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A SYSTEMIC INTERVENTION OF TRAFFIC EDUCATION FOCUSED ON ROAD SAFETY

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ABSTRACT

The issue of road safety is a social matter of ongoing concern for the educational authorities, especially in Greece where an increased number of fatal traffic accidents occur annually. In accordance to this concern, the Secondary Education Directorate of Western Attica (Greece) has initiated a project consisting of a series of educational activities that aim at training the high-school pupils on the acute problem of road safety. These activities involve the formation of a local sustainability network of schools and the collaboration of other communities' stakeholders (the local traffic-police department, private vehicle technical inspection centers and a few voluntary organizations), establishing thus a process that in long-term will deal effectively with the necessity of having citizens properly trained and aware of road safety issues. These educational activities are mainly conducted through the teaching and learning method of "experiential learning". Yet, the complexity of this intervention, due to the diversity of the participants, and the demand for planning a holistic approach led to the usage of a systemic methodology for the implementation of these activities, as described in this paper.

Key Words: Road safety, traffic education, experiential learning, sustainability network, systems science, systems inquiry.

1. INTRODUCTION

The economic and social repercussions of traffic accidents, especially the fatal ones among youths, are an issue of international ongoing concern (Adanu et al., 2018). The extremely diverse causes of traffic accidents may include:

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i) alcohol consumption (Charlton & Starkey, 2015);

ii) not using seat belt (Weiss et al., 2014);

iii) underestimation or overestimation of driving skills (Teese & Bradley, 2008; Waylen & McKenna, 2008);

iv) the locally lower socioeconomic conditions (Hasselberg et al., 2005), including education (Hasselberg & Laflamme, 2008);

v) loss of focus or attention (Curry et al., 2011; Shi et al., 2010);

vi) aggressive or risky driving behaviours (Hanna et al., 2012), particularly among young drivers (Hatfield & Fernandes, 2009; Simons-Morton et al. 2011);

vii) even driving on the unfamiliar side of the road (Malhotra et al., 2018) that is the most common type of traffic accidents involving tourists, internationally (MoT, 2017; Yannis et al., 2007).

Therefore, the prevention of dangerous driving and the improvement of road safety are two issues of major social concern. The proper training of novice drivers is a crucial tool for improving road safety, including the various aspects that are presented below (Simons-Morton & Ehsani, 2016):

viii) Initially, the cognitive issues on how novice trainees learn (Groeger, 2000).

ix) The process of acquiring vehicle management and driving skills (Elvik, 2006).

x) The issues of learning the traffic legislation, acquiring a driving license and the associated adequacy of formal training for them, including the limitations of training practices (Beanland et al., 2013).

xi) The self-control in various traffic conditions (Ericsson et al., 2006) and the ability of paying attention when driving, which could be distracted by other parallel activities like eating, using phones (Klauer et al., 2014) or listening to music (Brodsky, 2001).

Regarding the adequacy of formal training, the proposed considerations for improvement may include:

xii) various training innovations (Isler et al., 2011; Tronsmoen, 2010; Washington et al., 2011), like the use of a driving simulator (Pollatsek et al., 2011);

xiii) the supervised co-driving, by the parents of adolescent/novice drivers (Ehsani et al., 2015; Goodwin et al., 2014);

xiv) the extension of the training period.

The present work is being implemented in a national context (Greece), regarding road safety and considering the major relevant topics, internationally (Korakidi & Mavrakis, 2018; Papakitsos et al., 2018). It describes training innovations that aim at extending the training period towards early adolescence, namely, the target-population of 14-15 years old pupils. According to the relevant priorities of the European Union's Commission (EUC), regarding road safety policies (EC, 2018), the training process is focused on developing behaviour skills and personal attitude, rather than driving skills, due to the minor age of the target-population. This educational intervention is based on a methodology of Systems Inquiry (Bánáthy, 1997).

