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Success Factors in Teaching Occupational Risk Prevention in Schools: Contributions Based on Teachers' Experience in Andalusia (Spain)

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Author's contribution

The only author ABG performed the whole research work.

Research Article

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Aims: The purpose of this study is to determine the influence of various success factors related to the process of integrating occupational risk prevention in schools in achieving a series of benefits and advantages in the students' future work lives, according to the experience of the Andalusian teachers involved in an occupational risk prevention programme.

Study Design: A correlational-predictive study.

Place and Duration of Study: Different teachers who have participated schools in the programme "Learn to grow up safely, 2009" (Regional Government of Andalusia - Department of Employment and Education-. Spain).

Methodology: The methodology used in the present study has a generically non-experimental nature. More precisely, we can consider it a study of a decidedly predictive-correlational nature (ANOVAs). Sample of teachers (N=258) participating in the programme "Learn to grow up safely, 2009" (Regional Government of Andalusia -Department of Employment and Education-. Spain). These teachers rated a series of success factors (predictor variables) based on the model proposed by the European Occupational Safety and Health Agency (EU-OSHA).

Results: The results obtained from a multiple linear analysis indicate that the factors related to performance and the decision to implement occupational risk prevention are the most influential predictors of success in achieving a set of benefits related to the students' future access to the job market.

Conclusion: After the relevant multiple linear analyses had been performed, several

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predictive models were obtained, in which we were able to show the influence that various success factors had in predicting a series of benefits related to the process of integrating occupational risk prevention in schools, according to the experiences of the teachers from Andalusia who participated in the present study.

Keywords: Occupational risk prevention; school; multiple linear analysis.

1. INTRODUCTION

The main purpose of the study is to determine teacher perceptions of the influence of various success factors related to the process of integrating occupational risk prevention in schools in achieving a series of benefits and advantages in the students' future work lives. The teachers studied were Andalusian teachers involved in an occupational risk prevention program. This objective is based, on the one hand, on different reports, institutional campaigns, educational programmes and research studies that have shown an increase in and relationship between occupational accident rates in adulthood and in childhood, and it is seen as one of the key axes in the educational and employment policies promoted by the occupational and educational administration to reduce and/or prevent the number of accidents. Therefore, we take into account different studies published along these lines, among others, [1,2,3] and [4,5] which manifest the need to become aware of and analyse the risk factors of future workers in order to foster a preventive culture and make their future work settings safer and healthier. To achieve this idea, we need to know what are the success factors needed to design a training process that teaches a quality preventive culture to our students.

1.1 Conceptualisation of the Term Occupational Risk Prevention in Education

The concept of "occupational risk prevention" refers to measures directed toward protecting the safety and health of the agents who intervene in any work context, with the intention that they will develop behaviours and attitudes corresponding to prevention in their daily actions. For this purpose, one fundamental step in guaranteeing the quality of professional and personal performance is to develop key strategies and/or elements for "teaching and training prevention" in schools, at the Pre-school, Primary and Compulsory Secondary levels of education.

Any discussion about training and education in prevention in the classroom/school should consider the idea that specific knowledge about occupational risk prevention and a preventive culture must be present in the educational context, in order for education to act as a driver for change toward a society with safe and healthy behaviours and attitudes in both the professional and personal realms. Moreover, we agree with [6] when they state that the earlier children, adolescents and teachers become familiar with the concepts of safety and health, the faster they will become aware of the risks and satisfactorily arrange their own personal and professional surroundings.

Thus, an occupational risk prevention culture is defined as a space of reflection and awareness in matters of safety and health, whose basic framework is education; therefore, each of the elements that make up the teaching-learning process must be encouraged and included. This process involves *"the need to concentrate our efforts on the education of tomorrow's workers to guarantee that the schools integrate questions related to safety and*

health at work in the study plans from an early age, in order to make young people aware of this problem and change the attitudes of future generations” [7].

Therefore, when a culture of safety and health prevention is fostered through education, children and adolescents become familiar with safe and healthy behaviour by recognising risks and learning to make their surroundings safe and healthy, which means the prevention culture will have fulfilled its purpose [8].

1.2 The Need to Integrate Occupational Risk Prevention in Education

The past several years have witnessed a worrisome increase in work-related accidents. The statistical data are quite eloquent in this regard. In the review we carried out, we showed the existence of coincidences in both the types of accidents and in the rates of their occurrence in childhood and on the job. In both cases, the types of accidents that occur most frequently are, in this order: falls, cuts, injuries, burns, asphyxiation, intoxication and electrocution [9]. In the same way, the social consequences of childhood accidents are quite similar to those of work-related accidents.

Further support for these statements comes from the data from the General Direction of Public Health of the Junta de Andalucía. These data indicate that 38.9% of the cases of mortality in children between five and nine years of age are caused by childhood accidents, while this number climbs to 53.6% in children between ten and fourteen years of age [10]. The most frequent places where accidents occur in children from ten to fourteen years old are the street and the school. The children who have accidents are usually characterized by not being very aware of their strength and not calculating the risks of the school environment. These factors, together with children’s natural curiosity about how things work, lead them to attempt to do things that are beyond their abilities and become involved in dangerous situations with a high risk of accidents [10]. Some studies have shown that one cause of accidents that should be taken into account is the existence of incorrect or risky habits, both in the child and in the adult [11]. These data point out the serious problem existing in present-day society, but how can education contribute to resolving this situation? It is important to not only improve the behavioural habits related to prevention, but also to teach knowledge about safety and health and integrate health within a “culture of prevention” [9]. Such a large and global problem involving the whole society requires integrated and global solutions, and one of them would be to involve the school, which must adapt its educational strategies to a new goal, “to educate in occupational risk prevention” [5].

