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ORIGINAL RESEARCH ARTICLE

Factors Affecting Health, Safety and Environmental Risk Literacy Promotion Model

Ahmad Yari[1*], Seyyed Mohammad Shobeiri[2], Mahdieh Rezaie[3], Alireza Hamidieh[4]

[1] *Ph.D. student in environmental education, Department of Environmental Education, Payame Noor University (PNU), Tehran, Iran. Yari.1402@student.pnu.ac.ir*

[2] *Professor, Department of Environmental Education, Payame Noor University (PNU), Tehran, Iran. sm_shobeiri@pnu.ac.ir*

[3] *Assistant Professor, Department of Environmental Education, Payame Noor University (PNU), Tehran, Iran. mdrezaee@pnu.ac.ir*

[4] *Assistant Professor, Department of Industrial Engineering, Payame Noor University, Tehran, Iran. hamidieh@pnu.ac.ir*

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ABSTRACT

Purpose: The research aims to identify the effective factors on the health, safety and environment (HSE) risk literacy promotion model.

Method: the researcher has analyzed the results and findings of previous researchers by applying a systematic and meta synthesis approach and by performing the 7 steps of the Sandelovski and Barroso method, he has identified the effective factors. Among 556 articles, 55 articles were selected based on the CASP method, and the validity of the analysis was confirmed with the Kappa coefficient value of 0.711. In this context, to measure reliability and quality control, the transcription method was used, and its value was identified for the indicators identified at the level of excellent agreement. The results of data analysis collected in MAXQDA software led to the identification of 84 primary codes in 16 categories in 5 dimensions.

Findings: Finally, five dimensions of planning, concepts of literacy development, implementation of education, evaluation and revision were identified as influencing dimensions of health, safety and environmental risk literacy.

Conclusion: Organizations can focus on these factors in order to improve the literacy of HSE risks as one of the preventive and improving decision-making factors among their employees. Improving the literacy of HSE risks requires the attention and assistance of extra-organizational, organizational and individual factors. **©authors**

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1. Introduction

Organizations cannot function without healthy and safe employees, a fact that was demonstrated in the 2019-2020 Covid-19 pandemic. When lives are threatened, everything takes second place (De Cieri & Lazarova, 2021) ILO data and information update (2021) shows an increase in accidents and diseases (ILO, 2021). Occupational health and safety (OHS) is not only important for improving social security and workers' well-being, but also has a positive effect on the sustainability of employees' work productivity (Erdhianto, 2021). Risk means the impact of uncertainty. An effect is a deviation from something expected (positive or negative). Most of the time, the risk is known by the potential events and the consequences resulting from it or a combination of these, or it is expressed according to a combination of the consequences of an event (including changes in the situation and conditions) and the probability of the occurrence of an event (ISO, 2018).

Health literacy includes making decisions in daily life about health care, protecting oneself from disease, and promoting and improving health to maintain or improve quality of life throughout one's lifetime, as well as cognition, motivation, and competence in accessing, understanding, evaluating, and implementing accurate information (Ozaydin et al., 2021). Health literacy is a relatively new concept in health promotion. It is a composite term to describe a range of outcomes of health education and communication activities. Health literacy, as a term that was first proposed in the 1970s, generally deals with the issue of whether a person meets the complex requirements of promoting and maintaining health in modern society or not. Low levels of health literacy are associated with low levels of education and literacy and overall poorer health outcomes (Van Der Heide et al., 2013). Therefore, the background of health literacy is vital for people's ability to manage health (Sevinc et al., 2020).

Therefore, this research is looking for an answer to the question, what is the HSE risk literacy promotion model based on educational indicators?

2. Literature Review

A concept related to health literacy is safety literacy, which can be viewed as a specific content form of health literacy that focuses on patient/worker safety (Coman et al., 2020). There are unbreakable links between the occurrence of accidents and the lack of safety literacy of employees, so research on the evaluation of safety literacy is of great importance to find the deficiencies of employees in safety literacy (Hao, 2021). Increasing personal health literacy of employees can enable them to independently shape working conditions (dangers as well as protective measures) as a behavioral preventive measure and as a result, help to implement structural preventive measures (Georg & Guhlemann, 2020). Raucher and Myers (2014), found that occupational health literacy was positively associated with the prevalence of work-related injuries and receiving safety training. Recent models of health literacy follow an even more integrated approach and focus on risks as well as assets to create completely healthy behavior in the workplace (Rauscher & Myers, 2014).

Environmental literacy means increasing knowledge and becoming the owner of scientific competence to tend to responsible behavior towards the environment (Hollweg et al., 2011). An environmentally literate person has a good set of environmental values or ethics. This person also takes action in order to change his behavior in order to correct or prevent more environmental problems and is not only able to identify and analyze the values of societies with regard to a certain environmental issue, but he can also clarify his values in relation to action (Rezaei et al., 2021)

According to the model presented by Nara and Sata (2016), the three components of risk situation, risk perception, and understanding and dealing with risk can be considered as the constituent components of the structure of risk literacy, and these three components are represented by media literacy, scientific literacy, and statistical literacy and communication literacy are supported. The ability to make useful decisions, deal with uncertainties, infer and

estimate more or less probable results, manage high or low risk situations, forms a broader concept of risk literacy (Nikiforidou et al, 2012).

HSE risks in the organization can cause accidents and dangerous events with environmental consequences, and high literacy of health, safety and environmental risks can help to make more correct decisions and reduce the adverse consequences of events. The purpose of this research is to identify the factors and components influencing the HSE risks literacy promotion model.

