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Awareness-Raising on Air Quality and Health Effects in Primary School Children by Using MAPEC_LIFE Study Educational Package: Preliminary Data [Version 1, 1 Approved, 1 Approved with Reservation]

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Updates in Public Health and Preventive Medicine

Abstract

Air pollution is a global health problem for its relation to acute respiratory infections, cancer, chronic respiratory and cardiovascular diseases. Many studies suggest that environmental education on pollution should be started as soon as possible to prevent the onset of negative behaviors, to develop positive habits and skills and to create awareness, so it is easy to understand how the role of the school is fundamental for this education. In recent years video games have increasingly replaced traditional games, so the use of a teaching approach accompanied by technology tools could be very efficient for children learning activities. The Educational Package, realized in the context of MAPEC_LIFE project (Monitoring of Air Pollution Effects on Children to support public health policies, LIFE12 ENV/IT/000614), after the phases of validation, represented a useful tool for environmental education regarding air pollution, as confirmed by preliminary data obtained by its utilization. More than half of teachers (57%) considered it effective, understandable, simple and useful, confirming the importance of videogames in stimulating children's interest.

Keywords

Educational Package; Children; Air Pollution; Environmental Awareness

Introduction

The impact of pollution, in terms of human health and economic costs in industrialized countries, is increasing dramatically and, in this regard, the European Environment Agency (EEA) declared that air pollution is the major risk for environmental health in Europe. In fact, in 2013 PM_{2.5} caused 467000 premature deaths from exposure to long-term, while the NO₂ and NO₃ produced 71000 deaths 17000 respectively [1]. The International Agency for Research on Cancer (IARC) has classified outdoor air pollution and the particulate matter (PM) in outdoor air pollution as carcinogenic to humans, based on sufficient experimental evidence and strong support by mechanistic studies [2]. Recently the interest in the study of exposure of the pediatric population to environmental pollutants increased [3-6]. In fact, children may be more susceptible than the adult to the adverse effects caused by air pollutants for a variety of reasons, among which: to spend more time outdoors, to have an immature immune system and to intake more air [4,7,8]. Children have also a capacity of metabolism xenobiotics less than adults and, in addition, have different DNA repair systems and control cell proliferation [9]. In this context, the EU has financed MAPEC_LIFE project (Monitoring of Air Pollution Effects on Children to support public health policies, LIFE12 ENV/IT/000614) that aimed to evaluate the early effects on children's health using two biological damage indicators (micronucleus and comet test) [10]. In addition to the scientific objective of the study, an educational activity in schools was planned to raise awareness among children and their teachers on the main

air pollutants, their effects on health and healthy lifestyles to be taken to counter them. For this purpose, a didactic package composed of three video games, five educational cards and a cartoon was created and validated [11]. The aim of this study was a preliminary evaluation of the Educational Package efficacy in terms to raise children awareness on air quality and its health effects.

Material and Methods

At the first, a series of training sessions for 200 teachers regarding the Educational Package by academic researchers were performed. The package contains a storyboard, five lesson plans and three video games facing the main topics at the basis of the project: air pollution, health effects, cellular effects, environmental policies and healthy lifestyles. The storyboard was composed by an introductory video (three minutes) that illustrated the main educational content of the game and a practical demonstration of the use of the package was made after the training (Figure 1).



Figure 1: Educational package components.

The preliminary study interested 50 teachers of 200 that used the Educational Package to a total of 1048 children following the didactic classroom activities. To evaluate the improving of awareness, the teachers filled a questionnaire with five questions with Likert scale containing the following questions:

- Do you consider effective the educational package?
- Do you consider understandable the educational package?
- Do you consider simple the educational package?
- Do you believe that children had fun?
- Have the children shown that they have acquired new knowledge after the learning activity?

The possible answers to these questions were:

- Very much
- Very
- Enough

Updates in Public Health and Preventive Medicine

- Little
- Anything

Results and Discussions

The survey results are presented in Table 1 and Figure 2.

The usefulness of the tools to promote new knowledge was evaluated positively by all teachers and video games were greatly appreciated by the majority of children. In fact, adding “very much” and “much” answers, 72%, 54% and 62% of teachers considered the educational package effective, understandable and simple respectively. Meanwhile 72% and 54%, respectively, expressed as positive perception in terms of enjoy ability and usefulness, confirming the importance of video games in stimulating children’s interest and active participation in learning activities (Figure 2).

Table 1: Survey results by number of teacher’s answers.

Question	anything	little	enough	very	very much	TOT
a)	0	0	14	30	6	50
b)	0	1	22	14	13	50
c)	0	3	16	20	11	50
d)	0	1	13	25	11	50
e)	0	0	23	25	2	50

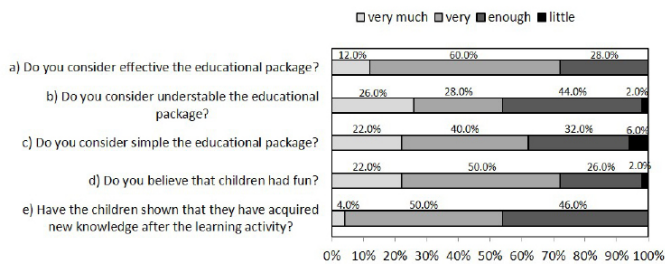


Figure 2: Teachers’ answers to the questionnaire administered after educational activities.

Considering the results by school classes and only the answer “very”, the data confirmed the Educational Package efficacy, mostly for 2nd grade classes for understanding and children feedback (Table 2).

Table 2: Percentage survey results by answers-school classes.

Question	little			enough			very			very much		
	2 nd grade	3 rd grade	4 th grade	2 nd grade	3 rd grade	4 th grade	2 nd grade	3 rd grade	4 th grade	2 nd grade	3 rd grade	4 th grade
a)	0	0	0	29.4	27.8	33.3	58.9	44.4	60.0	11.8	27.8	6.7
b)	0	0	0	31.3	27.8	38.5	36.8	61.5	23.1	21.0	27.8	38.5
c)	10.5	6.3	7.1	26.3	18.8	21.4	52.6	50.0	28.6	10.5	25.0	42.9
d)	0	0	0	11.8	18.8	28.6	76.5	37.5	57.1	11.8	43.8	14.3
e)	0	0	0	25.0	31.3	62.5	75.0	56.3	37.5	0	12.5	0

Conclusion

The intervention of environmental education and health literacy, approaching children with tailored messages and tools, appeared to be very useful, improving children knowledge and stimulating their interest. Our preliminary results confirmed prior evidence of the beneficial effects of combining traditional lessons with computer games as instructional tools; computer

games are able to strengthen and support the motivation to learn because they are attractive to students.

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