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When, What and How to Teach about Electric Mobility? An Innovative Teaching Concept for All Stages of Education: Lessons from Poland

Katarzyna Turoń [1,*], Andrzej Kubik [1,*] and Feng Chen [2]

[1] Department of Road Transport, Faculty of Transport and Aviation Engineering, Silesian University of Technology, 8 Krasińskiego Street, 40-019 Katowice, Poland
[2] Sino-US Global Logistics Institute, Shanghai Jiao Tong University, Shanghai 200240, China; fchen@sjtu.edu.cn
* Correspondence: katarzyna.turon@polsl.pl (K.T.); andrzej.kubik@polsl.pl (A.K.)

Abstract: The implementation of new mobility solutions based on electric vehicles such as electric cars, electric scooters, and electric bikes, in urban transport systems, may bring several advantages for society, from environmental and economic benefits to improved quality of life. Nevertheless, we witness a scarcity of education and promotion that supports electric mobility, which can lead to social barriers due to the lack of knowledge. Consequently, people may be discouraged from using new transport technologies. The article focuses on electric mobility issues and present the original concept of electric mobility education. The goal of the work is to identify appropriate educational methods, useful during teaching about electric mobility at different levels of education. The concept focuses on education from primary school to long-life learning. Presented pedagogical concept is based on the three main pillars of pedagogy as diagnosis, forecasting, and content developing. It was developed based on expert research and diagnosed challenges and education gaps during teaching about electric mobility. The concept includes many techniques of education, from the classic methods as lectures and working with books to new educational solutions as e-learning. The original concept of electric mobility education creates new opportunities to promote electric mobility and support the process of creating new services in the electric mobility market.

Keywords: electric mobility; education about electric mobility; education for sustainable development; low-carbon education; urban transport systems

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1. Introduction

Implementing various types of new mobility solutions in urban transport systems, including electric vehicles, may bring many benefits to society from economic and environmental aspects to improving quality of life. Thus, all activities promoting sustainable transport gaining particular support in the form of subsidies, grants (i.e., H2020 Electrific or ERA-NET Cofund Electric Mobility Europe, etc.) from leading international organizations, such as the European Union or the United Nations [1–3]. According to their recommendations, it is advisable to look for different solutions to properly promote and disseminate knowledge in the field of electric mobility [4–6]. From the engineering and management perspective, many practical solutions are introduced to facilitate the interaction with electric mobility. An example of that type of activities are as follows:

- Implementing all shared mobility services, such as electric car-sharing, bike-sharing, moped, or scooter-sharing services;
- Providing campaigns promoting purchasing electric vehicles;
- Implementing tax exemptions or offering additional privileges for electric vehicle owners;
- Spreading patterns of new mobility with the use of electric vehicles including electric quads, rickshaws, Segway's, unicycles and electric skateboards.

In line with the global trend, electric mobility is developing in the world and in Europe. In the case of Poland, to which this article is devoted, electric mobility has become increasingly popular in recent years. Currently, 22,291 electric passenger cars are registered on the Polish market, and this trend increased by 117% compared to 2019 [7]. Although the trend for electric vehicle sales is not as intense as in the case of Germany, Great Britain, or France, complementary forms of electric mobility such as electric micro-mobility services are being intensively developed [7]. In July 2021, the e-scooter offer in Poland reached a supply of 37,700 units of vehicles, which is a value 3.5-times higher than in the start of the season in 2019 [8]. The market also offers 1000 e-mopeds in shared mobility services that operate in 19 Polish cities [8]. Furthermore, the number of electric scooters and private scooters is also growing. In 2020, it reached the value of more than 120,000 pieces [9].

However, equipping cities with new transportation technologies, while not connected with appropriate education and promotional activities for electric mobility, can lead to the emergence of many barriers in society. These kinds of barriers may be related to insufficient knowledge in the field of electric mobility or fears of using a new type of vehicle and transport technology. Then, digital integration may not bring quantifiable benefits from the point of view of public investment or infrastructure [10]. To protect society from the unpleasant consequences related to the lack of adequate knowledge of electric mobility, it is particularly important to pay attention to the role of education and pedagogy in the use of all types of electric vehicles [11]. It is also important to provide the gradual adaptation of society to new solutions appearing in urban transport systems [11]. Although these issues appear to be very important and should be widely considered by scientists the authors noticed that many scientific works on electric mobility focus mainly on aspects related to management, transport systems, economy, technical, or automotive issues [12–21]. However, there are few works directly dedicated to the subject of education in the form of methods and concepts of electric mobility education. The identified research papers that seem to be related to the subject of education relate mainly to ongoing research grants and their results in the form of recommendations for selected countries. For example, in article [22] the authors presented recommendations considers to the production of electric vehicles in Slovakia. The article is based on the framework but does not present a clear concept of the pedagogical methodology. In turn, in the article [23], the authors present a tool developed in the European Union project on electric transport, indicating the possibilities of using it in the educational process. In [24], the authors focus on promoting electric mobility and recommendations for local governments. In article [25], the author presents various scenarios to develop electric mobility based on which society can be educated. However, in the analyzed articles there is a lack on a specific methodological approach that would indicate what kind of methods and pedagogical content should be applied at different levels of education. In addition, there is a research gap related to concepts that would constitute fears and barriers related to electric mobility and may help create innovations and develop new services in the electric mobility market. To fill that research gap, the authors dedicated this article to the topic of education about electric mobility.

