

Interventional Role of Training in Promotion of Health, Safety and Environment Culture in Wood Industries

GHAZALE MONAZAMI TEHRANI¹, MOOSA JABARI², FATEMEH BAKHSHI MOHAMMADI³, HASTI BORGHEIPOUR^{4*}

¹ *Department of Health, Safety, and Environment, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences and Health Services, Tehran, Iran.*

² *Department of Industrial Safety, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences and Health Services, Tehran, Iran.*

³ *Department of Health, Safety, and Environment, Islamic Azad University, West Tehran Branch, Tehran, Iran.*

⁴ *Department of Environmental Engineering, Central Tehran Branch, Islamic Azad University, Tehran, Iran.*

Received September 04, 2017; Revised January 21, 2018; Accepted February 28, 2018

This paper is available on-line at <http://ijoh.tums.ac.ir>

ABSTRACT

In order to prevent accidents and occupational diseases in workplaces, it is necessary to ensure the control of risks. Training has always been a fundamental pillar of health safety and environment management systems. This study was carried out to find the interventional role of training in promotion of HSE culture in wood industries. The Behsazan Wood Industry in Eslamshahr County, central Iran, was selected as a case study. Initially two pre-test and post-test sessions were held for the supervisors and workers in the company to assess the level of their HSE culture. The analysis of the training needs was done in accordance with ISO 10015 after administration of the specified training programs. The outcomes were analyzed using pre and post test statistical analysis. Finally, the relationship between training structures and HSE culture was investigated using structural equation modeling (SEM). After codification and implementation of six training courses, the results of the second part showed a significant difference in the three sub-factors, including "HSE awareness and attitude", "staff capability", and "HSE reporting". The noticeable changes in the sub-factor of "HSE awareness and attitude", as the most valuable result of this study, obviously indicated that the training programs were tailored and conducted to the training needs of the organization. Although the intervention seems to be effective from various aspects, however, it is often comprehensive and resource demanding. Thus, it is highly recommended to improve learning outcomes in all domains (cognitive, affective, and psychomotor) for planning promotion programs can be more effective in this industry.

KEYWORDS: *Interventional role, Training, HSE culture, ISO 10015, Wood industries*

INTRODUCTION

In recent years, attention to behavioral and as cultural aspects of Health, Safety, and Environment (HSE) management has grown widely.

* *Corresponding Author: Hasti Borgheipour*
Email: hasti_bo@yahoo.com

The mortality rate due to unintentional injuries in Iran has been reported to be higher than other countries around the world [1]. Different perspectives have been put forward on the role of training and education in improving occupational safety and health. An occupational accident

disrupts temporarily or permanently the balance in the working environment in which it occurs [2]. Minimizing occupational accidents seems to be attained through education and training. In this regard, Florio in 1979 declared that, in order to prevent accidents, it is essential and necessary to improve the knowledge, skills, attitudes, and habits of those concerned with safety.

Education and training play a key role in the attitude towards the occupational health and promotion of safety knowledge. Therefore, development and growth of education, as well as the learning of occupational health and safety is of paramount importance [3]. According to the research by Nawaz et al., all staff, including senior executives, should be trained with specific, unified purpose-oriented safety and health training programs to provide safety consciousness [4]. In addition, Gambatese (2003) claimed that training and education are key factors for employees in a workplace [5].

Sustainable continuous improvement in HSE systems can be reached through the culture improvement of organizations and plays a key role in prevention of incidents [6-7]. Thus, promoting HSE culture is of great importance [8]. Organizational culture is the shared corporate values, which the "attitudes and behaviors" of members [9]. HSE culture supports a reporting culture, because it can growth the trust between all of the workers and also management in a workplace [10]. Culture of an organization can be affected by training. Safety culture refers to a set of social and technical beliefs, norms, motivations, roles, and functions that reduce the exposure of employees, managers, consumers, and the public to hazardous situations. Safety culture, as a part of organizational culture, has a more profound meaning to the subject of safety, deals with safety and human resources in an organization based on core values that are hardly available [9,11].

