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CASE STUDY ON ROAD SAFETY ANALYSIS IN THE AREA OF EDUCATIONAL UNITS

A. P. TULIGĂ[1] C. COMAN[2] C. PLEȘCAN[3] V. BĂTRÂNU-PINȚEA[4]

***Abstract*:** *The article addresses the topic of road safety in the area of educational units, respectively the effect of road traffic. The aim of the study is to clearly highlight the causality between road accidents involving children as victims and road systematization. To achieve our main objectives, we used as a research method the analysis of documents: Road Accident Database, an application of the Romanian Police in which all traffic incidents registered in Romania are implemented, according to the criteria of Mehedinti County, student quality, road category (national, county, communal), the location of the school unit in the vicinity of the public road and the production of the traffic incident. One of the factors that decisively influences the quality of road traffic, therefore, implicitly the risk in traffic, is the public road network. The specialized studies, as well as the available international statistics, show that the main categories exposed to the risk of road accidents resulting in deaths and serious injuries are: pedestrians, cyclists, motorcyclists and mopeds, in other words, the category known in specialized practice as "the most vulnerable traffic participants".*

***Key words*:** *road safety, educational units, schools, public roads*

1. Introduction

Motto: "In road traffic it is enough to make a mistake once."

This paper is an analysis that includes both systematization and road signs, the physical characteristics of the road and the prevention of road traffic. The purpose of this paper is to clearly focus on the causality between road accidents involving child victims and road systematization.

In order to achieve our main objectives, we used as a research method the *analysis of documents*: Road Accident Database, an application of the Romanian Police in which all traffic incidents registered in Romania are implemented, according to the criteria of

[1] University of Craiova, adituliga@gmail.com , corresponding author
[2] Transilvania University of Brasov
[3] Transilvania University of Brasov
[4] Transilvania University of Brasov

Mehedinti County, student quality, road category (national, county, communal), the location of the school unit in the vicinity of the public road and the production of the road event.

The studies of World Health Organization show that young people are clearly the most exposed age group to road accidents with the most deaths, by age range as follows:

- 5 - 14 years, the second cause of death;
- 15 - 29 years old, the main cause of death;
- 30 - 44 years, the third cause of death.

The 2009 Global Status Report on Road Safety Time for Action (World Health Organisation, 2009) indicates a bleak global forecast of road accidents as the cause of death. Thus, if in 2004 road accidents caused about 2.2% of deaths (position 9), in 2030 they will be the cause of 3.6% of deaths (position 5).

The specialized studies, as well as the available international statistics, show that the main categories exposed to the risk of road accidents resulting in deaths and serious injuries are *pedestrians, cyclists, motorcyclists, and mopeds,* in other words, the category known in specialized practice as *"the most vulnerable traffic participants".*

One of the factors that decisively influences the quality of road traffic, therefore, implicitly, the risk in traffic, is the public road network. Thus, in the context of the urban and rural environment, a previous study found that people who live further from the center of the city have access to more public services than people who live closer (Rezeanu et al., 2016).

Public roads are intended for road and pedestrian traffic, to meet the general transport requirements of the economy, population and defense of the country, these being public property and being maintained from public funds and other legally constituted sources. In other words, public roads are managed by the state, which is often considered ”a necessary evil for the promotion and functioning of the autonomous public sphere, located within society” (Coman, 2010, p.22). Furthermore, the public sphere can be considered the “ place where power is shared between the traditional political system, political marketing consultants, sociologists, mass media and polling institutes” (Coman, 2004, p.86).

In the publication of the Romanian Police, *Road Safety Bulletin*, according to data provided by the National Institute of Statistics on the length of transport routes, public roads in Romania totalled 84,185 km, of which 16,887 km (20.1%) national roads, 35,380 km (42%) county roads and 31,918 km (37.9%), communal roads, the public road network ensuring motorized access in most localities of the country (Romanian Police and National Institute of Statistics, 2020). To this network the network of streets in cities and municipalities that is added totals around 120 thousand km, so that, in total, the length of the road network in Romania is approximately 204 thousand km.

A homogeneous road environment means the elimination of surprises for road users because of the harmonization of several elements:

- road function: how to ensure direct access to the class road superior, the way in which the traffic exchanges with the other arteries are performed;
- traffic characteristics: traffic volumes, traffic composition, distribution of peak hours;

- road geometry: combining vertical and horizontal flat features, arrangement in cross section, etc;
- land use: access organization and management, positioning and communication with commercial, industrial and agricultural areas, etc.

2. Methodology

2.1. Purpose (Main Objective) of the study

The purpose of the study is to highlight the causality between road accidents involving young victims and road systematization.