This work aims to propose the pedagogical concept of teaching about electric mobility and the idea of low-carbon technologies at various levels of education. Based on the performed research, it was proposed the original concept of electric mobility education from the lowest educational levels as primary and secondary education, undergraduate education to the highest levels like post-graduate education to adult education, and long-life learning. The idea is to present a pedagogical concept that will help teachers, business leaders, and influencers prepare content, products, and services suitable for the needs of society at different levels of education.

The article is presented according to the following structure: introduction, pedagogical background, methodology, results, discussion of results, summary.

2. Pedagogical Background

Similar to any other form of teaching, educating for electric mobility requires development of an appropriate methodology in the form of a general research strategy to identify educational methods that allow the acquisition of knowledge [26,27]. Although the educational process may seem simple to a person who has detailed knowledge in a given field, the process is complicated from the point of view of creating an educational concept and adapting it to the needs of society. Therefore, when creating new teaching concepts, many kinds of pedagogical approach are used. In the case of developing concepts in the field of transport education, an approach based on diagnosis, forecasting and content developing is proposed [28].

To correctly select education methods that will correspond to the assumed concept, it is necessary to develop the educational diagnosis process, which is the first step of the methodology [28]. The educational diagnosis is a process of analytically examining the learning problem, which may involve the identification of cognitive, perceptual, emotional, and other factors that influence academic performance or school adjustment [26,29]. It is used to diagnose the knowledge of society in a selected field [28–30]. The diagnosis process is used to establish an educational strategy that provides the appropriate methods and means to achieve the educational goals [28–30]. At this stage, interviews, focus meetings, or diagnostic surveys are conducted to get acquainted with the given educational problem [29,30]. After determining the social demand for education in selected area, it is necessary to move to the education planning stage related to forecasting [28]. The interdisciplinary nature of the issues related to teaching about electric mobility can be compared with research topics related to interdisciplinary environmental education [28–30]. This type of indication requires a particularly careful planning of the didactic process and the selection of appropriate teaching methods [28–30]. At this stage, a review of various types of methods along with the expected method of matching the subject of education to the proposed method, age group and level of advancement of recipients is prepared [28–30]. The third stage is the development of a ready-made educational offer tailored to the target group of recipients [29–31].

There are many methods of transferring knowledge and their classification. One of the most frequently cited divisions of teaching methods is the Szkosek's modified concept [32]. According to its assumptions, teaching methods can be divided into methods of knowledge assimilation (knowledge giving), problematic (self-inquiry methods), exposing, programable, and practical methods [32]. Over the years and with the development of technology, successively developed teaching methods have been added to the canon of classification. The division of teaching methods is presented in Table 1.

The complete guarantee of student activity in the teaching process is ensured by the appropriate educational methods selection [28]. Individual methods should not be mutually exclusive but complement each other. It is worth remembering that one method cannot be used alone [32–35]. It may be dominant during specific classes or courses, but should be supported and complemented by others, because of which the education process will be complete and correct [35]. Choosing the right teaching methods and techniques depends on many factors. These can include, among others [35]:

- Objectives;
- Content and didactic tasks;
- The age of the students, the size of the group;
- The time and place at teacher's disposal;
- The methodological and didactic skills of the teacher.
- These factors should be considered when designing learning content.

Table 1. Classification of teaching methods.

Methods	Description	Selected Techniques
Methods of knowledge assimilation (knowledge-giving methods)	Verbal transfer of specific content of education in the form of continuous structured expression, in an accessible form, consistent with the principles of logic.	Information lecture; talk; storytelling; description; lecture; anecdote; reading; explanation.
Problematic methods (methods of self-inquiry)	Ways of didactic work to solve theoretical or practical problems. The methods enable the functioning of passive knowledge, transforming it into active knowledge.	Activating methods (didactic game, drama, didactic discussion, hierarchy method, method of cases, situational methods, staging); mind mapping; observation and measurement seminars; interpretation from analysis and synthesis; posters; simulations.
Exposing methods	These methods equip students with a system of values that facilitates a life goal and learning about their own artistic creativity. Emotional activity dominates in these methods.	Active show and description; didactic film; vlogs; webinars; exposure; a show combined with an experience.
Programable methods	Methods using the structure of the developed syllabus.	Work with a book; work with the map; using a computer program; applications; E-learning platforms; E-content;
Practical Methods	The methods are based on practical and technical activity.	Show; subject exercises; laboratory exercises; production exercises; project method; the guiding text method; seminar; simulation.

Source: authors own collaboration based on [29–35].

