

# Risk Management in Teaching Children Road Safety

Lev I. Ushvitskii<sup>1</sup>, Radmila G. Ter-Grigor'yants<sup>2</sup>, Anna A. Babich<sup>1\*</sup>, Anna A. Ter-Grigor'yants<sup>1</sup> and Tat'yana A. Kulagovskaya<sup>1</sup>

<sup>1</sup>Department of Economic Analysis and Audit, Institute of Economics and Management, North-Caucasus Federal University, Stavropol, Stavropol Region, Russian Federation; delightful@bk.ru

<sup>2</sup>Non-Commercial Autonomous Methodology Center for Education, Upbringing and Social Security of Children and Youth SUVAG, Moscow, Russian Federation

## Abstract

**Background/Objectives:** The article was aimed at the development of scientific and methodical provisions and practical recommendations relating to the risk management programs on teaching children road safety. **Methods:** Methods of the structural and qualitative analysis and synthesis, comparison, expert estimates, economical and statistical methods, receptions of the systemic-functional analysis, etc. were applied to develop an author's methodology of identification and risks management of the educational activity aimed at their decrease in losses from road accidents with children. **Findings:** The article describes the typology of general and specific risks of the educational institution which implements the programs on the children's safety on the road and prevention of their involvement in road accidents. The algorithm of risk management in educational institutions, the key element of which is a risk management map based on the degree of risk importance and probability, has been developed. As compared to the traditional methods of adaptation to risks in the education system this method of risk management is focused on the increase of high efficiency, and quality of educational activity. **Applications/Improvements:** The results of research can be used in the control system of children's education development in the region, and the country in general.

**Keywords:** Evaluation, Educational Institution, Management, Methodology, Risk, Risk Factors, Road Safety

## 1. Introduction

Risk management in the sphere of teaching children the basics of road safety and prevention of their involvement into road accidents takes an important place in the national security of the state.

The significance of the problem is determined by the increase in the road accidents involving children. The number of children died in the accidents on the roads per 100 thousand people in Russia is about 3 times as high as in Italy and twice as high as in France and Germany. It has also been proved that people learn to behave safely on the roads and to pay due attention to the road traffic rules in the childhood.

Despite the social need for implementing measures on teaching children safety on the road and preventing their involvement in accidents, the current system of prevention

of children's involvement in accidents in Russia cannot be considered as satisfactory. First, we should mention the absence of systematic approach and coordinated actions of the parties concerned and low methodological level of teachers teaching road rules at school. The organization of preventive measures of children's involvement in road accidents in the educational institutions is insufficient.

The theory and methodology of decision-making strategies under risk were developed by Russian and foreign scientists. Among them, the following fundamental publications in the sphere of risk factor management should be mentioned<sup>1-15</sup> etc. At the same time, the results of the research do not cover all the aspects of the problem of risk management in educational institutions.

Some problems in teaching children to skills of safe behavior in roads are reflected in publications by<sup>16-21</sup>.

\*Author for correspondence

The social and pedagogical problems of additional education were researched by<sup>22–24</sup>. They were engaged in studying social and pedagogical problems of additional education.

In the last two decades productive approaches to creation of modern theoretical and technological base of training, education and creation of the children's identity, formation of special knowledge and skills in them, and also the general culture bringing up was developed by the following authors<sup>25–29</sup>.

The importance of scientific and practical implementation of the research objectives is determined by the consolidation of the information on the problem.

## 2. Concept Headings

The aim of the research is to identify risk factors influencing the process and the results of activities of educational institutions which implement the programs on teaching children's road safety and prevention of their involvement in the road accidents, to develop the key points, scientific and practical recommendations on risk management in education on the basis of the educational institution activities analysis.

Higher requirements for the quality of teaching road safety to children result in the need to identify risks and problems in this area of education and to develop tools for managing them.