Thus, different studies [12] point out that education is one of the most frequently-utilised components in the prevention programmes developed. In this type of programmes, it is common to rely on previously-existing organizations and infrastructures like the school. [4] analysed twenty-eight community-based programmes, and they detected that nineteen of these programmes included education provided by the school, together with other strategies such as: parent participation, changes in the legislation and the environment, active participation in the learning processes and reinforcement of behavioural changes, economic incentives for participating in the programmes or workshops, television programmes, and overseeing the fulfilment of strategies to reduce the risk of accidents.

In other studies, [3] complement the previous information by expressing the need to introduce an authentic prevention culture in the school framework at all the educational levels, from pre-school to levels near non-compulsory higher education.

Another fundamental aspect is the work of the teacher. In this sense, recent studies, such as the one by [13], have shown that the teachers' perception of the importance of education in prevention is relevant, given that it would reduce work accidents and foment efficacy on the job, although only with greater resources and external support. The authors warn of the numerous difficulties involved when elaborating or implementing truly integrated and planned educational programmes that go beyond performing isolated sporadic activities.

From the normative and institutional setting, the need to integrate prevention in the school comes from the national level through the establishment of the Spanish Occupational Safety and Health Strategy (SST), for the 2007-2012 periods, specifically in its objective 6.1. "... to integrate safety and health in the students' study plan from the Pre-school stage, in order to combat social and educational exclusion..." [14]. In the Andalusian regional context, the Governing Council, based on a proposal by the Education Department, approved the First Andalusian Occupational Health and Risk Prevention Plan (2006-2010) for the teaching staff of the public schools, as an instrument for planning and coordinating all the actions of the Education Department of the Region in matters of safety and health [15].

This plan responds to the commitments of the public administration regarding policies of integrating occupational risk prevention and improving work conditions, providing access to the professional world, obtaining tools to access the job market with guarantees, the environment, and safety and health in schools. The purpose is to introduce a culture of prevention in Andalusian society and promote quality management, integrating prevention in all the decisions, activities and hierarchical levels of the educational administration.

It is also important to highlight Decree 328/2010, of the 13th July, through which the Organic Regulation of the pre-schools and primary schools is approved (Article 29: "*Fulfilment of duties and exercise of rights*", in its section c) "*The prevention of risks and the promotion of safety and health as a social and cultural value*"), and the Order of the 16th April 2008, which regulates the procedure for the elaboration, approval and registration of the Self-protection Plan for all the public schools in Andalusia. Likewise, both the Decree and the Self-protection Plan interpret risk prevention and safety and health promotion as part of the School Plan, integrating these aspects in the organization and management of the school-classroom, and as a factor in the quality of the education.

Finally, in 1997 the Occupational and Educational Administration of the Region of Andalusia initiated a specific educational intervention programme, "Learning to Grow up Safely 2009". This initiative was designed to promote and spread a culture of prevention in the school setting, and it works in four directions: school awareness campaigns, studies on childhood accident rates, teacher training, and the elaboration of support guides for teachers. The "Learning to Grow up Safely 2009" campaign is carried out in pre-schools, primary schools and compulsory secondary schools, and it is basically directed toward the teachers and students involved in these educational stages. To deliver the campaign, a classroom-bus goes to the schools. This mobile training unit helps the technical and health teams in the Occupational Risk Prevention Centres of the different provinces in Andalusia to use a dynamic, innovative and participative approach in carrying out their activity with the students and teachers. The teams consist of the driver of the mobile unit, who has his/her base in the province of Jaen, and the technical advisors of the Occupational Risk Prevention Centre of the province where the campaign is carried out. Other collaborators are the person in charge of the action, a pedagogy expert and a psychologist. In these sessions, the students and teachers are taught to identify the main risks they can be exposed to and how to prevent them. They are also made aware of the importance of safety and health in the work

environment. The main objective of the institutional campaign is to create awareness about the accidents children and teachers have in the school environment. The main action of this campaign is to promote a prevention culture and, thus, try to reduce the number of childhood accidents, as well as the number of occupational accidents and illnesses in the future when these children become adults. Therefore, we coincide with [1,2] in stating that it is necessary to start with childhood safety as the first step on the path to occupational safety.

In summary, different studies, institutional experiences and current legislations highlight the need to include occupational risk prevention as a content taught in the educational system, in order to reduce work accidents, improve access to the professional world by students and teachers, foment efficacy on the job, obtain tools for accessing the labour market with guarantees, and combat social and work exclusion. These benefits and/or advantages are a reflection of the quality obtained in the teaching-learning process in terms of knowledge, attitudes and behaviours, both by the students in their future job performance and the teachers in the schools.

1.3 How to Effectively Teach Occupational Risk Prevention in Schools

Once the concept of occupational risk prevention in education and the need to integrate this topic in the teaching plans have been analysed, it is necessary to find out what process to follow and the success factors involved in effectively teaching prevention topics to children and/or adolescents. Therefore, we adopted an occupational risk prevention model called the "*Eco-holistic model of the school*" [16]. This teaching model reflects the need to integrate prevention in the teaching-learning process, taking into account different key socio-educational contexts for the development of teaching-learning strategies for studying prevention. Following [1], in order to guarantee success in the development of the "*Eco-holistic model of the school*", it is necessary to have a series of success factors in place that would reflect the quality of the integration process in a coordinated way.

There are six of these success factors (information, planning, decision-making, performance, evaluation and follow-up), and they are joined using an organisational-logical order. The development of these factors would improve the quality of the integration process and its learning results. Next, these factors are defined in a schematic way [1].

Phase 1: Information

Information must be gathered about the diagnosis of the current prevention situation before initiating an intervention programme, for example, accident data, number of class hours dedicated to teaching prevention in schools, job conditions in schools, etc. Different experiences acquired in similar programmes must be taken into account.

Phase 2: Planning

It is necessary to clarify which agents are going to participate in the educational programme that would support the process of integrating occupational risk prevention. The experiences and structures of other projects can be useful, for example, networks for spreading health, collaboration with authorities on safety and health, and their training centres. In this phase, the question of financing must also be addressed.