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1.1 The Context

Regarding the conditions on the Greek roads and according to recent data from Eurostat (EC, 2016) and the World Health Organization (WHO, 2015):

- More than 1,800 accidents occur every year in Greece, in and out of schools, with children and teenagers victims.
- In terms of road fatality rates among young adults up to 25 years old, adolescents and children, the third highest position in the European Union (EU) member states is occupied by Greece (14 per 100,000 persons).
- Every year, more than 75 children/teenagers (0-14 years old) are killed on the streets.
- 50% of the children aged 0-14 years, who suffered a traffic accident during the years 1996-2003, were injured as pedestrians.
- 20% of the killed or injured pre-school children in car accidents were seated in the front seat and 70% of them did not make use of the special child seat.
- Depending on the traffic conditions, even for driving a bicycle can be extremely hazardous, since 10% of the victims (children/teenagers from 5-14 years old) were cyclists, with almost none having used a helmet (Wall et al., 2016).
- 10% of the injured young adults and teenagers (aged 15-24 years) were injured as motorcycle riders.

In this respect, the area of Western Attica (especially Thriasio Plain) is particularly vulnerable to road safety issues, because of the low socioeconomic/educational conditions (iv). In addition, there are several socioeconomic and environmental factors that may have a significant impact, like urbanization, climate aridity, land use in a mixed landscape (urban-rural), industrial development, increased activities in the urban areas (Mavrakis et al., 2015), the full up waste dump of Athens' metropolitan area (Salvati & Mavrakis, 2014), social groups of diverse origins and values, consisting of ethnic groups and foreign immigrants (Karakiozis et al., 2015). Therefore, the downgrading of natural resources observed, the loss of social cohesion, the uncertainty regarding economic growth and the domestic migration cause intent economic and social conditions and challenges.

In this diverse context and since the highest percentage of adolescents involved in car accidents is between 12 to 15 years old, the local educational authorities initiate major actions, concerning road safety, planned in a systemic manner (Papakitsos et al., 2017a). Namely, the Secondary Education Directorate of Western Attica (WASED) consists of 48 high-schools, more than 1,200 teachers and about 11,000 students, located in five municipalities. There, a network of schools has been formed, with the purpose of promoting sustainability in school life and beyond, by gradually creating a culture and ethics of protecting the natural, cultural and social environment.

2. METHOD

In order to include all the important factors and to coordinate efficiently the various participants of the traffic education project in a holistic manner, the local authorities of WASED utilized

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Systems Science for planning the relevant intervention. In particular, the educational activities have been designed by using Systems Inquiry (Banathy & Jenlink, 2001), which is the most comprehensive conceptual framework of Systems Science (Papakitsos et al., 2019). Accordingly, Systems Inquiry includes three fields of study: Systems Philosophy, Systems Theory and Systems Methodology, the latter one consisting of conceptual tools that are utilized in the various applications. Such a conceptual tool is the Organizational Method for Analyzing Systems (OMAS-III), originally introduced in 2010 (Papakitsos, 2010) and finally revised in 2013 (Papakitsos, 2013).

OMAS-III is conceptually compatible to the Generic Systems Model (GSM) that consists of the looping quadruplet [input] > [process] > [output] + [feedback] (Sanders, 1991) and to the relevant analysis' models of Information Systems (Grover & Kettinger, 2000; Ross, 1977). The aspects of a problem (perceived as a system) are classified in seven categories:

1) Causality aspects, regarding the purpose and motivation of the system (i.e., traffic education).
2) Input aspects, regarding resources (both material and human) and raw data.
3) Ruling aspects, regarding any kind of conditions (social or natural), like legislation, policies and other regulations.
4) Spatial aspects, regarding parts of the structure of the system concerning natural or virtual places.
5) Temporal aspects, regarding relevant/absolute time and scheduling.
6) Monitoring aspects, regarding institutions or persons ("stakeholders") that operate in an influential or managerial manner.
7) Output aspects, regarding the required planning and results of the intervention (including feedback).

Following the suggested application of Systems Science in Education (Banathy, 1991), OMAS-III has been successfully utilized for dealing with a variety of educational issues that include, for example, curricula designing (Makrygiannis & Papakitsos, 2015; Papakitsos et al., 2015; Papakitsos, 2016b), teachers extracurricular training (Foulidi et al., 2016), confronting acute social problems within school context (Foulidi & Papakitsos, 2018; Karakiozis & Papakitsos, 2018; Papakitsos & Karakiozis, 2016; Papakitsos et al., 2017b), the designing of educational websites (Papakitsos et al., 2016), issues of environmental education (Mavrakis et al., 2019; Papakitsos & Mavrakis, 2018) and vocational education (Papakitsos, 2016a; Papakitsos et al., 2019). The results of the herein application of OMAS-III are presented in the next section, according to the afore-mentioned classification (1-7).