It is well-known that education is a rather specific sphere with its own specific risks. The conception of research takes into consideration that in order to assess the quality of education we need to apply a complex approach including both external and internal goals of education. This approach must comply with the existing standards and regulations and be supplied with all the necessary qualitative resources (educational programs, human resources, students, material and technical support, finance, etc). Another element of education quality assessment is the results of particular educational institution activities (current and final learning outcomes, successful socialization of students, lower social and road risks, etc).

When choosing a risk management strategy it is important to apply a complex approach to the analysis of the problem which includes risk source identification, estimation of the degree of its effect, validation of ways and methods of adaptation to risk and ambiguity factors.

Tools and methods of carrying out research has been made so that to provide a possibility of receiving representative selections and, therefore, objective estimates of conditions and results of the current educational process aimed at training children's road safety.

The ways of collecting, accumulation, processing and analysis of information in research included expert estimates and mathematical methods of data processing, the quantitative and qualitative analysis of results of poll.

Complex character of research and the necessity to ensure objectivity of the received conclusions have predetermined expediency of the conducted survey data comparison with opinion of experts in the respective area of research.

## 3. Results

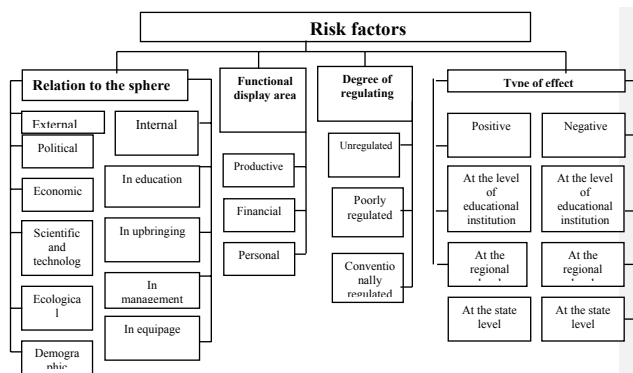
The analysis of Russian and foreign research and practical experience shows the substantial diversity in the aims of risk analysis in education, the availability of essential information as well as in the time, financial and other resources required to do this work. The existing approaches, particular methods and ways of presenting information on risk assessment vary greatly. At the same time, the level of risks in education as a complex phenomenon is characterized by a number of criteria and indicators, which means that they should be grouped and classified.

One of the key tasks of risk management methodology is to identify risk factors which are characterized as peculiarities of specific activities as well as to describe definite characteristics of ambiguity in the sphere in question. In terms of scientific research these factors are called risk-contributing or risk factors.

The list of risk factors made in due time affects the efficiency of decisions made. In our research, we suggest a risk identification tool aimed at their timely identification (Figure 1).

As a part of the research, the risks in educational institution were classified on the basis of the analysis of risk factors related to teaching children road safety and prevention of their involvement in the road accidents (Table 1).

Most efficient Educational Institutions (EI) introduces their own system of risk assessment and management; at the same time, they face many problems, the most typical of which are:



**Figure 1.** Modified classification of risk factors based on specific characteristics of educational institutions.

- The absence of standardized methods and the drawbacks of those applied.
- Insufficient development of the comparative benchmark of economic indicators.
- The limited number of professionals and departments in the sphere of risk management.

Risk coefficients showing the probability of the adverse result in achieving goals of the certain level by one of the parties concerned can be used as risk indicators in education. They can be presented as follows:

$$R = \sum_{i=1}^n W_i \cdot V_i \quad (1)$$

$$W_i = W_k \cdot \frac{(k-i) \cdot f + i - 1}{k - 1} \quad (2)$$

$$\sum_{i=1}^k W_i = 1 \quad (3)$$

$$f = \frac{W_1}{W_k} \quad (4)$$

$$W_k = \frac{2}{k(f+1)} \quad (5)$$

$$W_i^0 = \frac{W_i \cdot M_i}{\bar{M}} \quad (6)$$

$$W_i^1 = W_i^0 : \sum_{i=1}^k W_i^0 \quad (7)$$

Where,

$R$  is the integral assessment of each complex risk.

$V_i$  denotes average probability of a simple risk.