Safety and health subject attempts to investigate the perception of employees in the workplace, level of managerial interest in safety, safety measures, and degree of participation in risk control [12]. Mohammadfam et al. (2015) discussed that technical safety measures are not adequate to protect human, economic, and environmental assets of industries and HSE culture needs to be promoted as an alternative approach [8]. Kongsvik et al. claimed that HSE culture a fixed entity and what may change over time is how different companies respond to it [13]. Qiu and Zhang in 2017 declared that HSE training is an important tool for publicizing HSE policies of companies and improving the HSE knowledge, skills, and abilities of employees in the identification and control of job-related risks [14]. ISO 10015-based training standardization model

can be served effectively to help organizations solving the issues related to the assessment of the effectiveness of training programs, and justifying the investment in employee development [15-16].

According to Hofer (1998), the ISO 10015 standard is used not only to develop training programs, but also to prepare training courses and test materials, which is the responsibility of training providers either within the firm or outside it [17]. This standard helps organizations to make a link between training and assessment, as well as the functional goals of the organizations.

Such an attitude brings up a constant reaction regarding the investment on the competency of human resources and improvement of efficiency gained by training. Therefore, the present study aimed to investigate the interventional role of training in the fields of health, safety, and environment, based on assessment of the need for workforce training in wood industries.

MATERIALS AND METHODS

The following steps were designed in Behsazan Company to carry out the present study (Fig. 1).

Firstly, HSE culture questionnaire, with Cronbach's alpha coefficient of 0.86 [18], was used to assess the level of HSE culture among 114 employees (workers and supervisors) of this company. Then, based on the results of the HSE culture questionnaire and ISO 10015 [19], analyzes were performed to determine training needs of the employees and improve the efficiency and effectiveness of HSE programs in the company. To this end, all of the related documents and internal regulations, along with the periodic HSE reports, as well as interviews and meetings with the relevant authorities were analyzed within 3 months.

Based on the data collected, specific HSE training courses (using all available documentations, rules, and suggestions of the experts group) were planned in accordance with the procedure of ISO 10015.

The outputs were 6 training courses including, Accident investigation and analysis, Basic science of body posture, Introduction to neutral postures, Physical geometry, mass properties, and strength capabilities of the human body, General principles of workplace safety and regulations and personal protective equipment, and General principles of low and environmental issues of wood industries, which were codified and implemented in 3 months.

Finally, data was performed from the trained employees of the company and the research hypotheses were tested using structural modeling equation technique according to the study variables.



Fig. 1. Location of the study area in Iran

RESULTS

The results of this study showed that, all the male participants had an average age of 35 years old. In terms of education level, 52% of the participants had a high school diploma, 28% associate degree, and 10% undergraduate degree. Moreover, 10% of whom were low illiterate. Approximately, 65% were married and their average job experience was about 9 years. The results from the first round questionnaire (before the intervention of training in the promotion of HSE culture) are shown in Table 1. As the table suggests, three sub-factors, including, "HSE awareness and attitude", "HSE communication", and "HSE commitment", earned higher scores than the other sub-factors.

In addition, the subscale of "HSE rules" and "preferred ratio between production and HSE" accounted for the lowest scores. After the last planned and implemented training event (based on the time limitations in the production schedule and according to the consensus of managers and supervisors), HSE culture assessment questionnaire was distributed among the staff for the second round. The results showed that the score of most of the sub-factors increased after the training intervention. The mean score of the sub-factors along with the standard deviation values of both rounds are shown in Table 2. The table shows the mean values and T-student results of the pairs from C to I. Fig. 2 illustrates the mean value of the sub-factors.

As observed, there are significant differences in the mean values. As it shown in Fig. 2, there was found a significant difference in the four sub-factors after the training intervention. The results of the second round polling showed a significant difference in the three sub-factors, including "HSE awareness and attitude", "status of staff capability" and "HSE reporting". Accordingly, among the nine sub-factors in the HSE culture questionnaire (T-student results of the pairs), four sub-factors showed the effectiveness of the training programs and soft changes among the workers.