3. Method

In terms of the fact that the current research seeks to identify the factors and components influencing the HSE risks literacy promotion model in studies based on the meta synthesis approach, it is a qualitative study in terms of the general approach, and it was carried out with the library research method, with the meta synthesis technique in the field of HSE literacy. In fact, it is examined and analyzed in the meta synthesis of information and findings extracted from other studies with a related and similar subject. In this context, the data collected from these studies is qualitative and not quantitative. As a result, the desired sample for metasynthesisis selected and formed based on their relationship with the research question.

Metasynthesis is not just an integrated review of the qualitative principles of the case or the analysis of secondary data and primary data from selected studies, but the analysis of the findings of these studies. In other words, metasynthesis is the combination of interpretations of the main data of selected studies. MAXQDA software was used for analysis. According to Sandelowski and Barroso (2006).

4. Findings

As mentioned, meta synthesis analysis includes seven steps. In this section, the results related to each step of this analysis are presented separately.

The first step: Setting the basic questions of the research

The first step in Sandolowski and Barroso's method is setting research questions. These questions are generally based on four parameters: what, who, when and how; It is adjustable. After the research questions are set based on the purpose of the research, the stage of systematic review of the texts begins. Table 1 shows the answers to these fundamental questions related to the metasysnthesis method:

Table 1. *Research questions*

Research	Category
Identifying the effective factors on the health, safety and environmental risk literacy promotion model	(What)
Various works, including books, articles, reports in the field of effective factors on the model of improving the literacy of health, safety and environmental risks	(Who)
Including all the works in the years 2000 to 2022	(When)
Thematic review, identification and note-taking, key points, concept analysis	(How)

Table 2. *Introduction of suitable keywords for the second step*

Searched keywords
Literacy of health, safety and environmental risks
HSE literacy
Risk and safety literacy model
Safety and risk training in the workplace

Second step: systematic review of texts

To collect research data, secondary data called past documents are used. As mentioned earlier, the research databases of interest are Scopus and Web of Science.

The third step: searching and selecting texts

Table 3 shows the steps taken to refine the extracted articles. Based on this table, in order to refine the articles extracted from the literature, four steps were taken, the last step was based on

the opinions of 5 observers in this research. In order to measure the final quality of the articles based on the approach that will be introduced below, these experts presented their opinions for each screened final article, and the articles that scored lower than the applied quota were removed from the process.

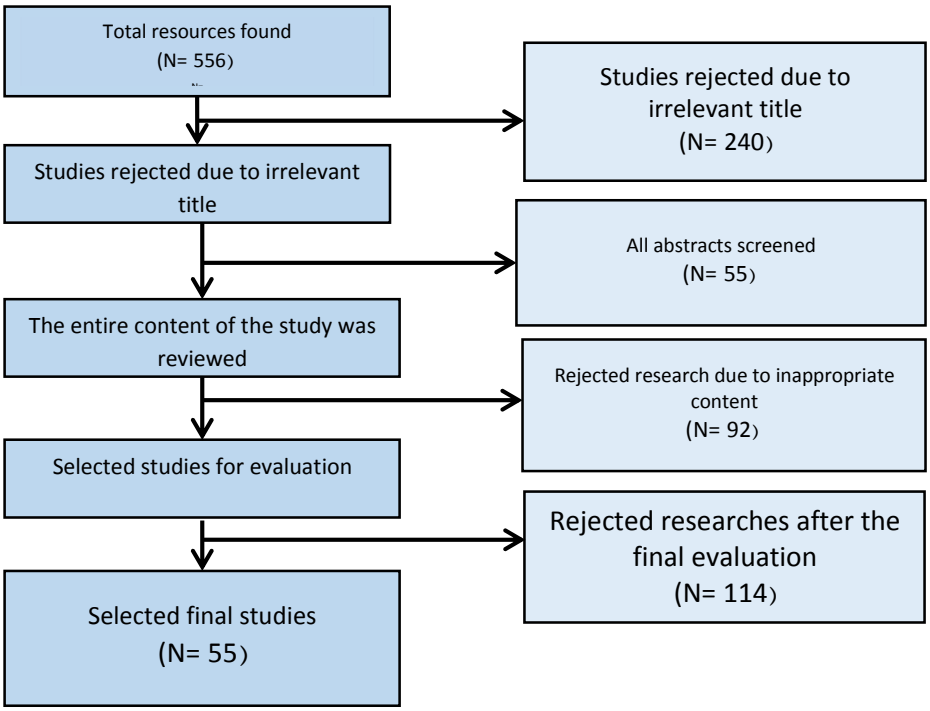

Figure 1. *Review and selection process*

After removing the studies that are inconsistent with the objectives and questions of the research, the researcher must evaluate the methodological quality of the research. The purpose of this step is to remove the researches in which the researcher does not trust the findings presented in them. A tool that is commonly used to assess the quality of primary qualitative research studies is the "Critical Evaluation Skills Program" which helps determine the accuracy, validity, and importance of qualitative research studies by proposing ten questions. These questions focus on: 1. Research objectives 2. Methodological rationale 3. Research design 4. Sampling method 5. Data collection 6. Reflexivity (which refers to the relationship between the researcher and participants) 7. Ethical considerations 8. Rigor of analysis Data 9. Clear expression of findings 10. Research value.

