed at improving the quality of life of workers, also within this group of activities, there are fundamental tasks such as early diagnosis and timely treatment of occupational diseases, occupational health is

also concerned with labor readaptation and attention to contingencies arising from occupational accidents and occupational diseases through the maintenance and improvement of their living conditions [1]. Occupational health is also oriented to the generation of healthy and safe work environments. Another latent concern of occupational health is to maintain adequate mental health on the part of the personnel so that, based on this, work performance is improved [2].

Within occupational health, some psychosocial risks affect the health of workers, both physically and mentally, among these risks is occupational stress; these risks are a current problem, evident in the workplace and predominantly in business, education, and health [3].

The early identification of the multiple factors that can affect the health conditions of workers and the appropriate management of these factors is essential for each company or institution to reduce absenteeism, job dissatisfaction, or demotivation as much as possible [4].

Occupational health is related to the community and the development of healthy practices not only for workers but for the entire population, which is why factors such as stress affect the entire population [5].

According to the World Health Organization [6], stress can be defined as a state of worry or mental tension provoked by some complex and difficult-to-solve situation. It should be mentioned that generally, we all suffer from a certain degree of stress since it is a natural reaction of our organism to threats and other stimuli. It should be noted that stress is the way we react to a problem and that is why it affects our wellbeing. In the workplace, conflict situations can include unpleasant work, overwork, poor interpersonal relations, lack of role definition, and more [7].

Stress is considered as the ability to cope with complex work situations, whether good or bad, and also defines the employee's response capacity. Currently, there are several models to analyze and study work stress [8]. In economic aspects, work stress produces important losses due to the drop in productive performance or sometimes the blocking of the same, which is why prevention is recommended by companies in the face of this problem [9].

According to the International Labor Organization (ILO), work-related stress is closely related to job insecurity and has a direct effect on the mental health of workers, especially those belonging to lower socioeconomic levels [10].

In recent years, educational institutions have been affected by several cases of teacher job stress, especially after the pandemic. Some of the factors indicating teacher job stress are political changes, job instability, long working hours, physical fatigue, an excessive number of students per class, lack of physical resources for the classroom, and more [11]. The education of each country reflects its community, and it is for this reason that education is also exposed to the problems of the same, and stress is something that every day has a greater impact on it. Teachers are affected by work stress, when it generates in them a desire to leave the job, they acquire low self-esteem and dissatisfaction. All these problems make teachers tend to distance themselves more and more from their students and affect their environment [12].

In their daily work, teachers use a lot of willpower, their daily work in class together with their personal and family commitments, which sometimes constitute a permanent

source of stress [13]. Teachers are particularly prone to be stressed and in many educational institutions, there have been high levels of work stress. In Ecuador, a work stress level of 25% has been reported for teachers in general, and 36% at the university level. University teachers must constantly interact with their students, maintain a high level of professional performance, and achieve goals while fulfilling their job duties. All these factors contribute to teacher job stress, which leads to the belief that teaching is one of the most stressful careers [14].

Assessing stress in the teaching profession is a reflective and critical challenge about the role they play because, among multiple professions, the teacher is the one that generates the greatest impact on the development of individuals [15].

To fortify the several works related to the subject have been searched, which have served as research antecedents, among those analyzed are the following: The one carried out by Rengifo & Valencia [16] whose title reads as: "Intra- occupational and extra-occupational factors that affect the labor stress in teachers in the modality of telework" which had as purpose: to describe the intra- occupational and extra-occupational factors that affect the labor stress in teachers, a documentary investigation was made where it was found that the labor stress is generated by internal and external factors to the organizations. Internal factors include increased workload, feelings of frustration, headaches, and excessive vacation needs, while external factors include work-family relationships, absenteeism, lack of adequate tools, and poor organization in terms of time [17].