$W_i$  is the risk weight in the priority groups,  $i = 1, 2, \dots, k$ .

**Table 1.** The classification of general and specific risks of the educational institution implementing educational programs on road safety and prevention of children's involvement in road accidents

| Types of general risks | Specific risks                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Legal                  | <ul style="list-style-type: none"> <li>- the risk of legislation underdevelopment in the sphere of road safety;</li> <li>- the risk of absence of local legal acts</li> </ul>                                                                                                                                                                                                                                                                                                 |
| Managerial             | <ul style="list-style-type: none"> <li>- the risk of inefficient management in the institution;</li> <li>- the risk of failure in providing children's safety on the territory of EI;</li> <li>- the risk of the irrational structure of EI management;</li> <li>- the risk of lower morale among the teaching staff;</li> <li>- the risk of lack of cooperation between the EI and State Traffic Inspectorate of the Ministry of Internal Affairs of the RF</li> </ul>       |
| Financial              | <ul style="list-style-type: none"> <li>- the risk of underfinancing of educational activities;</li> <li>- the risk of delayed financing</li> </ul>                                                                                                                                                                                                                                                                                                                            |
| Innovative             | <ul style="list-style-type: none"> <li>- the risk of insufficient introduction of innovations in the educational process;</li> <li>- the risk of introduction of pseudo-innovations and anti-innovations in the education;</li> <li>- the risk of obsolescence in innovations</li> </ul>                                                                                                                                                                                      |
| Professional           | <ul style="list-style-type: none"> <li>- the risk of personnel failure to meet the professional requirements;</li> <li>- the risk of lack of qualified professionals;</li> <li>- the risk of low wages and insufficient employment benefits;</li> <li>- the risk of methods and techniques inappropriate for the students' age and capabilities</li> </ul>                                                                                                                    |
| Technical              | <ul style="list-style-type: none"> <li>- the risk of poor facilities and resources;</li> <li>- the risk of insufficient use of modern IT and online learning technologies as well as unique technical means aimed at teaching children road safety and their involvement in road accidents prevention;</li> <li>- the risk of absence of complete sets of teaching resources;</li> <li>- the risk of nonconformity of teaching resources with current requirements</li> </ul> |
| Social                 | the risk of higher number of road accidents involving children                                                                                                                                                                                                                                                                                                                                                                                                                |
| Subjective             | the risk of wrong decision-making on the road by a child                                                                                                                                                                                                                                                                                                                                                                                                                      |

$k$  is the number of priority groups provided risks are divided according to the degree of their importance.

$f$  is the priority ratio coefficient.

$W_k$  is the weight of the group of the lowest priority.

$W_i^0$  denotes weight number of  $i$ -th priority group after adjustment for number of simple risks in a certain group of complex risks.

$M_i$  is the amount of simple risks in each priority group of complex risks.

$\bar{M}$  is the average number of risks by groups.

$W_i^1$  denotes weight number of  $i$ -th priority group after adjustment.

Materials for research were prepared on the basis of results received from questionnaire survey of participants of training the children's safety on the road.

The survey was conducted in 8 territorial subjects of the Russian Federation: in the Tambov, Kaliningrad, Chelyabinsk Regions, the Stavropol and Krasnodar Territories, the Republics of Buryatia, Tatarstan and Sakha (Yakutia).

The survey compared parameters of social, economic and demographic development, the infrastructure condition, the innovative development level, existence of system for continuous training of children in safe participation in traffic and prevention of accidents on the road in these regions. The organizations and establishments – the survey participants, were selected according to the research problems.

The respondents who had taken part in monitoring totaled to 816 people. Some of them (432 persons or 53.9% of respondents) were teachers and 384 persons (46.1% of a representative selective) were education system staff.

The results of assessing general and specific risks of the educational institution implementing educational programs on road safety and prevention of children's involvement in road accidents are given in Table 2.

This research demonstrates that of all allocated difficult risks of the educational organizations and those requiring special attention the following groups of risks are the most essential: Organizational and administrative, financial, innovative and personal. The simple risks entering into these groups are characterized by high probability of their emergence.