Table 3. *Selected articles*

CASP	TOPICS	CODES
38	Relationship of occupational health and safety training with health literacy among employees working in the various lines of business (8).	S01
31	Risk literacy in early childhood education under a lifelong Perspective (16).	S02
37	Construction of the practical model and learning program for risk literacy of everyday life: based on students' awareness (15).	S03
40	The effect of the environmental literacy education program based on augmented reality technology on the environmental knowledge, attitude and behavior of secondary school students. (18)	S04
39	Occupational Risk Perception, Safety Training, and Injury Prevention: Testing a Model in the Italian Printing Industry (19).	S05
44	Occupational Health and Safety (OHS) Analysis at The PG Kremboong Production Department using The Risk Priority Number and 5 Whys Method (3).	S06
32	Promotion of industrial safety based on worker safety culture: a case study of Saipa company. (20)	S07
32	Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century (21).	S08
32	Occupational health literacy and work-related injury among US adolescents(22) .	S09
37	Conceptual Framework for Analysing the Distributive Impacts of Environmental Policies (23).	S10
31	Health literacy of workers in the auto parts industry: a cross-sectional study (24)	S11
33	Investigating active safety index and its relationship with unsafe behaviors of employees of Esfrain	S12

CASP	TOPICS	CODES
	steel industry in 2017 (25)	
32	Skilled Decision Theory: From Intelligence to Numeracy and Expertise (26).	S13
33	International handbook of health literacy(6)	S14
38	Causes of accidents attributed to lowlevelliteracy in the nigerian construction industry (27).	S15
39	The Prevalence and Risk Factors of Limited Health Literacy in Iran: A Systematic Review and Meta-Regression Analysis (28).	S16
37	Needs assessment regarding occupational health and safety interventions among textile workers: A qualitative case study in Karachi, Pakistan (29).	S17
41	Action research for improving the risk literacy of university students: Focusing on the effectiveness of risk communication using Crossroad game (30).	S18
40	The Content Adaptation of Elementary Curriculum with the Needs Associated with Promoting Students' Environmental Literacy in the Cognitive Domain from the Teachers' Point of View (31).	S19
37	Measuring Risk Literacy: The Berlin Numeracy Test (32).	S20
37	Educational Interventions to Improve Safety and Health Literacy Among Agricultural Workers: A Systematic Review(9) .	S21
35	Relationship between Occupational Accidents of Industrial Workers, Health Literacy and Workplace Safety Climate(5) .	S22
45	Health Literacy, Health Behavior and States of Health among Trainee Personnel in Northern Germany (33).	S23
33	Language, literacy and their roles in workplace accidents (34).	S24
39	Identifying and ranking the effective factors on improving health, safety and environmental behaviors (case study: Tehran Municipality). (35)	S25
34	Differences in Workplace Risk Perception between Foreign-Born and First-Generation Mexican American Construction Workers (36).	S26
33	Work-Related Health Literacy: A Scoping Review to Clarify the Concept (37).	S27
41	The evolving concept of health literacy (38).	S28
45	Analysis of content production factors and environmental literacy among users of social networks in Tabriz (39).	S29
41	Examining the knowledge and factors affecting the environmental behavior of tourists in the north of the country. (40)	S30
43	The Effect of an Educational Intervention Based on the Theory of Planned Behavior on Firefighters' Risk Perception in Operational Units(41) .	S31
35	Presenting the health, safety and environment management model in order to improve the behavior of executive employees of Tehran Municipality (42).	S32
39	Predictors of Occupational Health and Safety Managementpractices in the Building Construction Industry, Kakamega Kenya (43).	S33
41	Research on evaluation of safety literacy based on social network analysis (44).	S34
33	Relationship Individual Factors With Occupational Health Literacy (Observational Study on Industrial Workers of Sasirangan in South Kalimantan)(45) .	S35
35	The influence of health literacy on health outcomes: A systematic literature review perspective (46).	S36
37	Scale Development and Validation to Measure Occupational Health Literacy Among Thai Informal Workers (47).	S37
40	Building a Health Literate Workplace (48).	S38
41	Good Practice in Occupational Health Services (49).	S39
40	Supporting Occupational Health and Safety Risk Assessment Skills: A Case Study of Five Companies (50).	S40
44	Cluster Modeling of Environmental and Occupational Health and Safety Management Systems for Integration Support(51) .	S41
37	Presenting the environment, safety and health management model in sports clubs. (52)	S42
35	Community-based initiatives improving critical health literacy: a systematic review and meta-synthesis of qualitative evidence(53) .	S43
45	A Multi-Objective Optimization Model of Health, Safety, and Environmental Risks of Coastal Landfills (A Case Study of the Coastal City of Bandar Abbas (54).	S44
41	Environmental Health Literacy as Knowing, Feeling, and Believing: Analyzing Linkages between Race, Ethnicity, and Socioeconomic Status and Willingness to Engage in Protective Behaviors against Health Threats (55).	S45
39	Environmental Literacy IN AMERICA (56).	S46
34	Infuencing factors of residents' environmental health literacy in Shaanxi province, China: a cross-sectional study (57).	S47
31	Model for Community Environmental Health Literacy in Peatlands: Research & Development Study (58).	S48
41	Association Between Health Literacy and Work Ability in Employees With Health-Related Risk Factors: A Structural Model (59).	S49
38	Occupational health literacy: Healthy decisions at work (60).	S50
31	An evaluation of the information literacy of safety professionals (61).	S51
37	Health Literacy Level of Casting Factory Workers and Its Relationship With Occupational Health and Safety Training (62).	S52
40	The Necessity to Establish Health, Safety and Environment Management Major at the University of Social Welfare and Rehabilitation Sciences (63).	S53
39	Development and Validation of an Environmental Health Literacy Assessment Screening Tool for Domestic Well Owners: The Water Environmental Literacy Level Scale (WELLS) (64).	S54
44	The effect of training on health, safety and environment topics on the level of awareness and changing the behavior of employees of a production factory in the country (65).	S55

Fourth step: information extraction

This stage includes reviewing the remaining articles and extracting texts for coding in the next stage. This step is focused on separating the results and outputs and the interpretations of these outputs along with the discussion and final conclusions of the researchers. At this stage, 55 articles were entered into the MAXQDA software, and for the purpose of initial review, parts of the study articles were randomly and randomly coded so that the researcher could familiarize himself with the available data. In this way, the researcher became familiar with the generalities of the discussion and its prevailing atmosphere. Figure 3 shows the coding cloud formed in MAXQDA software**:**

The fifth step: analysis of qualitative findings

During the analysis, the researcher looks for themes that have emerged among the studies in the metasynthesis. This is known as (subjective review). Once themes are identified and defined, the researcher forms a taxonomy and places similar and related categories into the theme that best describes it. Topics provide the basis for creating explanations, models, and theories or hypotheses. In this research, first, all the factors extracted from the studies were considered as identifiers, and then, considering the meaning of each of them, the identifiers were defined in a similar concept; Then, similar concepts were categorized in explanatory categories to identify the explanatory axes of the research indicators in the form of main and sub-components of the research. In Table 4, in the source column, each article is marked with the letter S and article numbering.