The study pursues 2 specific objectives:

O1. Identifying the determining factors regarding the road characteristics that influenced the production of road events with the involvement of students.

O2. Propose viable measures in horizontal and vertical signage in the area of schools to reduce road risk and traffic safety.

2.2. Working hypothesis

H1. We anticipate that the unpredictability of students' behavior in crossing the public road can turn them into victims, regardless of the condition and characteristics of the road.

H2. We anticipate that the lack of preventive driving of some drivers in the vicinity of schools associated with road characteristics (signs, markings and indicators) plus other obstacles and traffic values causes serious road events.

2.3. Methods and instruments

To fulfill the desideratum of the study, namely the achievement of the main objectives, we used the analysis of the documents.

The research was applied in the months of March-April 2022.

From the Traffic Accident Database application, used by the Romanian Police, we selected as search criteria, Mehedinți County, the age of traffic participants, the quality of the student, the time interval, the proximity of school units, in the last 5 years.

Several road events have been extracted, which we will describe below.

3. Mehedinti County School Network

The importance given to the field of school safety at the level of the Romanian Police also includes road safety. The school network in Mehedinți County includes a number of 202 pre-university education units. Of these, 53 operate in urban areas and 149 in rural areas.

At the level of the Mehedinți County Police Inspectorate, we are interested in the road risk, the educational units located in areas heavily trafficked by road traffic.

The role of the Mehedinti County Police Inspectorate is to check the road systematization at the beginning of the school year in the area of all educational units (pedestrian markings, signs, signs, asphalt carpet) and to report irregularities to the road

administrator and local public authorities. Also, to place traffic police crews in busy areas to direct and streamline road traffic for the safety of students.

Several school units in rural areas and 43 in urban areas were identified, located on such roads, each school unit of course with its specifics: located on European / national road or county road, in cities without bypass and which also take over heavy traffic, in municipalities where congestion creates risks to road safety.

4. Data Analysis and Interpretation

During the years 2016-2021, in Mehedinți County, 7 road events took place involving students, in the area of educational units, on public roads. The date of the event was not relevant, but the time hour was, because we only analyzed the incidents produced during the school program.

In the following lines, we will make a brief description of each car event, in which we will highlight the generating causes.

The analysis focuses on the drivers' or students' guilt, but not exclusively, as we want to find out if certain features of the public road influence in one way or another the incidence of road accidents.

In addition to the causes of the drivers and pedestrians's guilt, we are also investigating the condition of the road. When reporting a road accident, it is always mentioned if the condition of the road influenced the accident.

- Incident 1. Strehaia, Republicii avenue, 10.00 am, in the "Mihai Viteazul" Gymnasium School from Strehaia – a 5-year-old student, seriously injured, no priority given to pedestrians, the driver was under the influence of alcohol. Heavy traffic passes through the city. The longitudinal markings are deleted. No central refugee.
- Incident 2. Drobeta Turnu Severin, 12.10 am, Kiseleff street at the intersection with Alion street, in the area of the Gymnasium School no. 6 from Drobeta Turnu Severin, an 8-year-old student, slightly injured, not giving priority to pedestrians. Cars parked in the immediate vicinity of pedestrian crossings. No parking indicator prohibited.
- Incident 3. Drobeta Turnu Severin, 11.20 am, Revoluției avenue, in the area of the Gymnasium School no. 14 from Drobeta Turnu Severin – a 12 -year- old- pupil, slightly injured, no priority given to pedestrians. Cars parked in the immediate vicinity of pedestrian crossings. No parking indicator prohibited.
- Incident 4. Jirov commune, 11 am, on National Road 67 A, in the area of Jirov Gymnasium School a 10 –year-old student, slightly injured, illegally crossing. No speed limitations signs.
- Incident 5. Baia de Aramă city, 14.00 pm, 11 Tudor Vladimirescu street, in the area of the "Constantin Brâncoveanu" Technological College from Baia de Aramă city - 14-year-old student, slightly injured, careless driving. No speed limitations signs.
- Incident 6. Strehaia, bld. Republicii, 10.45 am in the area of the "Matei Basarab" Technological High School from Strehaia – a 17-year-old student, slightly injured, no priority given to pedestrians. Heavy traffic passes through the city. The longitudinal markings are deleted. No central refuge.
- Incident 7. Rogova commune, on National Road 56 A, 13 pm, in the area of Rogova

Secondary School – a 7-year-old student, an electric scooter driver engaged in crossing the public road, and without looking both ways, being seriously injured by a driver. Heavy traffic passes through the city. The longitudinal markings are deleted. No central refuge.