## 4. Discussion

Having analyzed the sets of intersecting risks, we can make a conclusion that for all the parties concerned the

greatest number of intersections coincides with the risks related to the quality of human resources and technical facilities.

As we cannot completely avoid risks, we should manage them and have a well-developed mechanism for a single approach to the formulation of investment offers and efficient decision-making. The risk management algorithm is shown in Figure 2.

The proposed methodology of risk management in educational institutions includes the implementation of the consistent research which has the following stages: the risk event identification; risk perception and risk acceptance; risk assessment; the analysis of current situation and events; development of strategic and tactical plans; the choice of control actions for the risk event; regular monitoring and control over the risks and their consequences.

When choosing risk management methods it is advisable to use the risk map (Table 3), which has been developed as a recommendation and is aimed to raise the efficiency of the managerial decisions made.

To complete Table 2, we used Delphi approach, according to which risks were assessed by experts applying the system of scores (finding arithmetic mean after independent assessment by each expert). The experts were professionals with the experience in the development of guidance on improvements in the sphere of children's involvement in the road accidents as well as the authorities and the teaching staff of educational institutions.

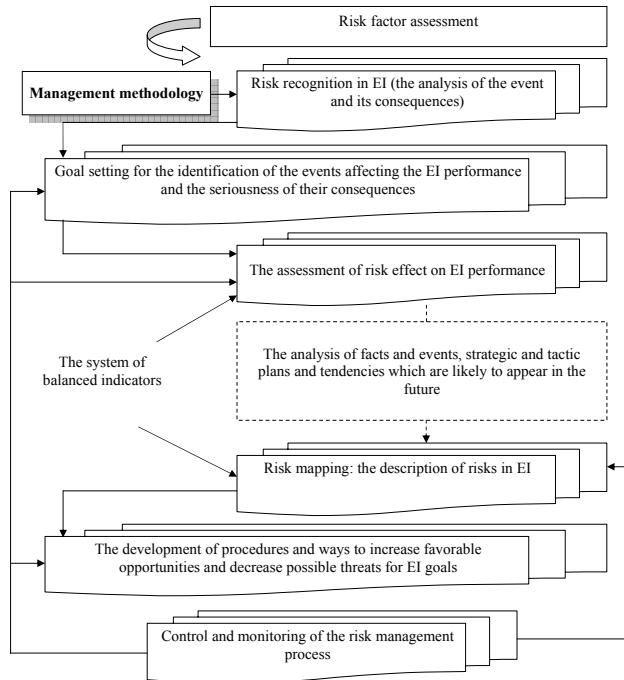
There are several approaches to the prevention of risk events:

- Avoidance, which means complete elimination of the risk event and, as a result, its effects.
- Minimization, which is the decrease in the event probability and accident severity.
- Transfer, which is the search of the third party ready to accept the risk and its effects.
- Acceptance, which means the absence of any actions and the consideration of all possible alternatives of risk effects as well as analyzing the most dangerous result in detail.

The undertaken monitoring of the current state of technical and educational resources at the educational institutions used in teaching children road safety and in prevention of their involvement in road accidents revealed the threats typical of this sphere.

**Table 2.** Assessment of general and specific risks of the educational institution implementing educational programs on road safety and prevention of children's involvement in road accidents