Table 4. *Main components and corresponding codes*

Source	Initial code	Category	Dimensions
S11-S19-S39-S41	Legal factors and upstream documents regarding safety, risk and health	Legal factors	Planning
S11-S19-S17-S23-S40-S52-S8-S43-S49-S29	Creating protective laws and legal insurance in the crisis sector caused by lack of health, safety and environment		
S11-S19-S30-S64	Implementation of approved programs related to the implementation of health, safety and environment		
S6-S9-S38	Compliance with moral, religious, legal and national issues in health, safety and environment		
S6-S13-S31-S32-S35	The commitment of managers and policy makers in the implementation of health, safety and environment	Political factors	
S9-S37-S53	Taking political measures to improve health, safety and environment		
S1-S2-S3-S4-S5-S6-S8-S19-S55-S47-S20	Support of government and political institutions for the development of health, safety and environment		
S44-S47	Cooperation of related organizations for the development of health, safety and environment		
S1-S3-S5-S7-S14-S22-S47	Efforts to improve health, safety and environmental risk culture	cultural factors	
S5-S7-S10-S16-S18-S26-S29-S30-S38-S41-S45-S46-S50-S55	Promotion of public culture regarding individual beliefs regarding health, safety and environmental risk knowledge		
S2-S4-S11-S12-S13-S20-S22-S27-S31-S32	Positive depiction of improved HSE awareness		
S3-S7-S10-S16-S18-S26-S29-S30-S38-S41-S45-S46-S50-S55	Alignment of organizational goals and HSE establishment culture		
S38-S48-S59-S42	Cultivating the priority of HSE in the organization		
S6-S17-S36-S43	Cooperation of national and organizational media in the direction of health, safety and environmental risk education		
S17-S18-S25-S28-S30-S44-S48-S50-S51-S54-S55	Expanding the positive attitude of managers and decision makers to the development of health, safety and environmental risk literacy	Management factors	
S5-S7-S10-S16-S18-S26-S29-S30-S38-S41-S45-S46-S50-S55	Determining the vision of the mission and creating a common vision in the HSE department of the organization		
S17-S18-S25-S28-S30-S44-S48-S50-S51-S54-S55-S18-S9-S10-S13	Increasing the attractiveness of HSE training for employees		
S1-S3-S39-S27-S16	management commitment		
S1-S11-S18-S29	Holding meetings between trustee and responsible institutions to improve HSE development		

Source	Initial code	Category	Dimensions
S1-S11-S33-S68	Improving human resource management to improve HSE awareness		
S1-S11-S15-S19	Identifying the organization's internal capabilities	Financial factors	
S1-S11-S21-S25	Consistent in making decisions and allocating sufficient funds		
S1-S11-S12-S19-S28-S36	Long-term financial planning and dividing the plan into short-term plans		
S1-S11-S28-S33	Proper cost management and targeted cost coverage		
S1-S40-S41-S11	Individual attitude	Individual factors	
S1-S41-S63-S47-S40	Preliminary literacy of safety, health and environmental risk		
S1-S2-S5-S7-S9-S10-S11-S15-S40-S41	Individual experience in the accident		
S4-S11-S30-S23	Individual work history		
S1-S5-S38-S49	Fire in pumps, electric motors, switchboards	Learning safety topics	Literacy development concepts
S1-S2-S40-S44	Slippery surfaces and falling from a height		
S1-S3-S5-S6-S16-S22-S27-S32	Increase in temperature and pressure		
S32-S38-S40-S44	Information in the field of carrying heavy goods and bulk transfers		
S1-S3-S7-S12-S16-S43	Electrical safety information		
S1-S2-S6	Equipment and machinery safety information		
S11-S14-S17	Defensive driving safety information		
S10-S17-S30-S49-S30	Information on reducing the risk of the workplace		
S1-S2-S5-S9	Understanding the objective situation of risk, including understanding the uncertainty of risk	Concepts of risk	
S3-S4-S8-S18	Understanding subjective risk status		
S1-S2-S6-S56-S7-S33-S38-S44	Understanding the gap between objective risk and subjective risk		
S10-S17	Understanding the importance of dealing with risk and its specific method and acquiring the ability to practice		
S1-S2-S5-S9	Risk management to reduce objective risk		
S16-S19-S28	Risk communication to reduce the gap between objective risk and subjective risk		
S8-S17-S20-S22	Assessment of harmful chemical factors at the workplace	Identification of various health issues	
S14-S22-S29	Identification of health hazards		
S17-S18-S26	Respiratory protection planning		
S1-S9-S16-S33	Hearing protection planning		
S34-S35	Identifying the risk of diseases and injuries		
S1-S18-S21-S35	Identification of personal protection at work		
S15-S27	Self-care information at the time of the accident		
S26-S28-S31	Public health in workshops		
S10-S17-S23-S49	Information on the use of different masks in polluted air		
S16-S18-S22-S27	Information related to filing medical records		
S9-S21-S36-S48-S53-S50	Information on the prevention of physical injuries and accidents in the workplace		
S1-S2-S6	Health and ergonomic hazards		
S10-S17	Issues related to soil pollution caused by other soil pollutants	Identifying various environmental issues	
S1-S2-S5-S9	Issues related to water pollution		
S13-S16-S22	Environmental pollution caused by the accident and cleaning the environment		
S17-S25-S30	Issues related to air pollution caused by machinery activities		
S18-S47-S48-S49	Creating reliable and trustworthy sources of access to safety, health and environmental information	Information Resources	Training implementation
S13-S35	Creating information boards in order to make information transparent in the workplace		
S4-S18-S27	Availability of HSE specialists and experts		
S21-S27-S46	Access to international and prominent sites in the field of up-to-date information		
S18-S22-S30-S35	Access to HSE textbooks		
S1-S10-S15-S26	Holding in-service training classes	Performance	
S15-S27	Localization of the safety, health and environmental risk alphabet for the organization		
S26-S28-S31	Platforming virtual education		
S10-S17-S23	Designing health risk education games, safety, health and simulation		
S1-S4-S6-S8-S16	Individual performance evaluation	Performance evaluation factors	Assessment
S19-S21-S25-S33	Periodic performance comparison		
S16-S20-S27-S33	Creating a checklist of organizational operations		
S1-S11-S12-S19-S28-S36	Determining the limit and level of evaluation (evaluation scale)		
S1-S11-S28-S33	Receiving information and statistics related to the amount of individual incidents	Feedback analysis	
S1-S40-S41-S11	Receiving information and statistics related to environmental incidents		
S50-S51-S52-S55	Analysis and identification of causes of incidents		