Another work reviewed is the one presented by Villareal [18] which points out that the return to preschool, elementary, and high school classrooms in Colombia after the confinement due to the pandemic has returned accompanied by situations of coexistence of students that affect not only the functioning of educational institutions but also put pressure on teachers, who feel pressured to feel responsible for the various events at school. The purpose of the study was to determine the level of affectation that these circumstances, including administrative circumstances, have on teachers about role stress and Burnout. An observational, descriptive-correlational study was carried out with a sample of 98 teachers. The results show a prevalence of Burnout of 70% at mild and extreme levels. Role stress was 95%.

The phenomenon of stress is beginning to gain an outstanding and necessary interest in the labor field of several modern organizations. It is unfortunate that in the educational field, in general, teacher stress is still an unknown topic. For a teacher to be able to face work demands effectively, first of all, he/she must be prepared and updated in topics such as this one (which have not been part of the curriculum in his/her academic training); and also, as a person, he/she must be physically and mentally healthy to perform his/her job. An increasing number of teachers admit to suffering or having suffered from stress as a consequence of their work in the classroom. We continually find in the media, news that tells us about the number of teachers who are on sick leave due to "depression and stress" or that "work-related stress punishes teachers". To a large extent, they are given greater importance because the future of society depends on them. Teachers are the ones who teach the young people who will have to make the world work tomorrow, so their health is of particular concern [19].

It is known that job dissatisfaction leads to abandonment of the profession. In Latin America there is evidence of high levels of severe job stress affecting 27% of teachers;

in Brazil, 24% of teachers suffer from emotional fatigue; in Ecuador, and specifically in Manabí, 35% of university teachers suffer from emotional fatigue [14]. The teaching profession is subject to a series of changes in society, personal and family problems, conflicts and problematic situations that affect health and deteriorate quality of life. The stress that a teacher may suffer is also related to psychosocial factors, within which infrastructure, equipment, physical spaces, and technology have an impact on health. Teaching is one of the most demanding professions that generates stress because of the diversity of people, cultures and ideologies that require constant adaptation to these situations. The teaching profession is subject to a series of changes in society, personal and family problems, conflicts and problematic situations that affect health and deteriorate quality of life. The stress that a teacher may suffer is also related to psychosocial factors, within which infrastructure, equipment, physical spaces, and technology have an impact on health. Teaching is one of the most demanding professions that generates stress because of the diversity of people, cultures and ideologies that require constant adaptation to these situations.

The “Atahualpa” Educational Unit is in the city of Ambato, Republic of Ecuador, specifically in the rural parish of the same name, it is a public educational institution, and its academic offer includes the initial level, General Basic Education, and High School in Science and Technical, it works in morning and afternoon shifts, it has 2550 students and 113 teachers.

In several dialogues with the Rector, Ms. Sylvia Chimborazo, who expresses her concern for the teaching staff because they have not undergone a mental health assessment, it is also mentioned that generally at the end of the school year, a general fatigue of most teachers is noted and there is a fear that such fatigue may turn into work-related stress.

The problem described in the previous section can be formulated in the following terms:

- What is the level of work stress among teachers belonging to the “Atahualpa” Educational Unit in the city of Ambato?
- Has the “Atahualpa” Educational Unit evaluated its teachers in terms of occupational stress?
- How concerned is the Atahualpa Educational Unit about the occupational health of its teachers?

To answer the research questions, this research work has been developed with the general objective: to evaluate teacher work stress at the Atahualpa School, with a web application with client-server characteristics designed for this purpose.

2 Methods

The research paradigm adopted is of a qualitative-quantitative type, according to Hernandez [20], an interview was conducted with the Rector to know how the teachers’ work stress is being evaluated and a transversal study was made of the level of affectation that the teachers of the “Atahualpa” Educational Unit of the city of Ambato are having. Initial bibliographic research was carried out to support certain required theoretical aspects,

Table 1. Subscales for the MBI-ES form

Subscale	Code	Items	No of items	Score per item	Score per subscale	Bournot indications
Emotional exhaustion	EE	1,2,3,6,8,13,14,16,20	9	From 0 to 6	From 0 to 54	Over 26
Depersonalization	DP	5,10,11,15,22	5	From 0 to 6	From 0 to 54	Over 9
Personal realization	PA	4,7,9,12,17,18,19,2	8	From 0 to 6	From 0 to 54	Less than 34