| Risks                                                                                                                                                                                                  | Priorities<br>( $P_i$ ) | Weight<br>number ( $W_i$ ) | Probability<br>( $V_i$ ) | Point<br>( $W_i \cdot V_i$ ) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------|--------------------------|------------------------------|
| Legal                                                                                                                                                                                                  |                         |                            |                          |                              |
| the risk of legislation underdevelopment in the sphere of road safety                                                                                                                                  | 0,280                   | 0,112                      | 10,0                     | 1,120                        |
| the risk of absence of local legal acts                                                                                                                                                                | 0,215                   | 0,107                      | 25,0                     | 2,675                        |
| Group total                                                                                                                                                                                            |                         | 0,219                      |                          | 3,795                        |
| Managerial                                                                                                                                                                                             |                         |                            |                          |                              |
| the risk of inefficient management in the institution                                                                                                                                                  | 0,305                   | 0,060                      | 50,0                     | 3,000                        |
| the risk of failure in providing children's safety on the territory of EI                                                                                                                              | 0,236                   | 0,058                      | 40,0                     | 2,320                        |
| the risk of the irrational structure of EI management                                                                                                                                                  | 0,231                   | 0,049                      | 26,0                     | 1,274                        |
| the risk of lower morale among the teaching staff                                                                                                                                                      | 0,184                   | 0,036                      | 25,0                     | 0,900                        |
| the risk of lack of cooperation between the EI and State Traffic Inspectorate of the Ministry of Internal Affairs of the RF                                                                            | 0,161                   | 0,034                      | 9,3                      | 0,316                        |
| the risk of underfinancing of educational activities                                                                                                                                                   | 0,109                   | 0,019                      | 16,9                     | 0,321                        |
| Group total                                                                                                                                                                                            |                         | 0,256                      |                          | 8,131                        |
| Financial                                                                                                                                                                                              |                         |                            |                          |                              |
| the risk of delayed financing                                                                                                                                                                          | 0,492                   | 0,059                      | 57,0                     | 3,363                        |
| the risk of insufficient introduction of innovations in the educational process                                                                                                                        | 0,323                   | 0,031                      | 48,5                     | 1,504                        |
| Group total                                                                                                                                                                                            |                         | 0,090                      |                          | 4,867                        |
| Innovative                                                                                                                                                                                             |                         |                            |                          |                              |
| the risk of introduction of pseudo-innovations and anti-innovations in the education                                                                                                                   | 0,420                   | 0,050                      | 35,1                     | 1,755                        |
| the risk of obsolescence in innovations                                                                                                                                                                | 0,312                   | 0,037                      | 34,2                     | 1,265                        |
| the risk of personnel failure to meet the professional requirements                                                                                                                                    | 0,191                   | 0,023                      | 7,9                      | 0,182                        |
| Group total                                                                                                                                                                                            |                         | 0,110                      |                          | 3,202                        |
| Professional                                                                                                                                                                                           |                         |                            |                          |                              |
| the risk of lack of qualified professionals                                                                                                                                                            | 0,495                   | 0,039                      | 16,6                     | 0,647                        |
| the risk of low wages and insufficient employment benefits                                                                                                                                             | 0,322                   | 0,025                      | 23,3                     | 0,583                        |
| the risk of methods and techniques inappropriate for the students' age and capabilities                                                                                                                | 0,181                   | 0,014                      | 11,7                     | 0,164                        |
| Group total                                                                                                                                                                                            |                         | 0,078                      |                          | 1,394                        |
| Technical                                                                                                                                                                                              |                         |                            |                          |                              |
| the risk of poor facilities and resources                                                                                                                                                              | 0,784                   | 0,026                      | 33,3                     | 0,866                        |
| the risk of insufficient use of modern IT and online learning technologies as well as unique technical means aimed at teaching children road safety and their involvement in road accidents prevention | 0,213                   | 0,007                      | 20,0                     | 0,140                        |
| the risk of absence of complete sets of teaching resources                                                                                                                                             | 0,189                   | 0,007                      | 19,8                     | 0,139                        |
| the risk of nonconformity of teaching resources with current requirements                                                                                                                              | 0,174                   | 0,006                      | 19,5                     | 0,117                        |
| Group total                                                                                                                                                                                            |                         | 0,046                      |                          | 1,262                        |
| Social                                                                                                                                                                                                 |                         |                            |                          |                              |
| the risk of higher number of road accidents involving children                                                                                                                                         | 0,390                   | 0,008                      | 15,0                     | 0,120                        |
| Group total                                                                                                                                                                                            |                         | 0,008                      |                          | 0,120                        |
| Subjective                                                                                                                                                                                             |                         |                            |                          |                              |
| the risk of wrong decision-making on the road by a child                                                                                                                                               | 0,8                     | 0,016                      | 80                       | 1,280                        |
| Group total                                                                                                                                                                                            |                         | 0,016                      |                          | 1,280                        |