Results of structural equation modeling

The results from the structural equation modeling are displayed in Fig. 3. A high relationship was reached between training and the variables of "worker participation", "HSE awareness and attitude", "status of staff capability", "HSE reporting", and "preferred ratio between production and HSE". In better words, training had a significant positive effect on these sub-factors. However, this model did not show any best relationships between training and the variables of "HSE commitment ($\lambda :0.25$, t-value: 2.38)", "HSE leadership ($\lambda :0.27$, t-value: 2.46)", "HSE communication ($\lambda :0.23$, t-value: 2.29)", and HSE rules ($\lambda :0.20$, t-value: 2.11). Therefore, the results of SEM for the assessment of the relationship between the training structure and HSE culture revealed a worst relationship between the factors and sub-factors under study.

Table 1. Results of the HSE culture questionnaire

	Sub-factor	Mean	Std. Deviation	Mean*	Std. * Deviation
A	HSE commitment	11.60	1.96	11.60	1.94
B	HSE leadership	6.59	1.29	6.60	1.29
C	Worker participation	4.88	1.03	11.10	1.43
D	HSE awareness and attitude	19.80	2.12	35.37	2.34
E	HSE communication	5.15	1.01	6.56	1.67
F	Status of staff capability	18.92	2.18	22.56	3.21
G	HSE rules	1.82	.70	2.79	.86
H	HSE reporting	9.40	1.66	13.67	2.14
I	preferred ratio between production and HSE	2.63	.78	2.88	0.80

* Results of HSE culture questionnaire after HSE training intervention program

Table 2. Mean values and T-student results

		Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	T	df	Sig. (2-tailed)
Pair 3	C2 - C1	6.21	1.77	0.17	35.64	103	.00
Pair 4	D2 - D1	15.55	2.84	0.27	55.76	103	.00
Pair 5	E2 - E1	1.40	1.54	0.15	9.28	103	.00
Pair 6	F2 - F1	3.63	2.64	0.25	14.01	103	.00
Pair 7	G2 - G1	0.96	1.29	0.12	7.59	103	.00
Pair 8	H2 - H1	4.26	2.54	0.25	17.09	103	.00
Pair 9	I2 - I1	2.88	0.80	0.07	8.57	103	.00

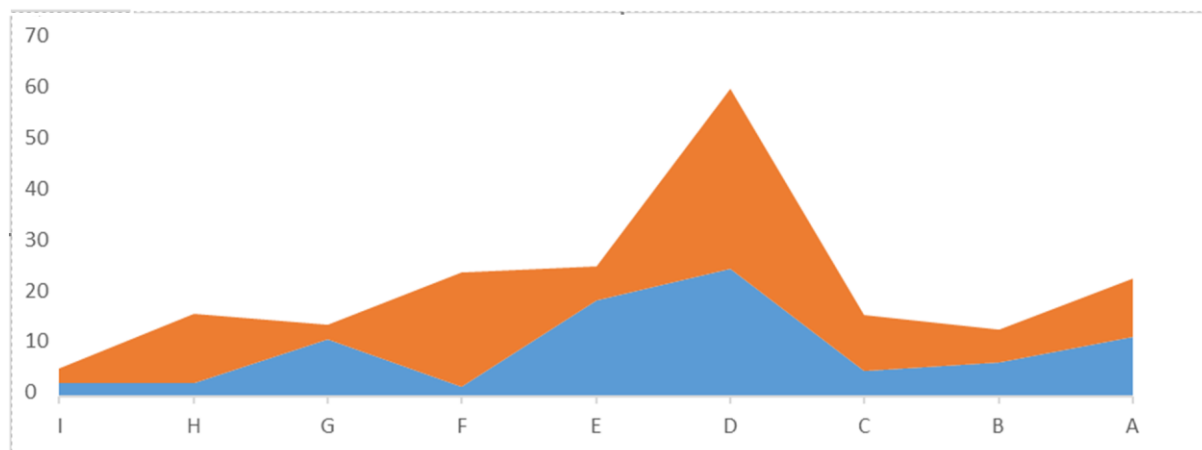


Fig 2. Comparison of the six sub-factors (pre- and post-intervention)