Source:<https://www.mindgarden.com/316-mbi-educators-survey>

Table 2. Rating for subscales

Subscale	Low	Medium	High
Emotional exhaustion	From 0 to 18	From 19 to 26	From 27 to 54*
Depersonalization	From 0 to 5	From 6 to 9	From 10 to 30*
Personal realization	From 0 to 33*	From 34 to 39	From 40 to 56
Personal realization	From 0 to 33*	From 34 to 39	From 40 to 56

(*) Symptoms of Bournout syndrome

Source:<https://www.mindgarden.com/316-mbi-educators-survey>

the field research was developed at the institution, but the web application developed for this purpose was used.

The qualitative aspects were investigated based on observation and a direct interview according to Bernal [21] with the rector of the institution, while the quantitative aspects were investigated with the respective survey, working with a sample of 107 teachers belonging to the institution, the instrument adopted was the Maslach Burnout Inventory - Educators Survey (MBI-ES) created by the authors Christina Maslach, Susan E. Jackson and Richard Schwab, which is a variant of the original Maslach questionnaire, but specifically designed for teachers. Jackson and Richard Schwab, which is a variant of the original Maslach questionnaire, but specifically designed for teachers (Tables 1 and 2).

- Subscales for the MBI-ES form.
- Rating:
- MBI-ES Questionnaire:

3 Results

First, the results of the interview with the Rector of the Institution, Ms. Sylvia Patricia Chimborazo Navarrete, are shown (Fig. 1).

MASLACH BURNOUT INVENTORY MBI-ES

Age..... Sex.....
 Area of work..... Time of work

Instructions

Read each statement carefully and check the box corresponding to the frequency of your feelings a bout the job where you work. The options you can check are:

- 0 Never/Never
- 1 Almost never/Few times a year
- 2 Sometimes/Once a month or less
- 3 Regularly/Few times a month
- 4 Quite often/Once a week
- 5 Almost always/Few times a week
- 6 Always/Every day.

		NEVER - never	SELDOM - few times a month or less	NOW AND THEN - few times a month or	REGULAR - few times a month	OFTEN - once a week	VERY OFTEN - few times a week	ALWAYS - every day
1	I feel emotionally drained by my work.							
2	I feel used up at the end of the day.							
3	I feel fatigued when I have to get up in the morning to face another day on the job.							
4	I can easily understand how my students feel about things.							
5	I feel I treat some students as impersonal 'objects'.							
6	Working with people all day is really a strain for me.							
7	I deal very effectively with the problems of my students.							
8	I feel 'burned out' from my work.							
9	I feel I'm a positive influence on other people's lives through my wor							
10	I have become more callous toward people since I took this job.							
11	I worry that this job is hardening me emotionally.							
12	I feel frustrated by my job.							
13	I feel I'm working too hard in my job.							
14	I don't really care what happens to some students.							
15	I can easily create a relaxed atmosphere with my students.							
16	I feel exhilarated after working with my students.							
17	I have accomplished many worthwhile things in this job.							
18	I feel like I'm at the end of my rope.							
19	In my work I deal with emotional problems calmly.							
20	I feel some students blame me for some of their problems.							
21	In my work, people bother me with personal problems that I don't want to be bothered with.							
22	I try to keep away from the personal problems of my students.							

Fig. 1. Maslach questionnaire adapted for teachers. Source: <http://estadisticando.blogspot.com/2016/04/escala-maslach-burnout-inventory-mbi.html>

Question 1. How important is occupational health in the teaching field?

Occupational health is essential in the teaching field because we work with human beings, especially children and young people who are the present and the future of the country, teaching today is more complex, and the teacher must be better prepared in terms of knowledge and technological management, also the classrooms have heterogeneous groups of students which hinder the work of the teacher, to this is added the high number of students per course which generates more work for the teacher, all this contributes to a possible job stress teacher is generated.

Question 2. How is the level of occupational stress among teachers being evaluated?

Unfortunately, the Institution has not evaluated possible work stress among teachers, because the Educational Unit does not have an occupational physician and because there has been no initiative in the previous rector's offices to carry out such an evaluation.

