

## **THE STRONG NEED FOR SUSTAINABLE EDUCATION OF ELECTRIC MOBILITY**

Ileana Gavrilescu, Bucharest University of Economic Studies, Caderea Bastiliei nr 2-10, sale 0217, sector 1, Bucuresti, Romania, Andrei Hîrjanu

### **Abstract**

The World Program for Sustainable Development does not, unfortunately, follow the pace desired and proposed by the political-scientific forums. Among other long-awaited areas to "explode" from a sustainable standpoint, personal electric mobility is delayed and no one can guarantee any predictions close to reality. The dichotomy between the potential users' request for similar dynamic, marketing and financial performance to non-electric vehicles, and electric car manufacturers' reproach for their lack of voluntary informing and their prejudices, habits, commodities and influences due to confusing folklore is obvious. The objective of this research is to examine the Romanian public's degree of acceptance of introducing in the school curriculum, from the primary school, sustainable education favourable to personal electrical mobility. The importance of speeding up the absorption of electric vehicles, adequate education of the potential buyer of personal mobility, especially in the medium-term perspective must be made apparent to the decision-makers involved in the field of mobility and lead to shaping its political and entrepreneurial approaches adequately.

**Key-Words:** electric-mobility, education, sustainability, societal reform

### **1. Introduction**

Faced with the prospect of self-destruction through intense and unrestricted economic, social and cultural activity, humanity realised in the latter hour, which coincided with the first hour of the new millennium, that the ill-fated situation must be urgently addressed with the utmost urgency. Addressing the problem of locomotion, the world is trying to solve the problem with electric propulsion. Technical and scientific research has discovered more types of energy that could be applied to mobility, but none of them proved to be as economically prepared as electric propulsion was. The massive and rapid absorption of electric vehicles in the market is enthusiastically embraced by some but still rejected by others. There are many pretexts that are invoked when it comes to buying an electric vehicle.

Of the many factors that determine the degree of absorption of the electric mobility market, those considered "barriers" have to be approached with even greater care if the problem of surmounting them is concerned [1]. This brings into discussion the case of the degree of information / education of potential purchasers of electric cars, as far as the field of personal electric mobility is concerned. This degree of information / education relates to a behavioural problem and therefore it is necessary first to have a thorough knowledge of the behavioural theory. In a next step, the behavioural principles compatible with the problem of electric mobility must be corroborated and practically correlated with the actual educational opportunities available, respectively with the means of information and education.

There are two classes of population that are suited to a process of informing on electric mobility: adults and children. Informing and educating adults in the spirit of sustainable electric mobility can be done through all known press channels (printed press, radio, TV, internet) and work-shops where, besides the specific presentation, there is also a drive-test for each potential customer. Children, on the other hand, although they can benefit from information / education through established media, do not have the same chances when it comes to work-shops, especially when it comes to a test drive. Instead, they have the advantage of a hypothetical systemic education in terms of sustainable training, and this type of education has already been ingested, right in the form of learning units, or just lessons or even paragraphs, in the socio-human disciplines. While adults only have the potential to purchase an electric car, children are at least as important due to their potential to become in ten to twenty years, adults who will be able to afford buying an electric car. The most important gain will be due to their psycho-moral training, the cultivation and further advancing of the civic consciousness of sustainability. Societies have a special ability to preserve and convey the distinctive character of the cultures they define and today's young people will determine the set of values and norms that will radically transform the future society [2]. Perhaps over a generation or two, the car will not dominate mobility, but rather other means of locomotion, and perhaps electric propulsion will not be widespread, but an entirely different kind of energy. However polluting or ecological will the means of locomotion in the future be, or whatever major challenges will shift onto the head of next generations, it is important that those generations, through a sustainable education that goes into the depth of their nature, can help them surpass any situation.

Regarding the issue of accelerating the absorption of electric mobility, the educational approach of young people must be started at this time, since they will be future beneficiaries of global decisions taken today [3].

Changing the values and norms of a culture and, ultimately, the behaviour of individuals within it, is a difficult task for adults not only because of the need to change their way of thinking but also the need to convey this way of thinking to the next generation [4].