5. Situation Analysis

From the existing data, we draw some conclusions:

- 5 incidents took place in urban areas and 2 in rural areas.
- The obvious causes are: not giving priority to pedestrians, as well as irregular crossing.
- The town of Strehaia is transited by European road 70 and in subsidiary DN 6 (National Road 6). The traffic values are permanently high, considering all the heavy traffic on this road that enters through the western part of the country, as well as the localities Timisoara-Craiova- Bucharest. Also DN 67A, which intersects with DN 6 in Strehaia locality, takes over all the localities from the northern area of Mehedinți county, as well as a part of Gorj county, starting with Motru municipality. To all these, the communal roads are also added, and the Republicii boulevard is the main traffic artery, the 2 educational units in the town of Strehaia being located in its vicinity.
- Drobeta Turnu Severin municipality is the residence of Mehedinți county, being characterized by large urban agglomerations as well as the largest car park. Given the need to increase the number of parking lots, the lack of parking in heavily trafficked areas and the location of schools near supermarkets, public institutions or block neighborhoods, many car owners are determined to park in forbidden spaces. We will analyze these aspects later.
- The 2 communes in which road incidents took place with the involvement of students, Jirov and Rogova, are located on national roads, respectively DN 67A and DN56A. As in the case of Strehaia locality, these roads are transited by heavy traffic, with high values on some road sectors and certain time intervals.

The main deficiencies found on the road signaling line in the educational units were the following:

- Missing road warning signs “Attention Children!” and “Speed Limit”;
- Lack of a station area for a means of public transport for people, with parking space or shelter and means of signaling;
- Lack of red non-slip mats with the inscription “School”;
- Lack of speed limiter placed in front of the transversal road marking intended for pedestrian crossing.

Taking into account these preliminary data, we will try in our analysis to find the elements of the public road that could help prevent such incidents or which would be better warned.

“Sustainable safety in the Netherlands”. A road safety system aims to prevent road accidents and, if they do occur, to minimize their consequences. This system is based on the idea that people make mistakes and are physically vulnerable. There are five basic principles: functionality, homogeneity, predictability, tolerance and state vigilance. The

vision of sustainable safety has a considerable influence on practical work on road safety; it has determined and still determines the implementation of effective and sustainable road safety measures. For example, one of the consequences of the principle of homogeneity is that car traffic and vulnerable road users (pedestrians, cyclists) can only interact if the speed of vehicles is reduced. If speed cannot be kept low, separate facilities are needed for vulnerable road users. To this end, some measures have been introduced, such as a substantial increase in the number and size of restricted areas of 30 km / h in built-up areas, the creation of restricted areas of 60 km / h outside these areas and the reduction of speed at intersections. What are the factors involved? Sustainable safety has been the dominant perspective for road safety policies in the Netherlands since the early 1990s. Road authorities at different levels (national, regional and local) are effectively implementing Sustainable Safety measures? (Elvik, R. & Vaa, T. (Eds.), 2004). How effective is it and what are the costs involved in this practice? It has been estimated that infrastructure measures under the "sustainable safety" approach have led to a 6% reduction in the number of deaths and injuries across the country. Costs, especially those related to road reconstruction, are high, but can be broadly included in the budget for current maintenance work.

Here is just a simple example of how it has acted in other states. Therefore, I would like to point out the importance of all the factors that contribute to car accidents with the involvement of pupils in the school area:

- the road risk is higher at the educational units located near the European and national roads because the traffic is intense there, and the drivers tend to slow down in their area, especially since there are no speed limiters, indicators “Attention children! or "Speed limit", nor red non-slip mats marked with "school". In other states of the European Union, pedestrian crossings are marked up on their entire surface in the school area.

- given that there are children in the area of school units, who travel to school or from school to home, their behavior is unpredictable.

- in municipalities, due to the increase of the car parks, especially in the area of interest objectives (public institutions, banks, supermarkets, utility companies, etc.) or in blocks of flats, without enough parking spaces, many drivers park illegally and often very close to pedestrian crossings. The location of cars near pedestrian crossings reduces the visibility of other traffic participants, both drivers and pedestrians. The situation is even more serious, as the students, being of small stature and having less predictable behavior, cross in front or behind these “obstacles”, without looking , considering that they have priority to cross.

We thus set out a number of reasons why, although existing, road signs consisting only of pedestrian crossings and signs are not sufficient.

In a guide developed by the European Commission “Best practices in road safety”, a series of models of good practice in the member countries of the European Union and beyond are presented, which have led to a safe environment and disciplined traffic (European Commission, 2007).