Source	Initial code	Category	Dimensions
-S40-S16-S39-S21 S25-S49-S54-S48-S40	Analysis of the causes of accidents		
S1-S3-S5-S7-S14-S22-S47	HSE unit needs assessment	Support and support	review
S46-S13-S16-S19-S10-S15	Equipping the HSE unit and updating related technology		
S11-S19-S39-S41	Increasing the organization's social capital in the HSE sector		
S11-S19-S17-S23-S40-S52-S8-S53-S54-S55	Increasing the quantity and quality of HSE services with the entry of academic experts		
S11-S19-S30-S64	Individual encouragement materially and spiritually to develop HSE literacy		
S5-S7-S10-S16-S18-S26-S29-S30-S38-S41-S45-S46-S50-S55	Modeling successful countries	Organizational optimization	
S2-S4-S11-S12-S13-S20-S22-S27-S31-S32	Trying to get international documents and certificates		
S3-S7-S10-S16-S18-S26-S29-S30-S38-S41-S45-S46-S50-S55	Participation in HSE standardization projects		
S38-S48	Localization of facilitating rules in the organization		

Sixth step: quality control of outputs

In this research, the researchers have used the comparison of their opinions with another expert to control the extractive concepts of the studied studies. For this purpose, a questionnaire of 84 questions consisting of identified indicators was designed. Then the obtained data were analyzed through SPSS version 23 software and transcript index. The results of the calculations are shown below, the transcript index value of 0.711 was obtained, which is at the level of valid agreement.

The seventh stage: final summary

In this step of the meta-combination method, the findings of the previous steps are presented. In the following, the research indicators will be identified. 16 categories and 5 dimensions were obtained from the indicators extracted from the texts of related articles, by removing synonymous and frequent indicators and finally by categorizing and categorizing the final indicators.

5. Discussion

By examining the direct factors involved in the literacy of HSE risks, this research has tried to identify and examine its direct components and categories and dimensions. Also, this research confirmed the relationship between HSE risk literacy and safety education by introducing the dimensions of developing literacy concepts and implementing training and related dimensions and codes, which is in line with the results of Raucher and Myers (2013). In this research, by reviewing the available sources and articles, an attempt was made to identify the factors effective on the promotion of health, safety, and environmental risk literacy by using the metacombination method, and as a result, 556 sources and articles were studied and analyzed, and finally 84 codes were obtained using the MAXQDA software. First, 16 categories and 5 dimensions affecting the literacy of health, safety and environmental risks were identified.

Therefore, by identifying these dimensions and categories, it can be said that organizations can focus on these factors in order to improve the literacy of HSE risks as one of the preventive and improving decision-making factors among their employees. What can be inferred from the categories and dimensions is the impossibility of balanced and proportional promotion of HSE risk literacy in an organization by one person and one department and even the organization itself alone. In the planning dimension and with the categories of legal, political, and cultural factors, there are more codes of extra-organizational influences such as the government or upstream institutions and policy makers of an organization, and they are effective on the HSE risk literacy in the organization, while the organization's management and decisions He and the group of managers are influential in the planning dimension but in the category of managerial and financial factors, and even the individual himself can be effective in the aforementioned

literacy in the same dimension but in the category of individual factors. The remaining 4 dimensions include the dimensions of the concepts of literacy development, implementation of education, evaluation and revision of the most effective and identified codes (components) related to the organization, its various departments and its management attitude and attitude, and of course the individual himself. By examining the results, it can be seen that there is the most frequency of primary categories and codes in the planning dimension, and this indicates the influence of the possible inputs of the HSE risks literacy improvement model, and in the next positions are the dimensions of the concepts of literacy development and the implementation of education, and finally, the other pillars of this improvement literacy is evaluation and revision. It seems that with further studies, by examining the relationships of these codes, categories and dimensions with each other, we can achieve a conceptual-structural model that will be the basis of the work of decision makers in the organization to promote the literacy of HSE risks. The results of this study suggest that a conventional/traditional approach to building risk and safety literacy may not include gathering essential information about the audience or how to use that information to engage with affected community members. Additionally, traditional/customary risk communication guidelines state what should be included in risk literacy, but do not provide how to develop a training and development program.