Phase 3: Decision

In this phase, the general purpose of the project and its specific objectives must be defined. An action plan has to be designed in which time periods and functions to be performed by the different agents involved are established. In the study, certain aspects must be taken into account, such as: the current legislation that affects the schools and their personnel, programme management and self-protection plans, the existence of collaboration agreements with other educational centres and public administration entities, both public and private, etc.

Phase 4: Performance

This is the phase for putting the educational intervention programme into practice. The success of the integration will depend on the following aspects: recognition of safety and health as a key component in ongoing learning; a broad interpretation of safety and health, including physical, mental and social well-being; a direct relationship between the educational measures adopted and the job; the participation of teachers with experience as advisors in the development of the intervention programme.

Phase 5: Evaluation

The evaluation of the project must take into account the comments and observations of all the interested parties. Furthermore, empirical studies are required to evaluate the good practices, in order to make an optimal use of the preventive infrastructures generated both inside and outside the schools [17].

Phase 6: Follow-up

The follow-up of an intervention programme is a phase where new alternatives are developed, complementing the work of the educational programme, permitting a continuous improvement of the teaching strategies and tools utilized, and providing orientation about how to put this type of initiatives into practice in other educational contexts, etc.

1.4 Purpose of the Investigation

The purpose of this study is to determine the influence of various success factors related to the process of integrating occupational risk prevention in schools in achieving a series of benefits and advantages (criterion variables) in the students' future work lives, according to the experience of the Andalusian teachers (Pre-schools, Primary Schools and Compulsory Secondary Schools) involved in an occupational risk prevention programme.

2. MATERIALS AND METHODOLOGY

Taking into account [18,19] and [20,21], we can state that the methodology used in the present study has a generically non-experimental nature. More precisely, coinciding with [12,22], we can consider it a study of a decidedly predictive-correlational nature. Based on these characteristics, the main objective of the study is to determine which of a set of predictor variables (factors perceived by the teachers to be related to success) best predict which perceived benefits and advantages, based on the experience of the Andalusian teachers involved in a prevention programme of these characteristics.

2.1 Variables Intervening in the Study

In congruence with the analytical technique used, multiple linear analysis, different *predictor* and *criterion* variables were contemplated. The former refer to the elements or phases of the Eco-holistic model, and they are:

- a) Information.
- b) Planning.
- c) Decision-making.
- d) Performance.
- e) Evaluation
- f) Follow-up.

The criterion variables established were a set of benefits and advantages based on the integration of occupational risk prevention in the school, which are:

- Future reduction in work-related accidents.
- Improvement in the students' and teachers' relations with the world of work.
- Promotion of efficacy in future job performance.
- Possibility of acquiring basic "skills" to access the job world.
- Fight against the students' social and occupational exclusion in the job world.

2.2 Participants

The selected sample represents the target population of our study, consisting of 1270 teachers who participated in the Occupation and Education Department programme "*Learn to grow up safely, 2009*" in the schools in Andalusia. The first type of sampling of a *quantitative nature* that we utilized was a probabilistic one; specifically, we used proportional stratified random sampling with only one level: the province where the teachers worked [23,24]. Before sending the questionnaires to the eight Andalusian provinces included in the study, according to their initial contribution to the population, the size of the sample was calculated based on the following parameters:

Confidence level= 95% associated with a $Z = 1.96$ ($\alpha = .05$ bilateral)
p= proportion by default without previous data, that is, 0.5
q= complementary proportion by default without previous data (1-0.5)
e= estimation of standard error (4.8%)

With these basic parameters and, through a simple computer application of *Append Market Research* in Excel, the result was a sample of 314 teachers divided in the following way (Table 1):

Table 1. Sample distribution by provinces

Province	N that it responds to proportionally * in invited sample	N corresponding to the real sample subtracting the sample attrition
Almeria	28	20
Cadiz	29	23
Córdoba	31	26
Huelva	26	21
Jaen	30	23
Granada	40	33
Malaga	56	47
Seville	75	65
TOTAL	314	258

* According to its initial contribution to the population ($P=1270$).

A second type of random sampling was applied to the initial census of 1270 teachers to determine to which teachers the questionnaire should be sent. Therefore, we can state that the invited sample consisted of $N=314$; however, only 258 questionnaires were returned, so that the real sample producing the data consisted of $N=258$, with a sample attrition of 56 participants. Next, we will show a series of data about the characteristics of the participating teachers. The first information we obtained was related to the age of the teachers in the study sample. The age data appear in Table 2.

Table 2. Age of the teachers in the sample

Age Categories	N	%
1. 21-30	39	15.3
2. 31-40	45	17.6
3. 41 or more	174	67.1
Total	258	100

The age of the teachers covers a broad range from young participants from the age of 21 to participants who are 41 years old or more. In any case, the different life stages are represented with their corresponding levels of experience, which is important because it will make it possible to discover the aspirations, interests and expectations of the different life cycles. As can be observed, the number of subjects who make up the sample increases gradually with the age. The first interval (21-30) has the lowest number of subjects (15.3%), which makes sense considering that, no matter how early one finishes the Teaching Degree, it is never before the age of twenty. This fact, together with the time spent preparing for civil service exams, does not allow one to begin to work immediately. The greatest number of subjects is found in the interval of forty-one or more years of age (67.1 %). Generally, age runs parallel to years of teaching experience, so that we find ourselves with a large number of subjects with extensive and varied teaching experiences who will undoubtedly provide experience solidly based on this experience. Another aspect shown by the data is related to sex, which appears in Table 3.

Table 3. Sex of the teachers in the study sample

Sex		
Categories	N	%
1. Men	122	47,3
2. Women	136	52,7
Total	258	100

Given the information provided, it is noteworthy that more than half of the sample was women (52.7%), while the participation of men was only 47.3%.