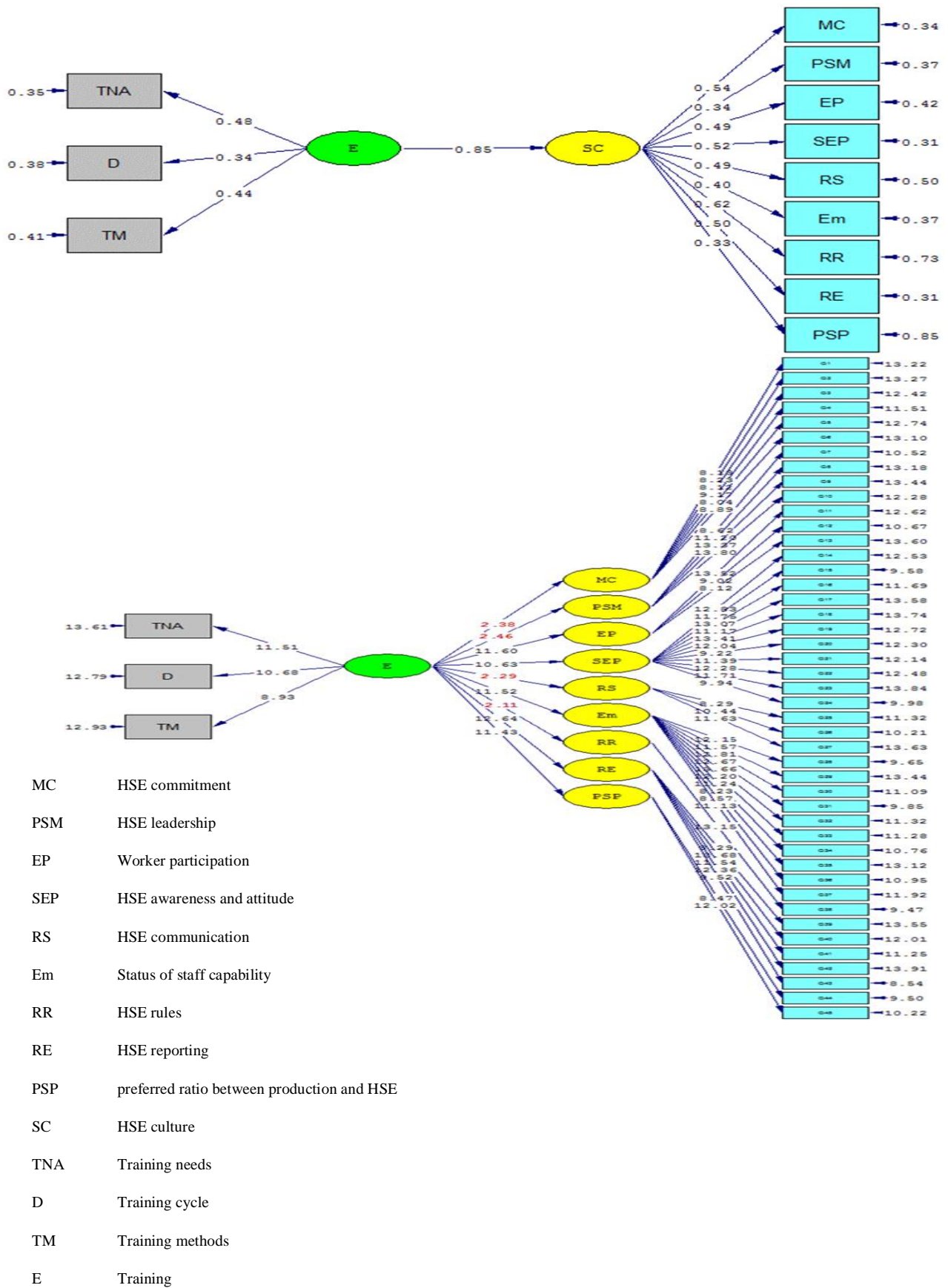


Fig. 3. Structural equation modeling

DISCUSSION

This research was conducted for the first time, considering the training needs of HSE in the wood industry. The results indicated the importance and necessity of development in behavioral and cultural aspects of HSE-MS, which are in line with the findings of similar studies [20, 21, 22]. The low level of staff capability in this company, which may be related to the low authority of HSE manager, and limited HSE equipment were two factors made negative contributions in this research. This is while, according to He et al., the authority of HSE manager guarantee the efficiency of HSE management [23]. In addition, the results of HSE reporting, in the first round polling, confirmed absence of a reactive reporting system in the company. As emphasized by Bouacha (2008), this type of system cannot effectively explain the attitudes and improve the whole HSE features [24]. The noticeable changes in the sub-factors of "HSE awareness and attitude", as the most valuable result of this study, "status of staff capability", and "HSE reporting", obviously showed that the training programs were prepared and conducted based on the organization training needs. However, the sub-factors of "HSE commitment" "HSE rules", and "preferred ratio between production and HSE" did not show any noticeable changes before and after the prevention. The training intervention dealt with the staff level and focused on the management practices and policies. Mullen and Kelloway (2009) showed that management and supervisors of organizations play a key role in safety programs and suggested "leadership training" as a potential method for improving safety [25]. Abqaria et al. [26], declared that the implementation of a strong HSE management system will lead to an increase in the personnel awareness of HSE issues [26]. Clark et al., (2000) claimed that lack of awareness could cause a feeling of irresponsibility to health issues [27]. In line with this research, Von Thiele Schwarz et al. discussed that implementation of the Safety Culture Promotion Intervention Program (SCPIP) (including safety culture education program and safety culture promotion program) was useful in improving the employees' perception on safety culture in the occupational setting [28]. Finally, in agreement with this research, the results of Ebrahimi et al. [29], showed that increased number of HSE training courses for staff, organization of specialized training courses for HSE personnel and increased number of hazard identification centers can be a valuable step to improve the HSE performance and safety culture of