6. Conclusion

There are several challenges in promoting risk literacy to people. Risk perception is a critical aspect of risk literacy, particularly in how people perceive and respond to risk. Sociological and anthropological research states that the understanding and acceptance of risk is rooted in social and cultural factors. Individuals in a society have unique perspectives on risk based on these open factors. Unique experiences, upbringings, and cultural contributions all play a role in whether risk is perceived as dangerous for health outcomes. Risk literacy and HSE management must be structured as a two-way process, otherwise it will fail. Both experts and the public have valuable things to contribute, and it is important to respect both sides.

The risk literacy model proposed in this research has comprehensively determined the effective factors to promote and improve risk literacy. The health, safety and environmental risk literacy model was created from the perspective that conventional/traditional risk communication guidelines/methods are often not effective. Traditional methods may not consistently articulate the actions an affected organization must take to keep itself, its employees, and its communities safe from exposure to environmental hazards. Improper training leads to mistrust and ultimately non-compliance with risky communication messages.

The developed model is based on the literature in health literacy, safety, risk perception and simple concepts. Additionally, it serves as a guiding protocol for creating, evaluating, and incorporating audience metrics as input to create appropriate messages and content.

The Health, Safety and Environmental Risks Literacy Model presents the principles of risk and safety as an essential input base used to build the model. Unlike traditional/conventional guidelines, this model is flexible in that the creator/communicator can select applicable inputs to produce an effective and understandable message about a sensitive issue affecting society. Therefore, the model identifies critical inputs that focus on audience characteristics and environmental health literacy of the audience as a basis for developing focused message content using plain/simple language and delivery methods. Based on the results obtained in this research, it is suggested to put risk and safety literacy as one of the organizational requirements that helps to solve their concerns and reduce their risk. Understanding community perceptions and misconceptions about hazards and safety issues and events is essential for communicators to address and dispel these misconceptions. Using simple and understandable language in sharing the concepts of safety and risk facilitates the productivity of the model that examines risks and causes the development of safety and risk knowledge.

Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

References

Afshari, M. Teymori, Gh. Afshari, M. Kohnavard, B. Esmail pour, & H. Kangavari, M. (2017). Workers' health literacy in Khodro's piece making factory: a cross-sectional study. Iran *Occupational Health Journal*. 14(2), 147-55.

Aliabadi, K., Joneidi Jafari, F., & Pourroostaei Ardakani, S. (2021). The Effect of Augmented Reality-based Environmental Literacy Education Program on the Environmental Knowledge, Attitude and Behavior of Highschool Students. *Environmental Education and Sustainable Development*, *9*(2), 9-22. doi: 10.30473/ee.2021.7534

Arazm, F. Mirhosseini, SA. Dehghani, M. BarkhordariAhmadi, M. (2021). A Multi-Objective Optimization Model of Health, Safety, and Environmental Risks of Coastal Landfills (A Case Study of the Coastal City of Bandar Abbas). *The Journal of Tolooebehdasht*.

Binder, AR. May, K. Murphy, J. Gross, A. Carlsten, E. (2022). Environmental health literacy as knowing, feeling, and believing: Analyzing linkages between race, ethnicity, and socioeconomic status and willingness to engage in protective Behaviors against health threats. *International Journal of Environmental Research and Public Health*. 19(5), 2701. DOI: 10.3390/ijerph19052701

Cokely, E. Galesic, M. Schulz, E. Ghazal, S. Garcia-Retamero, R. (2012). Measuring risk literacy: The Berlin numeracy test. *Judgment and Decision making*. 7(1), 25-47. 7. DOI:10.1017/S1930297500001819

Cokely, E., Feltz, A., Ghazal, S., Allan, J., Petrova, D., & Garcia-Retamero, R. (2018). Skilled Decision Theory: From Intelligence to Numeracy and Expertise. In K. Ericsson, R. Hoffman, A. Kozbelt, & A. Williams (Eds.), *The Cambridge Handbook of Expertise and Expert Performance*, 476-505doi:10.1017/9781316480748.026

Coman, MA. Marcu, A. Chereches, RM. Leppälä, J. Van Den Broucke, S. (2020). Educational interventions to improve safety and health literacy among agricultural workers: a systematic review. *International journal of environmental research and public health*. 17(3):1114. DOI: 10.3390/ijerph17031114

Coyle, K. (2005). Environmental literacy in America: What ten years of NEETF/Roper research and related studies say about environmental literacy in the US. *National Environmental Education & Training Foundation.*

Dansadau, IJ. Abubakar, A. (2020). Causes of Accidents Attributed To Low-Level-Literacy In The Nigerian Construction Industry. *Bakolori journal of general studies*. 10(2), 2771-2786.

De Cieri, H. Lazarova, M. (2021). Your health and safety is of utmost importance to us": A review of research on the occupational health and safety of international employees. *Human Resource Management Review*. 31(4), 100790, DOI: 10.1016/j.hrmr.2020.100790

De Wit, L. Fenenga, C. Giammarchi, C. Di Furia, L. Hutter, I. De Winter, A. (2018). Community-based initiatives improving critical health literacy: a systematic review and meta-synthesis of qualitative evidence. *BMC public health*. 18(1), 1-11. DOI: 10.1186/s12889-017-4570-7.

Ehmann, AT. Ög, E. Rieger, MA. Siegel, A. (2021). Work-related health literacy: a scoping review to clarify the concept. *International Journal of Environmental Research and Public Health*. 18(19), 9945. DOI: 10.3390/ijerph18199945

Erdhianto, Y. (2021).Occupational Health and Safety (OHS) Analysis at The PG Kremboong Production Department using The Risk Priority Number and 5 Whys Method. *Jurnal IPTEK*, 25(1), 19-26.