Another important information is on the "teaching experience". These data are shown in the following table:

Table 4. Years of teaching experience

Teaching experience		
Categories	N	%
1. 1-10	55	21,3
2. 11-20	43	16,7
3. 21-30	87	33,7
4. 31-40	61	23,6
5. NC	12	4,7
Total	258	100

Table 4, we can observe that the highest percentage is represented by teachers who have developed their job for a period of between 21-30 years (33.7%), followed by those with 31-40 years (23, 6%).

Finally, Table 5 shows the data on the "job performed" for the teachers in the schools studied:

Table 5. Job held by the teachers in the sample

Job performed		
Categories	N	%
1. Classroom teacher	188	72,9
2. Support teacher	16	6,2
3. Director/Principal	23	8,9
4. Head of studies	18	7
5. Administrator	13	5
Total	258	100

We can see in the table that the study sample is made up of roles which would involve different functions and diverse responsibilities. On the one hand, the classroom teachers and support teachers engage in practical, daily and continuous work with students. On the other, the directive team performs different jobs involved in managing and running the school and the teachers in general. This fact will provide rich and varied information from different viewpoints and perspectives, bringing a special quality to the study. Among the management roles, there is the Director or Principal, the Head of Studies and the Administrator. In any case, the group most represented in the sample is that of the classroom teachers, with 72.9 %. This group provides us with valuable information as, based

on their work in the classroom, they have knowledge about strategies and theoretical-practical aspects which will allow them to provide adequate teaching about prevention. The Management Team, as a group, has a representation of about 21%, and they make a fundamental contribution through their management, promotion and encouragement of our research study.

2.3 Data Collection Instrument

To collect the data, some of the blocks of the Prevention Culture Scale by [25] were used. These blocks are made up of diverse items on a scale with a Likert-type response format of: **1**: not at all; **2**: very little; **3**: a fair amount; **4**: a lot. The items by blocks which were finally taken into account were the following (the choice of these items represents the relationship between the success factors that guarantee an “*Eco-holistic model of the school*”, in terms of teaching prevention, and the benefits and/or advantages theoretically extracted from the scientific literature, which together make up the Prevention Culture Scale):

- a) The benefits or advantages of working on occupation risk prevention in the school: 5 items identified with the 5 criterion variables (see section on variables).
- b) The information, made up of 4 items.
- c) The planning, made up of 8 items.
- d) The decisions, made up of 11 items.
- e) The performance, made up of 15 items.
- f) The evaluation, made up of 8 items.
- g) The follow-up, made up of 10 items.

2.4 Procedure

Once the scale had been applied to the real sample, as indicated in the previous section, 5 criterion variables (coinciding with benefits or advantages) and 6 predictor variables or success factors were established. For the success factors, the summed average of each of the blocks of information, planning, etc..... was used, so that the 51 scale items that made up these sections were reduced to 6 predictor variables.

3. RESULTS AND DISCUSSION

For the analysis of the data, and in congruence with the purpose of the proposed study, a multiple linear analysis was performed. As in [26,27], the process of implementing and interpreting this technique followed these steps:

- a) Characteristics of the multiple linear analysis implemented.
- b) Main results and interpretation of the resulting model.
- c) Fit criteria of the inferred model.

A) Characteristics of the multiple linear analysis implemented

The stepwise technique was applied to the multiple linear analysis performed with: Prob. of F to enter $\leq .050$, Prob. of F to remove $\geq .100$). This technique was applied on five different occasions, one for each of the criterion variables contemplated, in relation to the six success factors proposed, that is (Table 6):

Table 6. Variables intervening in the models contemplated

Multiple models considered	Success factors used in the five models as predictors
Model 1: Criterion: Reduction in occupational accidents	Information. Planning. Decision-making. Performance. Evaluation Follow-up.
Model 2: Criterion: Improvement in relations in the job world	
Model 3: Criterion: Fomenting efficacy in future job	
Model 4: Criterion: Basic tools for accessing the job market	
Model 5: Criterion: Fight against students' social and job market exclusion	

B) Main results and interpretation of the resulting models

First, we present the bivariate correlations matrix of all the predictors by binomials.

Table 7. Bivariate correlations of all the predictors compared by binomials

Predictor Variables	Correlation coefficients and associated statistical significance, as well as the sample size used	Info.	Plan.	Decis.	Perf.	Eval.	Foll.-up
Information	Pearson Correlation	1	,482(**)	,407(**)	,321(**)	,520(**)	-,090
	Sig. (bilateral)		,000	,000	,000	,000	,155
	N		249	250	250	247	250
Planning	Pearson Correlation		1	,324(**)	,538(**)	,624(**)	,049
	Sig. (bilateral)			,000	,000	,000	,444
	N			251	251	248	251
Decision	Pearson Correlation			1	,483(**)	,395(**)	,178(**)
	Sig. (bilateral)				,000	,000	,004
	N				257	248	257
Performance	Pearson Correlation				1	,500(**)	,134(*)
	Sig. (bilateral)					,000	,032
	N					248	258
Evaluation	Pearson Correlation					1	,047
	Sig. (bilateral)						,464
	N						248
Follow-up-Application	Pearson Correlation						1
	Sig. (bilateral)						
	N						258

** The correlation is significant at the level of 0.01 (bilateral).

* The correlation is significant at the level of 0.05 (bilateral).

Table 7 shows that statistically significant correlation coefficients were found, both at 5% and at 1%, in the majority of the binomials compared. This result indicates that the predictors have moderate relations with each other, regardless of whether collinearity was produced. In fact, in the five models calculated, diagnostic tests of collinearity were performed that showed its absence in the inferred models.