3. RESULTS

3.1 Causality Aspects

The numbers of traffic accidents involving adolescents and children, already presented in subsection 1.1, define the motives of the local educational authorities (WASED) regarding traffic education, focused on road safety (1). Although these numbers have been steadily decreasing since 2001 in Greece (ETSC, 2019; Infogram, 2019), this is not a reason to rest as long as a

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single human life is lost in traffic accidents, especially in an area (namely Western Attica) with acute social problems (iv).

3.2 Input Aspects

The input aspects of the traffic education project (2) include the target-population and the target-topics. The former consists of the high-school pupils of WASED, as mentioned previously (*1. Introduction*), along with their associated cognitive features. The later consist of all those topics that the pupils should primarily become aware of, regarding road safety (i-iii, v, vi, xi). In addition and in relation to didactic goals that are cognitive, emotional and psychomotor (Papakitsos et al., 2018), the pupils should be informed on the following topics:

- Regarding the dangers of traffic, to cross a road safely waiting for the traffic to stop first, not to cross it by carelessly following others or by zigzagging, to use pedestrian crossings, to cross a pavement in the middle of an avenue (if there is any, separating the opposite lanes) as if there were two separate streets, to pay attention, to think for themselves and to be always careful, realizing that life is valuable.
- Regarding their traffic awareness, to understand the potential dangers of each walking route (especially towards their school), to make use of the sidewalks (if they exist), to recognize risks and "safer passes", to properly estimate the speed and distance of cars on busy roads and to play in secured places.
- Regarding their knowledge on traffic formalities, to recognize and understand the meaning of pedestrian traffic signs and to respond to visual signals.
- Regarding various functional subjects, the relationship between the conventional and the racing safety belt, the role of tires in road safety (tire pressure control, when to replace them, suitability for every vehicle, replace a flat tire), the importance of having a first-aid kit and a fire extinguisher in the vehicle (usage and inspection), the use of the Emergency Lane (LEA), the notion of Sustainable Urban Mobility (see subsection 3.3), the proper use of the motorcycle (potential dangers, safe driving, the importance of helmet) etc.

By the end of this traffic education intervention, the pupils should be able to report at least 4 points that they must know as pedestrians and eventually to take the relevant role of a sensitized citizen.

3.3 Ruling Aspects

Besides the cognitive issues on how novice trainees learn (viii) and the national traffic legislation to be learned (x), the ruling aspects (3) include other innovative didactic practices (xii) and road safety policies (EC, 2019) that are used as guidelines for planning traffic education efficiently. In the former case, experiential learning is the method that allows pupils to understand better the cognitive issues and to perceive the existing dangers in real conditions, both as future drivers and as passengers. In the latter case, the Sustainable Urban Mobility Plan (SUMP) is a strategic plan that takes into account various principles such as the citizens' participation in decision-making processes, the ongoing evaluation of interventions and the holistic approach for exerting related policies (Eltis, 2018). In order to have the quality of life in urban centers improved, the satisfaction of existing and future travel needs is a key criterion for the planning of such projects.

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SUMPs can be distinguished from the conventional short-term or long-term transport-planning, traffic and parking management studies. The most important differences from them are the next:

- They do not focus on traffic but on people, being based on participatory processes of all interested parties and a multidisciplinary approach. Thus, instead of facilitating traffic flow by improving the capacity of the road network, they aim at improving accessibility, enhancing the attractiveness and quality of urban environments and the quality of life.
- They are geographically extended on the basis of operational criteria, being limited neither by administrative boundaries nor by plain thematic approaches, since they require unified planning (environment, land use, transportations, social cohesion, etc.).
- They aim at increasing the efficiency and cost-effectiveness of transportations for people and goods, therefore reducing energy consumption, greenhouse gas emissions and consequently environmental pollution.

Finally, SUMPs require a continuous assessment of the impact of various interventions and the forming of processes for learning and improving.

3.4 Spatial Aspects

The implementation of such a demanding educational project cannot be conducted only in the premises of schools (4), thus requiring the participation of other related agencies and organizations (see subsection 3.6). The most suitable outer premises for traffic education activities proved to be those of Vehicle Technical Inspection Centers – VTIC (Korakidi & Mavrakis, 2018).