workplaces in the oil and gas industries. They also suggested interventions based on short-term training courses with the aim of improving the employees' health and safety.

CONCLUSION

Based on the results, effective educational programs should well understand the determinants of HSE culture among the workers and develop stage-specific interventions. In conclusion, improving learning outcomes in all domains (cognitive, affective, and psychomotor) can be more effective for planning promotion programs in this industry.

REFERENCES

1. Akbari ME, Naghavi M, Soori H. Epidemiology of deaths from injuries in the Islamic Republic of Iran. *East Mediterr Health J* 2006; 12(3/4):382-92.
2. Borgheipour H, Mohammadfam I, Narenji MA. Assessing and comparing human errors in technical operations in petroleum wells using extended CREAM technique. *Int J Occup Hyg* 2017; 9(3):132-41.
3. Endroyo B, Yuwono BE, Mardapi D. Model of learning/training of Occupational Safety & Health (OSH) based on industry in the construction industry. *Procedia Engineer* 2015 125:83-8.
4. Nawaz T, Ishaq A, Ikram AA. Trends of safety performance in construction and civil engineering projects in Pakistan. *Civil Environ Res* 2013;3(5):23-40.
5. Gambatese JA. *Safety emphasis in university engineering and construction programs*. Construction safety education and training—A global perspective. 2003 May 14.
6. Arendt S, Alsaleh N, Suarez, O. *Improving HSE Culture and Leadership-How KNPC is Pursuing HSE Excellence*. SPE International Conference and Exhibition on Health, Safety, Security, Environment, and Social Responsibility, 16-18 April 2018; Abu Dhabi, UAE.
7. Mavaji M, Borgheipour H, Monazami-Tehrani G. Validation and development of the questionnaire for assessment of safety climate and safety performance according to safety knowledge and safety motivation in cement industry. *Safety Promot Inj Prev* 2018;6(1):3-12.
8. Mohammadfam I, Nikoomaram H, Faridan M. Evaluation of health, safety and environment (HSE) culture. *Int J Occup Hyg* 201511;5(1):1-5.
9. Cooper MD. Towards a model of safety culture. *Safety Sci* 2000;36(2):111-36.
10. Hudson PT, Bryden R, Vuijk M, Biela D, Cowley C. *Meeting expectations: A new model for a just and fair culture*. SPE International Conference on Health, Safety, and Environment in

Oil and Gas Exploration and Production, 15-17 April 2008; Nice, France.