Furthermore, the internal consistency of the six latent traits was moderately high if we take into account that the Cronbach's alpha reliability coefficients ranged from values of 0.65 to 0.80. The criterion validity is also quite acceptable due to the correlation coefficients reached when correlating each dimension with the total minus that dimension (element-corrected total correlation), with correlation coefficients from .49 to .71, all statistically significant at a 95% confidence level. Finally, the overall internal consistency of the six dimensions is .735, as shown by the Cronbach's alpha calculated.

Predictor variables	Element-corrected total correlation	Cronbach's alpha if element is eliminated
Information	,492	,692
Planning	,599	,661
Decision	,540	,676
Performance	,596	,671
Evaluation	,626	,656
Application-follow-up	,713	,801
Cronbach's alpha		N of elements
,735		6

Table 8, we present summaries of the models by listing the calculations of some relevant statistics:

Table 8. Summaries of the calculated models

Models*	R	R squared	Corrected R squared	Standard estimation error	Durbin-Watson
1	,416	,173	,162	,61478	1,784
2	,481	,231	,222	,66366	1,649
3	,407	,166	,159	,66836	1,724
4	,448	,201	,194	,73456	1,906
5	,376	,142	,134	,87502	1,536

* The model inferred in the last step is used as the reference.

Regarding the first results obtained for the five models (Table 9), moderate multiple correlations were obtained (from 0.37 for model 5 on the fight against students' social and job exclusion to 0.48 for model 2 on improving relations with the job world), associated in all cases with low standard errors of estimation, an indicator of good model fit, along with other indicators mentioned below. Moreover, the resulting coefficients of determination range from 0.14 (14% de la σ^2 explained by the set of predictors) in model 5 to 0.23 (23% de la σ^2 explained by the set of predictors) in model 2.

Table 9. Multiple equations and complementary statistics of the five inferred models

Models	Members of the equation	Non-standardized coefficients		Standardized coefficients	t	Sig.
		B	Stand. error	Beta		
Model 1	(Constant)	,917	,342		2,683	,008*
	Performance	,354	,116	,209	3,058	,002*
	Decision	,214	,083	,184	2,580	,010*
	Information	,164	,080	,133	2,044	,042*
Model 2	(Constant)	,051	,371		,137	,891
	Decision	,304	,090	,233	3,392	,001*
	Performance	,468	,125	,247	3,745	,000*
	Information	,172	,087	,125	1,982	,049*
Model 3	(Constant)	,919	,343		2,676	,008*
	Decision	,327	,086	,258	3,791	,000*
	Performance	,390	,125	,212	3,117	,002*
Model 4	(Constant)	,350	,369		,949	,344
	Decision	,523	,090	,371	5,833	,000*
	Evaluation	,264	,116	,144	2,273	,024*
Model 5	(Constant)	,139	,452		,308	,759
	Decision	,458	,113	,280	4,038	,000*
	Performance	,350	,164	,148	2,136	,034*

* Statistically significant with a bilateral $\alpha = .05$.

Regarding the different resulting equations for the five models, once the predictors are eliminated, we can see that some are more important than others. To appreciate this predominance more clearly, we created the following dual-entrance table with a control list (presence vs. absence) to show in which models each predictor was statistically significant ($p \leq 0.05$), in other words, which predictors formed part of their equations.

The results obtained in Table 10 show, first, that the tangents or inferred non-standardized beta coefficients in the 5 models have positive signs. This means that the 5 criterion or dependent variables maintain directly proportional relationships with each of the predictors that make up its equation. Second, we can see that the success factor *decision* had a greater presence than the others, appearing in the 5 inferred multiple models. Moreover, we find that the factor *performance* is present in 4 of the inferred models, while the success factors *information* and *evaluation* are only present in one model each.

On the other hand, success factors that were relevant a priori, like planning and follow-up of the actions carried out in creating an occupational risk prevention culture in the school, had no or almost no influence, according to the teachers surveyed. Obviously, this result corresponds to a specific sample of teachers, and we believe that previous planning tasks and follow-up of actions can play a decisive role in implanting occupational risk prevention in schools.

Table 10. Presence vs. Absence of each predictor in the five inferred models, as well as the equations of each model in statistical notation

	Predictors	Model 1	Model 2	Model 3	Model 4	Model 5
Include in a model	Performance	✓	✓	✓		✓
	Decision	✓	✓	✓	✓	✓
	Information	✓				
	Evaluation				✓	
Eliminated from all the models	Planning					
	Follow-up					
Model 1: Criterion: Reduction in occupational accidents			$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_N X_N$ $Y = .917 + .354_{\text{performance}} + .214_{\text{decision}} + .164_{\text{information}}$			
Model 2: Criterion: Improvement in relation to the job world			$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_N X_N$ $Y = .051 + .304_{\text{decision}} + .468_{\text{performance}} + .172_{\text{information}}$			
Model 3: Criterion: Fomenting efficacy on the future job			$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_N X_N$ $Y = .919 + .327_{\text{decision}} + .214_{\text{performance}}$			
Model 4: Criterion: Basic tools for accessing the job market			$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_N X_N$ $Y = .350 + .523_{\text{decision}} + .268_{\text{evaluation}}$			
Model 5: Criterion: Fight against students' social and job market exclusion			$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_N X_N$ $Y = .139 + .458_{\text{decision}} + .350_{\text{performance}}$			

C) Fit criteria for the inferred model

To evaluate the goodness of the inferred models, different criteria can be taken into account. Along with [28,29], we highlight as the most important ones: the coefficient of determination (R^2), the significance of the models measured through analysis of variance (ANOVA), and the dispersion graphics for the standard predicted values in each model¹ in order to detect atypical values or outliers.

The coefficients of determination have, overall, moderately low values. However, as other criteria for the goodness of the model are satisfactory, as shown in Table 10, we can assume that these results are reasonable in a real investigation where it is difficult to obtain moderately high explained variances.