## **2. Literature review**

In order to provide a documentary basis as pertinent to the production of productive conclusions, the literature was approached sequentially and deductively, although not in successive stages but coagulated according to a logic of axiological importance, starting with the problem of education in general, continuing with the problem of sustainable education deeply grasping the issue of sustainable education conducive to electrical mobility. It is emphasized even the intense insistence of documentary orientation on school age groups.

The world should not be surprised that the development of a healthy, fair and sustainable society involves a major change in thinking, of the system of values and in concrete actions [5]. Children have extraordinary learning abilities, helped by their active imaginations, which could contribute to the formation and development of the next major environmental project [6].

Preferences for certain types of technology and habits such as the usage of natural resources start from childhood. A child benefiting from abundant electricity, or automobiles that lead to a developing of his desire for speed, begins to see the world naturally as convenient, fast and gushing with life energy [7], becoming quickly used to motor vehicles [8]. Also, childhood contact with different forms of transport, such as trains, cars, buses, is essential for developing future values and expectations of mobility for future adults [9].

Many young people do not yet have mobility practices formed that are followed with consistency or more precisely, a clear and strong dependence on the machine from the driver's position. Therefore, there is a great opportunity to influence them before they develop and fix their behavioural habits. Although these children will not buy or drive a car in the future they are "metaphorically and literally the future leaders" [10] and their perspectives on mobility are relevant to the level of information and involvement in several segments of society. In addition, children are recurrent passengers being transported every day and are also among the most affected by transport pollution and [11].

The extent to which today's students and students, who tomorrow will be business leaders, scientists, politicians, artists and citizens of the world, will be prepared to make decisions in favour of a sustainable future, depends on awareness, knowledge, expertise and values which they have acquired during the studies of the current period. It is therefore imperative that the themes and concepts of sustainability be integrated into all levels of education. The curriculum needs to be reconsidered, making sustainability a theoretical domain valid for the entire period of studies [5].

A study dedicated to school travel of German children, found that the attributes of the mother's preference influence the patterns and perceptions of travel rather than the attributes of the father. It has also been observed that the likelihood of walking and cycling as an alternative to mobility increases with age [12]. Several researchers' analysed active modes of transport to the school (walking and cycling) on a sample of Dutch children aged 6 to 11, tracking 623 trips through a GPS system. The conclusion reached was that well-connected streets and bicycle lanes had a significant positive impact on association with active transport at school [13]. Driving a car to school in the United States and Canada is perceived as superior to both bus and active travel, as driving is seen as faster, safer and more convenient [14].

A group of researchers interviewed a group of fifty-year-old teenagers aged 15 years in Denmark, and noted a wide range of reactions. Some of the group were "car enthusiasts," who associated cars with high values and a car-oriented lifestyle. Others, however, were "car pragmatists," who had an ambivalent vision in relation to cars in general and a third group, called "car skeptics," who had no interest in cars and tended more towards a type-oriented lifestyle of active mobility such as cycling [15]. A study in the United States suggests that such car-based transport preferences can be hard to change, as transport as an activity is more difficult to pass on to renewable energy sources than in other areas. In the case of the United States, such mobility values and preferences are difficult to modify because they are particularly constrained by cultural, geographic and economic factors, especially in the case of small children who do not have too much control over these factors

[16]. It has also been observed that families with children can be stuck in transport habits that use classical motor vehicles but also that these mobility practices become more difficult to change once they become rooted [17].

However, contrasting evidence stems from a survey among UK students in study years 7 (11-12 years), 9 (13-14 years), and 11 (15-16 years), where most children have correctly identified cars as a major source of environmental problems [18]. A survey of 165 UK children in six education groups aged between 9 and 10 years showed strong knowledge of fuel-efficient cars and electric cars. They noticed that more than three-quarters of the children asked were aware that battery-powered cars reduced pollution and correctly stated that the fuel economy of a vehicle is beneficial to the natural environment [19]. In this regard, in a study on children and sustainable mobility, the authors also stated that despite the numerous investigations on unsustainable urban transport modes, the active contribution of children to these sustainable mobility trends is very limited [20].