**Figure 2.** Risk management algorithm in Educational Institutions (EI).

**Table 3.** Risk management map based on the degree of the risk and probability of its manifestation

| General risks | Manifestation probability |        |         | Influence on the implementation of the program on teaching road safety |     |
|---------------|---------------------------|--------|---------|------------------------------------------------------------------------|-----|
|               | Maximum                   | Medium | Minimum | High                                                                   | Low |
| Legal         |                           | +      |         | +                                                                      |     |
| Managerial    | +                         |        |         |                                                                        | +   |
| Financial     | +                         |        |         |                                                                        | +   |
| Innovative    | +                         |        |         |                                                                        | +   |
| Professional  |                           | +      |         | +                                                                      |     |
| Technical     |                           | +      |         | +                                                                      |     |
| Social        |                           | +      |         |                                                                        | +   |
| Personal      | +                         |        |         |                                                                        | +   |

## 5. Conclusion

Thus, many factors, which are typical of the current state of the economy, create conditions for risks in the educational institution activities, that is why introduction and implementation of risk management system in education is an essential part of quality management. The developed methodological approach to risk management in

educational institutions helps to identify general and specific risks in their performance, as well as to select the most relevant ones.

We suggest the risk management map which includes risk factors and is based on the identification of failures in EI technical and educational resources for teaching children road safety and prevention of their involvement in road accidents.

The following recommendations can serve as a tool for risk management in EI, implementing the programs on teaching children road safety and prevention of their involvement in road accidents:

- To generate the comprehensive concept of teaching children road safety and prevention of their involvement in road accidents in a particular educational institution to develop skills and abilities of safe behavior on the road among children.
- To contribute to the development of the pedestrian-friendly road environment and improvements in traffic infrastructure including EI neighborhood.
- To provide the compliance of the EI material and technical facilities of teaching children road safety and prevention of their involvement in road accidents with modern educational standards and safety requirements.
- To cooperate with State Traffic Inspectorate of the Ministry of Internal Affairs of the RF in the sphere of teaching children road safety and prevention of their involvement in road accidents.
- To develop social cooperation on the implementation of programs on teaching children road safety and prevention of their involvement in road accidents among ministries, organizations concerned, associations, guardian and coordination boards, and other non-governmental organizations.
- To promote cooperation of educational institutions with mass media in the sphere of information support of road safety.
- To introduce up-to-date IT and online learning technologies, unique technical means aimed at teaching children road safety and prevention of their involvement in road accidents, including the disabled children, to the educational process.
- To raise the proficiency of directors of EI implementing the programs of children's road safety and prevention of their involvement in road accidents regularly, and to develop further teachers' professional skills in this sphere.

- To develop programs for the employment of young professionals in EI, to provide incentives for their efficient work.
- To modernize educational resources in teaching children road safety and prevention of their involvement in road accidents taking into account their relevance, intensiveness, practical applicability and compliance with the students' psychophysical characteristics.
- To carry out activities aimed at the adaptation of road traffic regulations to be conceived by the children taking into consideration their psychophysical characteristics.
- To enhance the conditions for the participation of children in the regional and national contests, competitions, festivals, etc., aimed at the abidance by traffic regulations and the prevention of children's involvement in road accidents.
- To involve families into teaching children road safety and prevention of their involvement in road accidents.
- To develop and regularly apply the methods and criteria to assess the performance efficiency of the administrative personnel and the teaching staff of the educational institution in teaching children road safety and prevention of their involvement in road accidents.

In our opinion, the adaptive use of risk management in education should be based on the comprehensive and reliable assessment of the educational institution, which is the essential prerequisite for the development of the ways to increase the quality of education in general and to provide teaching children road safety and preventing their involvement in road accidents in particular.

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