Finally, it is necessary to find out whether the joint effect of the different predictor variables or success factors, which were shown to be relevant in predicting the criterion variables considered, differ statistically from zero or not. For this purpose, the following ANOVAS were used (Table 11):

¹ Considered as poor predictors those observations whose prognostic values were $\pm 2\sigma$ ($\alpha = 0.05/2$).

Table 11. ANOVAS associated with the different inferred models

Models*	Sources of Variation	Sum of squares	gl	Quadratic mean	F	Sig.
Model 1		19,012	3	6,337	16,767	,000**
	Residual	91,086	241	,378		
	Total	110,098	244			
Model 2		31,696	3	10,565	23,988	,000**
	Residual	105,267	239	,440		
	Total	136,963	242			
Model 3		21,309	2	10,654	23,851	,000**
	Residual	107,210	240	,447		
	Total	128,519	242			
Model 4		31,809	2	15,904	29,476	,000**
	Residual	126,801	235	,540		
	Total	158,609	237			
Model 5		29,783	2	14,891	19,449	,000**
	Residual	180,694	236	,766		
	Total	210,477	238			

* The model inferred in the last step is used as the reference (step). ** Statistically significant with a bilateral $\alpha = .05$.

As shown in the previous table, important **F ratios** were reached, associated with probabilities of $p = .000$ in all cases. These data indicate that the inferred models acquire statistical significance, that is, that their explained variance is more important than what is not explained. They are, therefore, relevant to the predictive objectives that have been developed. We also include the ANOVAS calculated in each step to determine the variations in F and the associated statistical significance.

As can be observed in Fig. 1, in all cases, for both the three-step and two-step models, smaller F values were achieved in each step, associated with the increase in the variance explained by the models (source of variance) and the resulting reduction in the variances explained by the errors (source of residuals variance). In all cases, statistical significance ($p \leq 0.05$) was also obtained for all the steps in all the models.

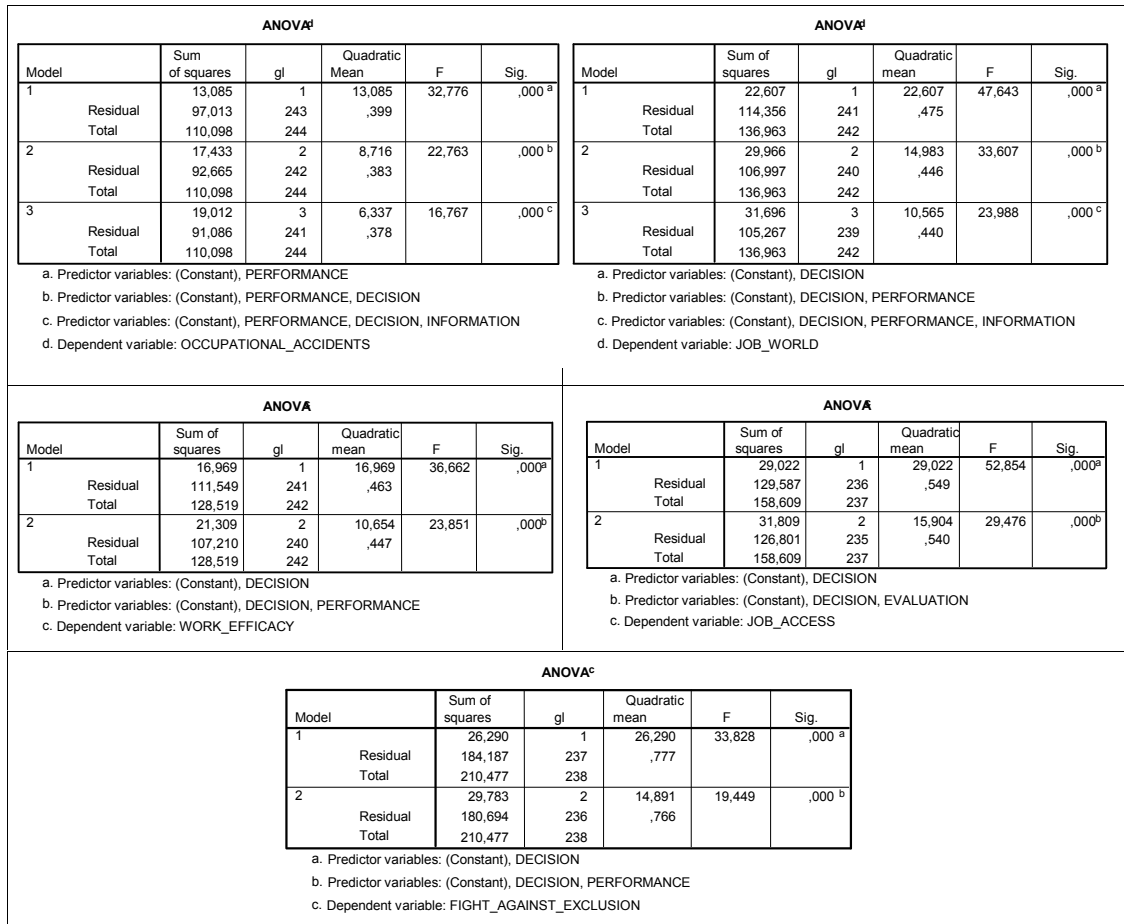


Fig. 1. Stepwise ANOVAs for each model to determine the variations in F and associated statistical significance

With regard to the dispersion graphics on the standardized predicted values for the detection of atypical values in each model, the following results were obtained (Fig. 2):