It is unclear to what extent children should be considered as part of the solution, able to become active agents to change current and future mobility patterns. However, it is particularly important for sustainable mobility and sustainable development in general to create new platforms for youth participation in relevant debates where children can contribute to the development of solutions, taking into account their views and perceptions, so that policies can then be set according to their needs and the directions they initiate [21]. In recent years, research has begun to focus on gaming frameworks and some papers have recently highlighted the promising benefits of using gaming techniques to influence individual behavior in relation to changes in sustainable mobility models [22]. A gaming model to mobilize users to adopt a sustainable mobility style has also been proposed with the process involving an analysis of a person's mobility behaviour and proposing incremental challenges based on real user progress [23]. The learning process associated with feedback offers new opportunities for educators, as they now have the opportunity to offer new experiences through the application of gaming in education [24]. Direct feedback from gaming can have a positive impact on the behavior of individual mobility and that social influence is among the most potent factors of change in human behavior [25].

### **3. Methodology**

For this study, an opinion poll, based on a "face-to-face" questionnaire interview, with a single question, related to the very hypothesis of the need to introduce through school curriculum and curriculum, in primary and gymnasium, education favourable to personal electrical mobility. There were 85 men and 104 women from Romania, so a total of 189 respondents. They were selected by age groups, respectively 15-19 years, 20-24 years, 25-34 years, 35-44 years, 45-54 years and over 55 years. The survey was conducted face to face, the questionnaire interview including the question "Are you in agreement with introducing a new electrical mobility discipline in primary and high school?"

The investigation was conducted in three stages, corresponding to three consecutive days in May 2019, at three relatively central points in Bucharest. The working sessions were practically carried out on the ground by a single operator or the author of the present study. In the best spirit of

sustainability, the poll question was not printed, the interviewees' answers being recorded on a laptop. Response variants respected the typical questionnaire model, with two firm responses,

YES and NO respectively, and two RESERVED answers, respectively NOT and CAN. The repartition of responses by age and gender categories, in a corresponding matrix, was achieved after the centralization of responses.

**4. Results**

The main result of the research is that 70 (42%) respondents favoured the idea of introducing sustainable education for personal electrical mobility into the curriculum, while 28 (14%) respondents oppose this hypothesis. Therefore, 98 (57%) respondents generated categorical answers. Unfortunately, the difference of 91 respondents is in one form or another either undeclared (52 marks) or unfamiliar with the problem (39 marks). One of the merits of the survey is the size of the valid sample. The limits of the opinion poll are, as always, related to the subjectivism of the respondents, the choice of the moment (as a calendar date). From the tracking of data in Table 1, it is noted that the smallest variation is inherent in all age groups as to the lack of determination for a firm response.

However, figure 1 reveals, paradoxically, that the greatest enthusiasm for the idea of introducing sustainable education favouring the electric mobility at elementary and secondary school level is evidenced by the age groups 50+ (38 marks) and 45-44 (35 marks).