Returning to the European Commission's good practice guide, we review another example. Under the heading “Indicators and markings”, it is specified "Signs and

markings can provide important information for improving road safety. They regulate, warn and guide traffic participants. If they are informed about what is expected of them, they are more likely to react and behave appropriately. Signs and markings must be consistently installed, placed in logical locations, easy to understand and visible. It also means that the underlying road regulations, such as local speed limits, must be established on the basis of clear and consistent principles. The visibility of signs and markings should be checked regularly so that they are not covered by tree branches or fade due to the sun. The use of retroreflective materials is required to ensure visibility at night. Road signs located at the side of the road should be placed rarely, as road users can only process a limited amount of information at a time. Too many signs in one place can confuse traffic participants and distract them instead of helping them. Installing too many indicators can lead to violations and non-compliance with their significance" (European Commission, 2007).

Thus, "The institutional organization of road safety refers to a variety of measures which, together, constitute the basis for the implementation of measures in all areas of road safety. The activity in this field supports all the other activities in the field of road safety. The measures presented in this section refer to the general organizational framework, perspectives on road safety, objectives and strategies, provision and issuance of financial resources and tools and strategies for the selection and implementation of (cost-effective) road safety measures " (European Commission, 2007).

In the next section we will present a few road markings (figures 1) and speed limitation (figure 2) constructions which can make an improvement in road traffic near the educational units.

Fig. 1. *Road marks*

Fig. 2. *Speed thresholds*

6. Conclusion and Prospects

1. Most accidents are due to not giving priority to pedestrians. These involved the lack of risk prediction by drivers, given the proximity of the school, as well as the lack of speed adaptation. At the same time, the pupils' spontaneity in crossing is also considered, booking both ways they "venture" on the pedestrian crossing, considering that they have priority.
2. Vehicles parked in the vicinity of pedestrian crossings in the school area are real "obstacles" that hinder traffic conditions, especially if the weather conditions are unfavorable: fog, rain, frost, snow, etc.
3. Road signs must be mandatory in accordance with environmental conditions, easy to identify and interpret, and include: "Attention children! Signs, speed limit", non-slip carpets with the SCHOOL inscription or pedestrian crossings marked up on their entire surface, acting as speed limiters.
4. Road infrastructure. Measures that do not involve exorbitant costs have already been used successfully in many European Union countries. Speed limitation is very important, especially in the school area up to 30 km / h, or even 10/15 km (in residential areas or woonerf). Many drivers may not take into account a simple indicator, so additional measures can be taken: thresholds, narrowing of the road, curve. The results of a survey conducted in the United Kingdom showed that areas with a speed limit of 30 km/h reduced the number of accidents by 27%, collisions with injuries by 61%, and serious accidents by 70% (Webster & Mackie, 1996).
5. Finally, road safety education and campaigns are very important. In our country, with some applicability at a young age, preschoolers, and primary school pupils, it is missing at other stages of age. Hence the fact that local drivers are somehow undisciplined in road traffic, this leads to other factors: education, level of training, risk assessment, etc. Therefore, especially with the advent of modern vehicles, where the legislation for the time being does not specifically regulate the driving conditions (such as electric scooters) used by many students, it is also necessary to continue preventive measures and campaigns for road safety at older ages, middle school, and

high school. It is necessary to do that even more in high school, as many students obtain a driver's license.

The essential elements in driver training have been very well summarized in the ODT (OBJECTIVES FOR DRIVER TRAINING) matrix (Hatakka et. al., 2002).

ODT matrix Table 1

	ODT matrix: essential elements in driver training		
	Knowledge and skills	Factors that increase the risks	Self-assessment
IV. Life goals and life skills	Lifestyle, age, group, culture, social position, etc vs. driving behavior	Looking for strong sensations - Accepting risks - Group rules - The pressure of the entourage	- Introspective competence - Your own personality - Pulse control
III. Objectives and the context in which it is driven the car	- Choice of shape - Choosing the moment - The role of motives - Route planning	- Alcohol, fatigue - Low friction - Rush hour - Young passengers	- Personal reasons influence choices - Self-critical thinking
II. Mastering traffic situations	- Road rules - Cooperation - Perception of dangers - Automation	- Failure to follow the rules - Not keeping your distance regulations - Low friction - Traffic participants vulnerable	- Calibration of skill driving - Your own leadership style
I .Vehicle handling	-Functioning vehicle - Protection systems - Control over vehicle - Physical laws	- Not using the safety belts - System failure vehicle - Tire wear	Calibration of skill vehicle control

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