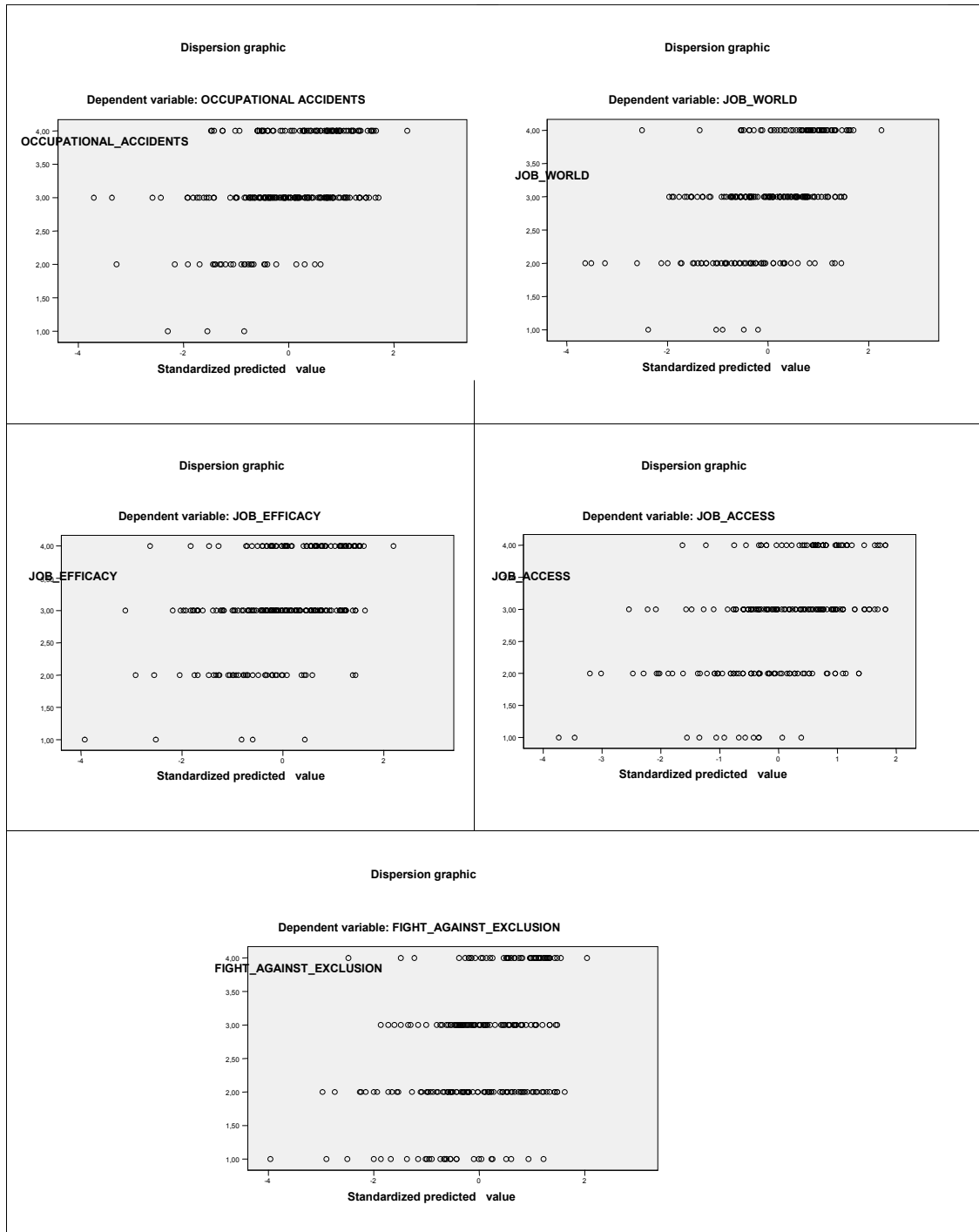


Fig. 2. Standardized prognostic graphics for the detection of outlier values

As the results shown in the dispersion graphics reveal, few participant ratings were predicted in the 5 criterion variables outside of the $\pm 2\sigma$ limits in the corresponding inferred models; in

other words, there were few atypical subjects. Along with [28], we define as atypical any predicted observation that was not well-represented by the model. In this sense, they are observations that do not coincide with the rest of the cases analysed and are accompanied by high residuals. In fact, in the five dispersion graphics, all of the ratings outside the limit were situated at the left of $\pm 2\sigma$, that is, with negative predictive ratings under -2σ , but in no case surpassing seven ratings per model out of 258 possible ratings predicted in each. Without doubt, this is one more indicator of the goodness of fit of each model.

4. CONCLUSION

After the relevant multiple analyses had been performed, several predictive models were obtained, in which we were able to show the influence that various success factors had in predicting a series of benefits related to the process of integrating occupational risk prevention in schools, according to the opinions of the teachers from Andalusia who participated in the present study. In this regard, and based on the five inferred multiple equations (models), we can conclude that:

- a) In order to significantly reduce the accident rates of children and adolescents, an important measure would be to promote occupational health and safety programmes, taking into account three basic phases. First, it is necessary to obtain a diagnosis of the current prevention situation in the school (data on accidents, number of teaching hours that can be dedicated to teaching "prevention", infrastructure related to human resources and materials and the elaboration of similar activities), in order to be able to "inform" all the agents involved in the school. Second, once the bases of the school's preventive context have been established, it is necessary to "decide on" the appropriateness and development of the teaching of preventive topics. For this purpose, it is necessary to define the objective of the programme and/or project and its specific strategies, tools and/or collection and analysis strategies, costs, calendar and performance responsibilities, etc. From that point on, the next step is to design an action plan in which the time periods and functions to be performed by the different agents involved are established. Finally, there would be a final concluding phase of "performance" or execution of the educational project on topics related to prevention. The main elements to certify the success of this phase of the educational project would be the recognition of safety and health as a key component in the teaching/learning process, paying attention to criteria such as physical, mental and social well-being, the direct relationship between the prevention measures and the job, and the degree of participation of the students and teachers.
- b) The improvement in the relations with the job world, the promotion of efficacy in a future job and the fight against social and job exclusion of our future workers are aspects, among others, that would produce benefits derived from the "decision-making" and later "performance" of educational projects for teaching occupational risk prevention in schools. The "decisions" made, among others, would have to be based on the current normative related to the management of self-protection programmes and plans, performance protocols and collaboration agreements with other schools and public administration entities, etc. Regarding "performance", it would be advisable to have didactic means and resources that pursue a "*transversal*" integration of the safety and health aspects in the different subjects, taking into account the age and educational level of the students, the flexibility and adaptation to the "local" context of each school, and the different subject matters.