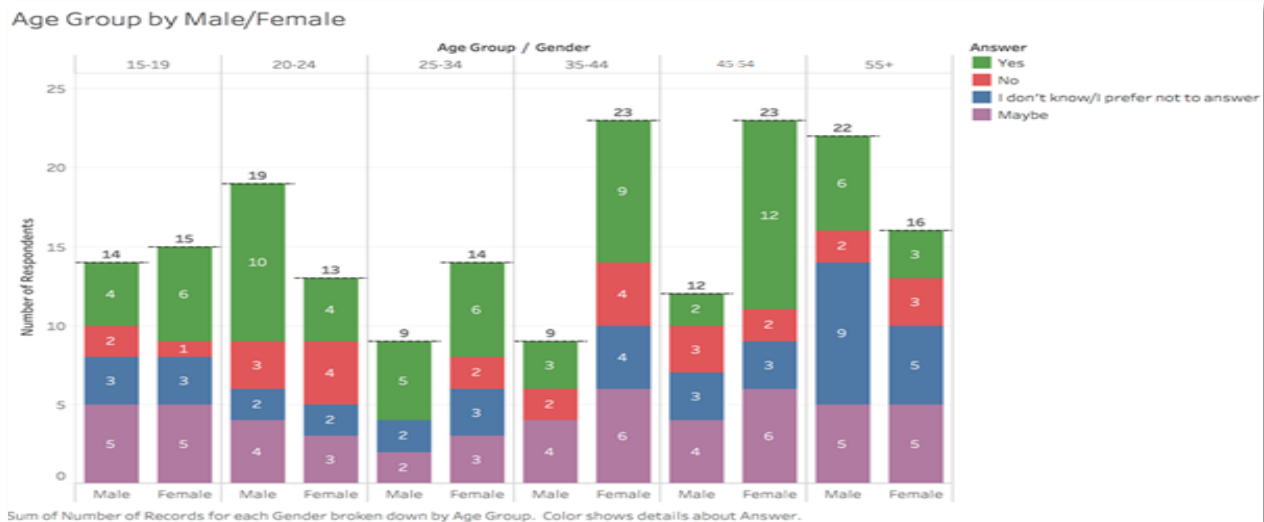


Figure1. Responses of the opinion poll

/	Yes		No		Maybe		Don't know/prefer not to answer		Total
	M	F	M	F	M	F	M	F	
15-19	4	6	2	1	5	5	3	3	29
20-24	10	4	3	4	4	3	2	2	32
25-34	5	6	0	2	2	3	2	3	23
35-44	3	9	2	4	4	6	0	4	32
45-54	2	12	3	2	4	6	3	3	35
55+	6	3	2	3	5	5	9	5	38
<b>Total</b>	<b>30</b> <b>(15%)</b>	<b>40</b> <b>(21%)</b>	<b>12</b>	<b>16</b>	<b>24</b>	<b>28</b>	<b>19</b>	<b>20</b>	<b>189</b>

Table 1.Results of the questionnaire

The weaker appetite of the age group of 15-19 years is undoubtedly justified by the lack of thorough documentation or sustainable education. At the same time, the results trigger a complex alarm signal, that from generation to generation, teenage "techniques" is continuously decreasing. There is today, a well-known, high percentage of young technicians, and this is due to inefficient practical training. For a more suggestive perception of the relative proportions of responses, the graph in Fig.1.It results in the percentage increase of indecision (39 marks), but also the poor involvement of young people.

**5. Discussion and conclusions**

The aspect thus denotes that adults and elders are the most responsive people towards the destiny of humanity. This idea, detached from some free discussions of the author of the present study with various people (not only with the respondents of the interview questionnaire), corroborated with some empirical conclusions drawn from the literature on the given topic, argues a progressive attitude for the youth between 20 - 24 years (32 marks) and a truly mature attitude for those over 45. On the other hand, the best score was scored by women aged 45-54, which signifies a paradox if one considers the paradigm that males are more technical but signifies a stronger, more authentic maternal determination, if the issue of the future of the children of the world is concerned.

In conclusion, public opinion in Romania is ready for a change aimed at introducing sustainable education for electric mobility into the curriculum. The decision makers of the Ministry of Education have a real argument based on the results of this study towards implementing a substantial change.