Farahi-Ashtiani, I. Jahangiri, K. Jabari, M. Safi-keykaleh, M. Safarpour, H. Vaziri, MH. (2023). Promoting Industrial Safety Based on Safety Culture's Worker: SAIPA Case Study. *Irtiqa Imini Pishgiri Masdumiyat*, 7(3), 182 -173. DOI: 10.22037/meipm.v7i3.30898

Farajzadeh Gargari, M., kordi, N., & Jafari, A. (2021). Analysis of the Elements of Environmental Literacy Content Preparation among the Users of Social Networks in Tabriz. Quarterly Scientific *Journal of Audio-Visual Media*, 15(39), 173-143. DOI: 10.22085/javm.2021.297013.1799

Farrokhi, M. Khankeh, H. Poursadeqiyan, M. (2019). The Necessity to Establish Health, Safety and Environment Management Major at the University of Social Welfare and Rehabilitation Sciences. *Health in Emergencies and Disasters Quarterly*. 4(3), 119-126.

Febria, D. Saam, Z. (2020). Model for Community Environmental Health Literacy in Peatlands: Research & Development Study. *PalArch's Journal of Archaeology of Egypt/Egyptology*. 17(6), 8315-8329.

Georg A, & Guhlemann K. (2020). Arbeitsschutz und individuelle Gesundheitskompetenz. Perspektiven der Prävention von Arbeitsintensivierung in der „Arbeit 4.0 “. *WSI-Mitteilungen*. 73(1), 63-70. DOI: 10.5771/0342-300X-2020-1-63

Gernert, M. Stassen, G. Schaller, A. (2022). Association between health literacy and work ability in employees with health-related risk factors: a structural model. *Frontiers in Public Health*. 10. DOI: 10.3389/fpubh.2022.804390

Ghorbali, Z. Mohammadfam, I. Ghaffari, F. (2021). Presenting a health, safety and environment management model in order to improve the behaviors of Tehran Municipality executive employees. *Quarterly of Industrial Technology Development*, 19(45), 15.

Güner, MD. Ekmekci, PE. (2019). Health literacy level of casting factory workers and its relationship with occupational health and safety training. *Workplace health & safety*. 67(9), 452-460. DOI: 10.1177/2165079919843306

Guo, Y. Tao, J. Yang, F. Chen, C. Reniers, G. (2022). An evaluation of the information literacy of safety professionals. *Safety science*. 151, 105734. D0I: 10.1016/j.ssci.2022.105734

Hao, Q. (2021). The Uses of Social Network Analysis in the Field of Engineering Construction Management: A Review of the Literature. *Proceedings of the 25th International Symposium on Advancement of Construction Management and Real Estate*. 61-72. DOI: 10.1007/978-981-16-3587-8_43.

Hollweg KS, Taylor JR, Bybee RW, Marcinkowski TJ, McBeth WC, Zoido P. (2011). Developing a framework for assessing environmental literacy. *Washington, DC: North American Association for Environmental Education.* 6(1), 17-19. DOI: 10.1177/097340821100600107

Hussain, N. Kadir, MM. Nafees, AA. Karmaliani, R. Jamali, T. (2019). Needs assessment regarding occupational health and safety interventions among textile workers: a qualitative case study in Karachi, Pakistan. *JPMA the Journal of the Pakistan Medical Association*. 69(1), 87-93. PMID: 30623919.

Ibarra-Mejía, G. Gómez-Bull, KG. Vargas-Salgado, MM. (2021). Differences in workplace risk perception between foreign-born and first-generation Mexican American construction workers. *International journal of environmental research and public health.* 18(11), 5652. DOI: 10.3390/ijerph18115652.

ILO. World Statistic (2021). [Available from: https://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm.

Irvin, VL. Rohlman, D. Vaughan, A. Amantia, R. Berlin, C. Kile, ML. (2019). Development and validation of an environmental health literacy assessment screening tool for domestic well owners: the water environmental literacy level scale (wells). *International journal of environmental research and public health*. 16(5), 881. DOI: 10.3390/ijerph16050881

ISO. (2018). ISO 31000.

Jørgensen, MB, Larsen AK. (2019). Occupational health literacy: Healthy decisions at work. International Handbook of Health Literacy. *Policy Press*, 347-58. DOI: 10.51952/9781447344520.ch023

Kamal, SHM. Basakha, M. Sajjadi, H. (2018). The Prevalence and Risk Factors of Limited Health Literacy in Iran: A Systematic Review and Meta-Regression Analysis. *J Adv Med Biomed Res*. 26(118), 1-18.

Larijani, M. (2018). The Effect of Training on Health, Safety and Environment Issues on the Level of Awareness and Behavior of Employees in a Zinc Manufacturing Factory. *Quarterly Journal of Environmental Education and Sustainable Development*. 6(3), 13.

Leiter, MP. Zanaletti, W. Argentero, P. (2009). Occupational risk perception, safety training, and injury prevention: testing a model in the Italian printing industry. *J Occup Health Psychol*. 14(1), 1-10. DOI: 10.1037/1076-8998.14.1.1. PMID: 19210042.

Li, X. Li, Q. Long, Y. Li, Z. Liu, R. Zhu, Y. (2020). Research on evaluation of safety literacy based on social network analysis. *Process safety progress*. 39(1), 12059. DOI: 10.1002/prs.12059

Mehrabian, S. Bai, N. Esfahani Nia, A. (2021). Presenting HSE Management Model (Environment, Safety, Health) in Sports Clubs (with Strauss and Corbin Approach)oring the effect of temperature on the Covid 19 pandemic using profile analysis. *Razi Journal of Medical Sciences*. 28(6), 12-24.