Question 3. Would you consider that a software evaluation is much faster and more confidential than a paper or digital form evaluation? (Fig. 2).

Automation will always be more efficient than any manual process, in this case, I believe that software that allows to automatically evaluate and diagnose the level of work stress will be much better than a paper process or a digital form because there is no need to tabulate and that is already a great help. It should also be mentioned that a web application allows the evaluation to be done from any place where the teacher is (Fig. 3).

From the electronic evaluation carried out through the system, the following results were obtained about the fundamental factors of teacher work stress (Fig. 4).

Proposal:

The technological proposal of the research process was the development of a client-server type web application that allows electronically evaluating of the level of teacher work stress in any educational institution. The software has been developed with free software tools such as PHP, Apache, and MySQL. Laravel was used as a framework and the software development methodology applied was SCRUM. The general questionnaire was divided into three sub questionnaires, the user can define the characteristics

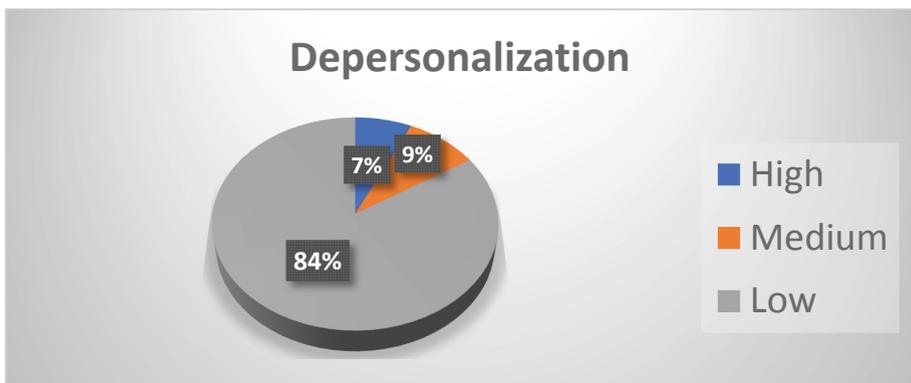


Fig. 2. Results related to the level of depersonalization.