**References**

- [1] Tanțău, A., & Gavrilăscu, I. (2019). Key anxiety factors for buying an electric vehicle. *Management & Marketing. Challenges for the Knowledge Society*, 14(2), 240-248.
- [2] Hofstede, G., & Minkov, M. (2010). Long-versus short-term orientation: new perspectives. *Asia Pacific business review*, 16(4), 493-504.
- [3] Farrant, B., Armstrong, F., & Albrecht, G. (2012). Future under threat: Climate change and children's health. *The Conversation*, 9.
- [4] Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Harcourt Brace Jovanovich College Publishers.
- [5] Orr, D. 1992. *Ecological Literacy: Education and the Transition to a Postmodern World*. Albany: State University of New York Press.
- [6] Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R. E., ... & Munro, K. (2002). Economic reasons for conserving wild nature. *science*, 297(5583), 950-953.
- [7] Aguirre-Bielschowsky, I., Lawson, R., Stephenson, J., & Todd, S. (2018). Kids and Kilowatts: Socialisation, energy efficiency, and electricity consumption in New Zealand. *Energy research & social science*, 44, 178-186.
- [8] Urry, J. (2004). The 'system' of auto mobility. *Theory, Culture & Society*, 21(4-5), 25-39.
- [9] Nilsson, M., & Küller, R. (2000). Travel behaviour and environmental concern. *Transportation Research Part D: Transport and Environment*, 5(3), 211-234.
- [10] Kopnina, H. N. (2011). Applying the new ecological paradigm scale in the case of environmental education: Qualitative analysis of the ecological world view of Dutch children. *Journal of Peace Education*, 5, 15.
- [11] Farhana Borg, T. Mikael Winberg & Monika Vinterek (2019) Preschool children's knowledge about the environmental impact of various modes of transport, *Early Child Development and Care*, 189:3, 376-391, DOI: 10.1080/03004430.2017.1324433)
- [12] Scheiner, J., Huber, O., & Lohmüller, S. (2019). Children's mode choice for trips to primary school: a case study in German suburbia. *Travel behaviour and society*, 15, 15-27.
- [13] Helbich, M., van Emmichoven, M. J. Z., Dijst, M. J., Kwan, M. P., Pierik, F. H., & de Vries, S. I. (2016). Natural and built environmental exposures on children's active school travel: A Dutch global positioning system-based cross-sectional study. *Health & place*, 39, 101-109.
- [14] Stone, M., Larsen, K., Faulkner, G. E., Buliung, R. N., Arbour-Nicitopoulos, K. P., & Lay, J. (2014). Predictors of driving among families living within 2 km from school: Exploring the role of the built environment. *Transport Policy*, 33, 8-16.
- [15] S.B. Sigurdardottir, S. Kaplan, M. Møller. 2014 The motivation underlying adolescents' intended time-frame for driving licensure and car ownership: A socio-ecological approach, *Transport Policy* 36 (2014) 19–25, <https://doi.org/10.1016/j.tranpol.2014.07.001>
- [16] Boudet, H., Ardoin, N. M., Flora, J., Armel, K. C., Desai, M., & Robinson, T. N. (2016). Effects of a behaviour change intervention for Girl Scouts on child and parent energy-saving behaviours. *Nature Energy*, 1(8), 16091.
- [17] Benjamin K. Sovacool, b, \*, Johannes Kestera, Vimke Heidaa, 2019, Cars and kids: Childhood perceptions of electric vehicles and sustainable transport in Denmark and the Netherlands, *Technological Forecasting & Social Change* 144 (2019) 182–192

- [18] Batterham, D., Stanisstreet, M., & Boyes, E. (1996). Kids, cars and conservation: children's ideas about the environmental impact of motor vehicles. *International Journal of Science Education*, 18(3), 347-354.
- [19] E. Leeson, M. Stanisstreet, E. Boyes, Children's ideas about the environmental impact of cars: a cross age study, *International Journal of Environmental Studies* 52 (1997) 89–103, <https://doi.org/10.1080/00207239708711098>
- [20] Gilbert, H.; Whitzman, C.; Pieters, J.H.; Allan, A. Children and sustainable mobility: Small feet making smaller carbon footprints. *Aust. Plan.* 2017, 54, 234–241.
- [21] MacDonald, M. Early Childhood Education and Sustainability: A Living Curriculum. *Child. Educ.* 2015, 91, 332–341.
- [22] Kazhamiakin, R.; Marconi, A.; Perillo, M.; Pistore, M.; Valetto, G.; Piras, L.; Avesani, F.; Perri, N. Using gamification to incentivize sustainable urban mobility. In *Proceedings of the 2015 IEEE First International Smart Cities Conference (ISC2)*, Guadalajara, Mexico, 28 October 2015; pp. 1–6.,
- [23] Wells, S.; Kotkanen, H.; Schlafli, M.; Gabrielli, S.; Masthoff, J.; Jylhä, A.; Forbes, P. Towards an Applied Gamification Model for Tracking, Managing, & Encouraging Sustainable Travel Behaviours. *ICST Trans. Ambient Syst.* 2014, 1, e2.
- [24] Gordillo, A.; Gallego, D.; Barra, E.; Quemada, J. The city as a learning gamified platform. In *Proceedings of the 2013 IEEE Frontiers in Education Conference (FIE)*, Oklahoma City, OK, USA, 26 October 2013; pp. 372–378.
- [25] Holleis, P.; Luther, M.; Broll, G.; Cao, H.; Koolwaaij, J.; Peddemors, A.; Ebben, P.; Wibbels, M.; Jacobs, K. TRIPZOOM: A system to motivate sustainable urban mobility. In *Proceedings of the SMART 2012: The First International Conference on Smart Systems, Devices and Technologies*, Stuttgart, Germany, 1 June 2012; pp. 101–104.