11. Mearns KJ, Flin R. Assessing the state of organizational safety—culture or climate?. *Curr Psychol*. 1999;18(1):5-17.

12. Zohar D. The effects of leadership dimensions, safety climate, and assigned priorities on minor injuries in work groups. *J Organ Behav* 2002; 23(1):75-92.

13. Kongsvik T, Gjørund G, Vikland KM. HSE culture in the petroleum industry: Lost in translation?. *Safety Sci* 2016;81:81-9.

14. Qiu SL, Zhang LB, Liu M. HSE training matrices templates for grassroots posts in petroleum and petrochemical enterprises. *Pet Sci* 2017;14(3), 560-569.

15. Wang YD. Exploring human resource (HR) account managers competency in semiconductor industry. *Afr J Bus Manag* 2011;5(22):9412.

16. Nair H, Sinha A. *Indian manufacturer benefits from ISO 10015 training guidelines*. ISO Management Systems, 2009; 36-39. 1

17. Wang PC, Wu HH. *Integrating quality function deployment with ISO 10015 to discuss the quality of human capital*. 12th International Conference on Information Technology (ICIT), April 2007; Taiwan.

18. Jabbari M, Alijanzadeh M, Vaziri M, Rahimi S. Validity of the assessment tool of HSE culture in a manufacturing company. *Iran Occup Health* 2014;11(4): 99-108.

19. ISO 10015. *International Standards Organization. Quality Management—Guidelines for training*; 1999.

20. Alimohammadi I, Hashemi H, Farshad A, Amini M, Haghi B, Nouri S. Safety culture survey questionnaire detergents and cleaners industries. *J Health Safety Work* 2012;1.

21. Haji Hosseini, M. *Investigate the situation of educational system in Jaboun industry company*

according to ISO 10015 standard. M.Sc. thesis, University of Tehran, Tehran, Iran, 2008.

22. Garcia MU. Training and business performance: The Spanish case. *Hum Resour Manag J* 2005;16(9):1691-710.

23. He X, Fang X, Wei Z, Yang Y, Sun Z. *Study on HSE Management System of AP1000 Nuclear Plant Project*. 18th International Conference on Nuclear Engineering, American Society of Mechanical Engineers, May 17–21 2010; Xi'an, China.

24. Bouacha F. *HSE performance measurement and proactive reporting system within in amenas operations*. SPE International Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production, 15-17 April 2008; Nice, France.

25. Mullen JE, Kelloway EK. Safety leadership: A longitudinal study of the effects of transformational leadership on safety outcomes. *J Occup Organ Psych* 2009;82(2):253-72.

26. Abqaria F, Suryana I, Ritonga H. *Changing New Paradigm on HSE Perspective: The Transition from Project to Production Phase*. Proceedings, Indonesian Petroleum Association, Forty-First Annual Convention & Exhibition, May 2017; Indonesia.

27. Clark JN, Van Eck RN, King A, Glusman B, McCain-Williams A, Van Eck S, Beech F. HIV/AIDS education among incarcerated youth. *J Crim Just* 2000; 28(5):415-33.

28. Von Thiele Schwarz U, Hasson H, Tafvelin S. Leadership training as an occupational health intervention: Improved safety and sustained productivity. *Safety Sci* 2016; 81:35-45.

29. Ebrahimi MH, Abbasi M, Khandan M, Poursadeghiyan M, Hami M, Biglari H. Effects of administrative interventions on improvement of safety and health in workplace: A case study in an oil company in Iran (2011-2015). *J Eng Appl Sci* 2016;11(3): 346-51.