- c) Finally, to obtain basic tools that guarantee access to the adult world from a personal and occupational perspective, it is fundamental, among other aspects, to “make decisions” that adjust the initiation of the educational programme to the school and “evaluate” the actions proposed based on the results obtained, taking into account the programme’s sustainability and the possibility of extrapolating it to other schools.

However, based on the experiences of the teachers, a surprising lack of relevance was obtained by certain elements that are influential a priori, such as the planning and follow-up of the actions carried out in implanting an occupational risk prevention culture in the school, as they are fundamental aspects at the beginning and end of the process. Therefore, we think it is necessary to continue to work along these lines, taking into account other factors and/or agents that can provide rich and relevant information for proposing the effective teaching of occupational risk prevention as part of our students’ education. For this purpose, it would be necessary to analyse the practices of the Work and Educational Administration, in relation to financing, project development and/or institutional campaigns, taking into account variables such as efficacy and/or profitability, service quality, and student and teacher satisfaction. Another important group to analyse would be the parents, as key actors in the socialisation and initial basic training of their children in preventive attitudes.

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COMPETING INTERESTS

Author has declared that no competing interests existing.

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APPENDIX N° 1

LEARN TO GROW UP SAFELY

Culture of risk prevention in school

The purpose of this scale is to determine the influence of various success factors related to the process of integrating occupational risk prevention in schools in achieving a series of benefits and advantages in the students' future work lives.

The scale, after a section of identification data, presents a series of questions and statements before which should show their level of agreement with X marking one of the options offered from the following scale:

1: not at all; 2: very little; 3: a fair amount; 4: a lot

Complete los siguientes datos:				
Age:	Sex:	Job performed:		
Teaching experience:	Pre-school	Primary	Compulsory Secondary	
Type of school	Public	Charter-school	Private	

The benefits or advantages of working on occupation risk prevention in the school	1	2	3	4
Reduction in occupational accidents				
Improvement in relations in the job world				
Fomenting efficacy in future job				
Basic tools for accessing the job market				
Fight against students' social and job market exclusion				

Information	1	2	3	4
Inform students, parents and teachers of school preventive plans				
Provide and share information to the educational community				
Impulsar un "flujo comunicativo" continuo para gestionar eficazmente la prevención				
Promote continuous communication processes to manage the prevention				

Planning	1	2	3	4
Identify the goals and objectives in prevention				
Diagnose the health and safety needs at school				
Consider the needs and expectations from the reality prevention work				
Establish criteria to meet the needs and expectations of the educational community in prevention				
Use information from other schools that stand out for their practices in this area				
Support information on prevention regulations applicable in the school				
Contemplating the Prevention Program school, activities to promote a culture of prevention				
Reflect all the information in the Prevention Program school				

Decisions. The teacher	1	2	3	4
This formed and prepared to teach prevention				
Diagnosed preventive training needs of their students				
Prepared resources and materials to teach prevention				
Encourages students' interest towards contents and activities related to health and safety				
Encourages student participation in preventive activities				
Facilitates the understanding of basic contents of occupational health and safety				
Is such preventive action and values for their students				
The advice and guidance teacher prevention activities complementary to the classroom				
Proposes procedures for the development, implementation and updating of preventive culture				
Knows the professional reality that students will access				
Has a divergent view and wide				

Performance	1	2	3	4
Prevention is its own entity to be treated as a subject of the official curriculum				
The content must be preventive transversely through the various traditional materials				
The Government should promote prevention of occupational hazards as teaching material				
Where knowledge is structured, hierarchical, is rote				
Student-centered, from interest, motivations, horizontal learning, etc..				
Where the teaching content is based on a previous content				
Considering the repetition cycles / stages, increasing the level of awareness gradually				
The content must be the same that are used in the job world				
The student (skills, attitudes, etc..) Is responsible for their own action				
Psychological attitudes and behaviors of teachers				
On the teacher's ability and learning outcomes of students				
A holistic interpretation (global) social and prevention				
The relationship of content (theory) and practice by students				
From students' own experiences				
Exemplify the preventive context we intend to instill learning				
Identify life situations, concepts such as "prevention", "safety" ...				
Preventive Content must be controlled by the teacher				
Encourage the participation of parents and other members of the educational community				
Teaching preventive contents repeatedly until the student can learn the key concept				
Consider different and complementary strategies seeking new ways to facilitate understanding				

Evaluation	1	2	3	4
Analyzing the interest of teachers in relation to the training activity				
Planning and organization of training activities based on a group reflection on the school				

Promoting teacher reflection on the teaching process in the classroom				
Reflect on teaching and the proposed objectives				
Assess resources based on criteria of quality, quantity, use and interest				
Evaluate the content that students learn				
Reflect the effectiveness of the process to be followed in the teaching and learning of preventive contents				
Analyzing the interest of teachers in relation to the training activity				

Follow-up	1	2	3	4
Do they use the terms "prevention" and "culture of prevention" in the school?				
Have there been any incidents to justify the need to address health issues related to work and school?				
Do you think it appropriate to teach students the culture of prevention?				
Is there a commitment of all staff in promoting prevention at the center?				
Does the center offer integrates educational preventive activities?				
Do you work in the classroom with students occupational risk prevention?				
Do you have the resources to promote prevention of occupational risk in the school?				
Are there joint relations with other schools to work on preventing occupational risks?				
Is there coordination with the administration on the prevention of occupational risks?				
What is the impact of a prevention culture in the reality of school today?				

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