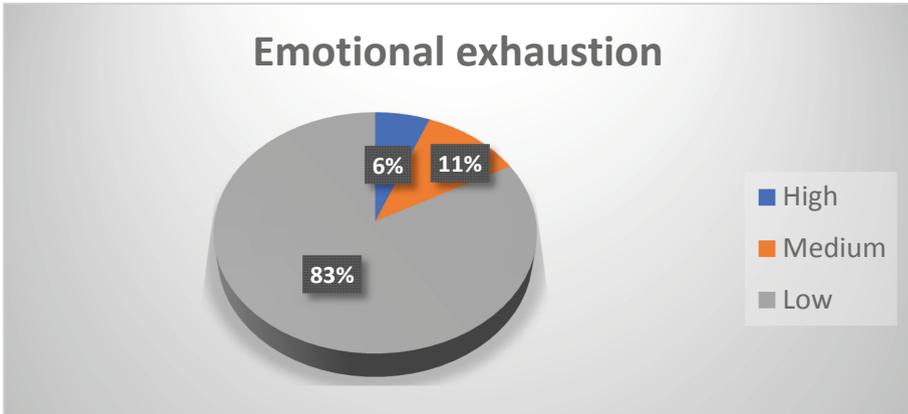


Fig. 3. Results related to the level of emotional exhaustion

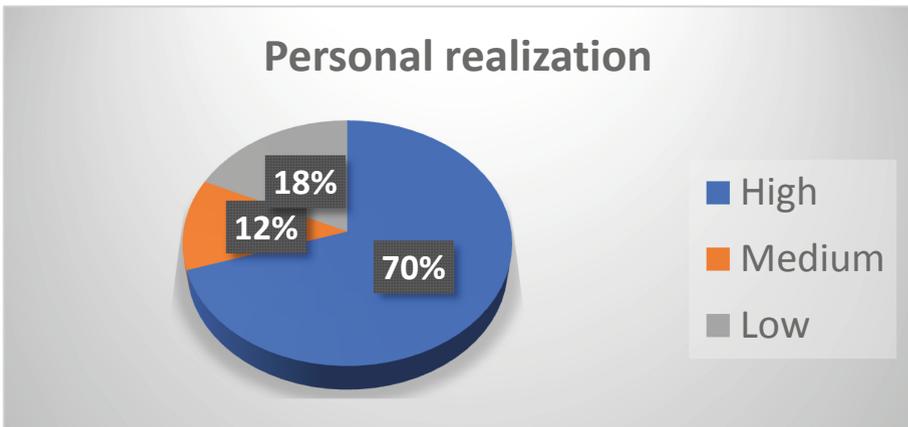


Fig. 4. Results related to the level of personal accomplishment

of each question and the evaluation of their answers, this allows the software to be flexible and applicable to other questionnaires related to occupational health. Each user can register automatically and then be approved by the administrator, finally, the result of the questionnaire is issued with low, medium, and high levels, finally issuing a medical suggestion to follow. Before being implemented, the software went through Black Box and White Box tests to verify calculation and process errors. The implementation was done on the website <https://isteinvestigaciondaw-dam.net/rrhh/public/login> and has some security features such as data validation for data entry, malicious code insertion controls, and automatic backups of the database.



Fig. 5. Web application interface in administrator mode. Source: <https://isteinvestigaciondaw-dam.net/rrhh/public/dashboard>

4 Discussion

Initially, the main research question posed at the beginning of the research work should be taken up again: What is the level of work stress among teachers belonging to the Atahualpa Educational Unit in the city of Ambato? (Fig. 5). This question can be directly answered with the findings of the research, which are: 1% show medium and high emotional exhaustion, in terms of depersonalization (temporary sensation of “losing oneself”, feeling “different”, “strange” or “like in a dream”) 7% are high and 9% are medium, and in terms of personal fulfillment 18% are low and 12% are medium. In conclusion, it can be said that: teachers’ work stress is minimal, but there is a need to improve aspects of personal fulfillment on the part of teachers and to reduce the existing depersonalization

The results obtained can be directly compared with the findings of the work carried out by Villareal [18] on the topic “Stress and Burnout perceived in Colombian teachers in the return to classroom attendance. An exploratory study”, in which an observational, descriptive-correlational, cross-sectional, cross-sectional study was conducted with a convenience sample of 98 Colombian teachers, using the Teacher Burnout Questionnaire (CBP-R), The results show a 70% prevalence of Burnout between Mild and Extreme levels, a 95% prevalence of Role Stress, at the same levels, the correlation between stress and Burnout variables with those of the work and organizational environment. Although the situation is different because the pandemic was a triggering factor for teacher work stress, despite this, the levels are low, like the results of the present investigation.

Another research work considered has been the one developed by Rodríguez et al., [4] with the topic “Psychosocial factors and coping strategies associated with stress in university professors” which generated the following result: the stress of university professors reported in the present study was 82.6% (Mean = 31.29, SD = 7.09), higher

than the average reported (15.7 points) by professors of the “Universidad Autónoma de Nuevo León (UANL)” who, similarly to the present research, detected a level of teaching work stress at the academic level.

5 Conclusions

As conclusions of the research work carried out, the following conclusions can be drawn:

- The use of the SCRUM methodology greatly facilitates the development of software and therefore of web applications.
- The evaluation of teacher work stress using a web application designed for this purpose is very easy to perform and tabulate.
- Tests and implementation of system safeguards allow for greater reliability of operation.
- An evaluation of teacher job stress has not been carried out in the educational institution.
- The results obtained after making the electronic evaluation of teachers’ work stress were: 1% showed medium and high emotional exhaustion, 7% showed high and 9% medium depersonalization (temporary sensation of “losing oneself”, feeling “different”, “strange” or “as if in a dream”), and 18% showed low and 12% medium personal fulfillment.
- In short, it is concluded that: teaching work stress is minimal, but there is a need to improve aspects of personal fulfillment on the part of teachers and to reduce the existing depersonalization.

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