3.5 Temporal Aspects

The conducting of traffic education projects in secondary education are mainly extracurricular (Foulidi et al., 2018), namely, they are implemented either inside the school's premises after the normal teaching schedule or outside the school's premises during the normal teaching schedule; depending on the overall duration, there may be a bit of both modes (5). In any case, the daily duration of the project should not exceed two hours' time. Consequently, a one-day training activity has been designed that includes an introductory presentation of 30 minutes and 90 minutes of workshops (six), according to relevant international practices (Senserrick et al., 2009). The workshops (that six functional subjects are presented; see subsection 3.2) have a duration of 15 minutes each, for dealing effectively with the "lazy brain" phenomenon (Kahneman, 2011). That is, to keep the topics less complex, boring and difficult, for ensuring the cognitive attention of pupils (see subsection 3.2 & 3.3). In addition, traffic education, as implemented in school context, extend indirectly the training period of driving (xiv).

3.6 Monitoring Aspects

The diversity and nature of topics to be covered require the participation of teachers, parents and experts (6). The participation of teachers in extracurricular programmes is voluntary. Therefore, the local educational authorities and educators-researchers (WASED) occasionally conduct surveys for recording their opinions in matters of educational interest, in order to improve the planning of training activities. In a recently conducted survey (October 2019), the participating

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teachers (N=210, almost 18% of the total in WASED) responded on a question about how concerned they feel in case of road accidents involving vehicles that carry hazardous load. A 32% of them declared "very", 30% "enough", 18% "average", 12% "a little" and 8% "not at all". This particular survey indicates that the majority of teachers take the issues of road safety seriously, as they should (Keskinen, 2014), and it is used to motivate their participation in road safety projects.

Parents should become the right example of traffic behaviour (EC, 2018; Ehsani et al., 2015; Goodwin et al., 2014), both as pedestrians and as drivers/riders. Their contribution is crucial because it is direct (xiii) and long-lasting (xiv). The rest of experts that contribute in traffic education are the engineers of VTICs, officers of the local traffic-police department, specialized members of the Automobile Association Clubs (car racing driver, safety technician, motorcycle rider) and members of a local voluntary organization (KOUROS, 2018).

3.7 Output Aspects

The combination and analysis of the previous aspects (1-6) formed the output of the traffic education intervention (7), perceived herein as a systemic project. This traffic education project for road safety (see subsection 3.1) has been designed with two main parts: a lecture and a set of six workshops (see subsection 3.5), circularly executed in an experiential manner (see subsection 3.3). All the topics (see subsection 3.2) are presented by experts (see subsection 3.6), in the suitable premises of a VTIC (see subsection 3.4).

The feedback of this system/project (7) consisted of a pilot project having two phases. The first phase (Korakidi & Mavrakis, 2018) of small scale mainly tested the didactic requirements (namely, the suitability of the training syllabus) and their impression to the pupils. The second phase (Papakitsos et al., 2018) mainly tested the operational requirements (namely, the collaboration protocols with the partners) in a larger scale. The first phase had been designed according to the relevant guidelines of European Union (Giannopoulos, 2018), for pupils at the third grade of junior high-school. This age-group has been suggested as very appropriate for learning road safety, because they are found in a transition, both behavioural (they start changing attitude) and functional, as they gradually proceed from driving bicycles to driving motorized vehicles (Mayhew & Simpson, 2002; OECD, 2006). Yet, the positive impact of this phase led the educational authorities of WASED to expand the traffic education programme to senior high-school students, as well, during the second phase of the pilot project.

Nowadays, this traffic education project, presented herein, has become the standard educational proposal for training teenagers in road safety. Hundreds of pupils from the participating schools of WASED attend it every school year, having a great impact on pupils and educators.

4. CONCLUSIONS

The important social necessity of preventing road accidents can be achieved by the implementation of traffic education programmes, focused on road safety, that are addressed to the school population. In order to cover the topics of road safety in a holistic manner and with a didactic adequacy, many agencies and organizations have to collaborate with the educational authorities, by providing suitable training premises and relevant experts. The coordination of so many diverse participants in a large scale is operationally quite a demanding task. In this respect, Systems Science and especially its conceptual framework of Systems Inquiry offer useful tools

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for the operational planning of educational activities. Such an application has been presented herein, through the usage of OMAS-III by the local educational authorities of Western Attica (Greece), for conducting traffic education activities regarding road safety to high school pupils successfully.

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