Mohammad Abadi, PB. Zamani, A. PariZanganeh. A. (2020). Assessment of Environmental Knowledge and Factors Influencing Environmental Behavior Among Tourists in North Iran (A case study in Zanjan & Golestan provinces), *J Env Sci Tech*. 22(6).

Nara, Y. (2018). Action research for improving the risk literacy of university students: Focusing on the effectiveness of risk communication using Crossroad game. *Procedia computer science*. 126, 2219-2227. DOI: 10.1016/j.procs.2018.07.227

Nara, Y. Sata, T. (2016).Construction of the practical model and learning program for risk literacy of everyday life: Based on students' awareness. *Procedia computer science*. 96, 1258-1266. DOI: 10.1016/j.procs.2016.08.170

Nikiforidou, Z, Pange J, Chadjipadelis T. (2012).Risk literacy in early childhood education under a lifelong perspective. *Procedia-Social and Behavioral Sciences*. 46, 4830-4833. DOI: 10.1016/j.sbspro.2012.06.343

Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health promotion international*. 15(3), 259-267. DOI: 10.1093/heapro/15.3.259.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social science & medicine*, 67(12), 2072-2078. DOI: 10.1016/j.socscimed.2008.09.050

Olutende, M. Wamukoya, EK. Wanzala, M. Wabuyabo, IK. (2021). Predictors of Occupational Health and Safety Managementpractices in the Building Construction Industry, Kakamega Kenya. *Journal of Nursinng and Health Science*. 10(2), 43-57.

Omidi, S. Feridooni, GJ. Farmanbar, R. Heidari, M. (2021). The Effect of an Educational Intervention Based on the Theory of Planned Behavior on Firefighters' Risk Perception in Operational Units. *Journal of Health and Safety at Work*. 11(2), 237-51.

Organization WH. (2002). Good practice in occupational health services: a contribution to workplace health. *Copenhagen: WHO Regional Office for Europe*.

Ozaydin, F.Demirci, H. Karayurek, Y. (2021).Relatıonship Between Occupational Accidents of Industrial Workers and Health Literacy and Workplace Safety Climate. *Eur Health Liter J*. 1:47-57.

Pauliková, A. Chovancová, J. Blahová, J. (2022). Cluster modeling of environmental and occupational health and safety management systems for integration support. International *journal of environmental research and public health*. 19(11), 65-88.DOI:10.3390/ijerph19116588

Pearce, D. (2003). Conceptual Framework for Analysing the Distributive Impacts of Environmental Policies. *Prepared for the OECD Environment Directorate Workshop on the Distribution of Benefits and Costs of Environmental Policies*.

Rantala M, Lindholm M, Tappura S. (2022). Supporting occupational health and safety risk assessment skills: a case study of five companies. *International journal of environmental research and public health*. 19(3), 1720. DOI: 10.3390/ijerph19031720

Rauscher, KJ. Myers, D. (2014). Occupational health literacy and work-related injury among U.S. adolescents. *Int J Inj Contr Saf Promot*. 1(21), 81-9. DOI: 10.1080/17457300.2013.792288

Rezaei, M. Najafi, M. Shafiei, H. (2021). The Content Adaptation of Elementary Curriculum with the Needs Associated with Promoting Students' Environmental Literacy in the Cognitive Domain from the Teachers' Point of View. *Educational and Scholastic studies*. 10(3), 37-65.

Sandelowski, M. Barroso, J. (2006). Handbook for synthesizing qualitative research: *springer publishing company*.

Sepehr MaJ-K, P. Pirani, D. Rajabi, F. (2020). Investigation of Active Safety Index and its Relationship with Unsafe Behaviors of Esfarin's Steel Industry Workers. *Journal of Safety Promotion and Injury Prevention.* 8.

Sevinc, N. Korkut, B. (2020). Relationship of occupational health and safety training with health literacy among employees working in the various lines of business. *Universa Medicina*. 39(3), 171-7. DOI: 10.18051/UnivMed.2020.v39.171-177

Steinke, S. Koch, P. Lietz, J. Schillmöller, Z. Nienhaus, A. (2021). editors. Health literacy, health behavior and states of health among trainee personnel in northern Germany. *Healthcare.MDPI*. 18; 9(6):757. DOI: 10.3390/healthcare9060757

Suthakorn, W. Songkham, W. Tantranont, K. Srisuphan, W. Sakarinkhul, P. Dhatsuwan, J. (2020). Scale development and validation to measure occupational health literacy among Thai informal workers. *Safety and Health at Work*. 11(4), 526-532. DOI: 10.1016/j.shaw.2020.06.003

Van Der Heide, I. Wang, J. Droomers, M. Spreeuwenberg, P. Rademakers, J. (2013). The relationship between health, education, and health literacy: results from the Dutch Adult Literacy and Life Skills Survey. *Journal of health communication*. 18(1), 172-84. DOI: 10.1080/10810730.2013.825668

Wong, BK. (2012). Building a health literate workplace. *Workplace Health & Safety*. 60(8), 363-9. DOI: 10.1177/216507991206000806

Yusida, H. Suwandi, T. Yusuf, A. Sholihah, Q. (2018). Relationship individual factors with occupational health literacy. *International Journal of Scientific and Research Publications*. 6(1) 481-484.

Yusoff, H. Hamzah, M. Manaf, A. Ismail, A. Ahmad, Y. Hussin, H. (2021). editors. The influence of health literacy on health outcomes: A systematic literature review perspective. *AIP Conference Proceedings; AIP Publishing LLC*. 2339(1). DOI:10.1063/5.0044287

Zhao, Y. Sheng, Y. Zhou, J. Wang, H. Chilufya, MM. Liu, X. (2022). Influencing factors of residents' environmental health literacy in Shaanxi province, China: a cross-sectional study. *BMC Public Health*. 22(1), 1-10.