3. Methods

Based on the pedagogical background presented in Section 2 and the approach to creating new teaching content, the methodology of the concept of electric mobility education has been proposed. The diagram of the stages leading to the development of the methodology of electric mobility education is presented in Figure 1.

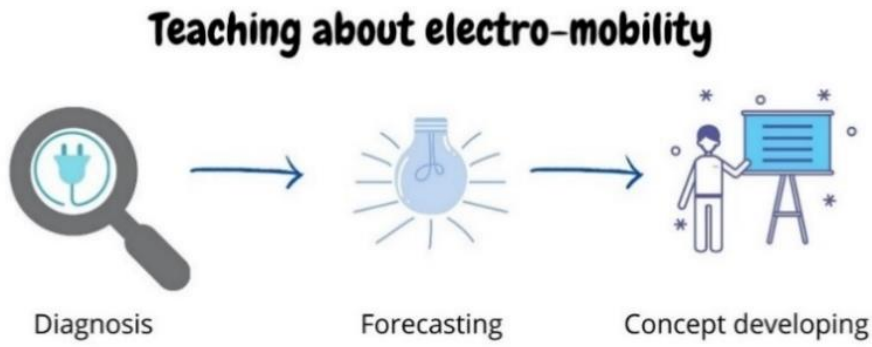

Figure 1. Structure of the education process in the field of electric mobility based on the three main pillars of pedagogy.

Based on the proposed methodology, a research plan for the work was developed. The research plan has been divided into the following stages:

- Stage 1: an educational diagnosis survey leading to the identification of educational gaps and concerns regarding the use of electric mobility;
- Stage 2: expert research among professionals related to the implementation of electric mobility to determine recommendations for the planned educational methodology;

- Stage 3: development of the concept with a juxtaposition of educational issues in the field of electric mobility and education methods adapted to the level of education.

The first stage of the research part was to diagnose problems related to the use of electric mobility services. The diagnosis consisted of identifying the object and the problems encountered during regular contact with the electric mobility to obtain information for remedial actions. The study was based on a purpose-based sample of the respondents. The survey was conducted on a group of people who use electric shared mobility services extensively and who were members of closed social media groups dedicated to electric mobility and shared mobility services. The purposeful-research sample was used due to the need for respondents to meet a specific feature, which was experience in using electric mobility services. In Poland, as electric mobility is in the initial stage of development, conducting research on a large sample would not be reliable due to the lack of experience in the use of electric mobility by the entire society.

The survey was conducted over the Internet using the Computer-Assisted Web Interview (CAWI) technique. The survey was available to Polish respondents in November 2020. As part of the study, the main research questions were formulated. The focus was on the following questions:

Q1: *What is your level of education?*

Q2: *What form of electric mobility do you prefer?*

Q3: *What is your experience with electric mobility (how long have you been using services)?*

Q4: *What do you think are the biggest gaps in electric mobility education?*

Q5: *What are the most common concerns about electric mobility based on your own experiences?*

The second stage is dedicated to expert research. The study was developed among professionals related to the implementation of electric mobility to determine recommendations for planned educational methods. Representatives of the electric mobility industry were invited to the study. Research was conducted online in December 2020 in the form of a structured video interviews. The research sample included 21 respondents. The number of experts invited to the study complied with the Mishin's minimum research group requirements [36], in accordance with Formula (1):

$$E_{min} = 0.5 \times \left(\frac{3}{p} + 5 \right) = 17.5 \rightarrow 18 \quad (1)$$

where:

E_{min}—minimum number of experts,
$p = \alpha$ is statistical significance, $\alpha = 10\%$.

Experts constituted a diverse group of representatives from various electric mobility sectors consisting of:

- Electric shared mobility providers who daily deal with the implementation and maintenance of sharing systems—11 representatives;
- Infrastructure providers (charging stations and parking spaces) for electric vehicles—3 representatives;
- Representatives of foundations fighting for the rights of electric vehicle users—4 representatives;
- Representatives of companies selling and servicing electric vehicles—3 representatives.

Due to the desire to reach people with real experience in the electric mobility industry, purpose-sampling was used. Based on their experience, the respondent's task was to identify:

Q1. *What skills and competencies should people have before they start to use electric vehicles?*

Q2. *What concepts should future and current users be familiarized with to increase their awareness of electric mobility?*

The third step was to develop the concept of teaching about electric mobility based on a detailed analysis of the available pedagogical methods (including presenting, expos-

ing, problematic, programed, and practical techniques), proposing appropriate forms of education and adapting educational content to them.

4. Results

The obtained results were divided into two parts. The first part is related to the developed survey and is presented as the 'Electric mobility knowledge—diagnosis' in Section 4.1. The second part related to the use of expert study methodology is presented as 'Results of Expert Research' in Section 4.2.

4.1. Electric Mobility Knowledge—Diagnosis

The study involved 195 people (n = 195), including 148 men and 47 women from Poland. The structure of the respondents is presented in Figure 2.

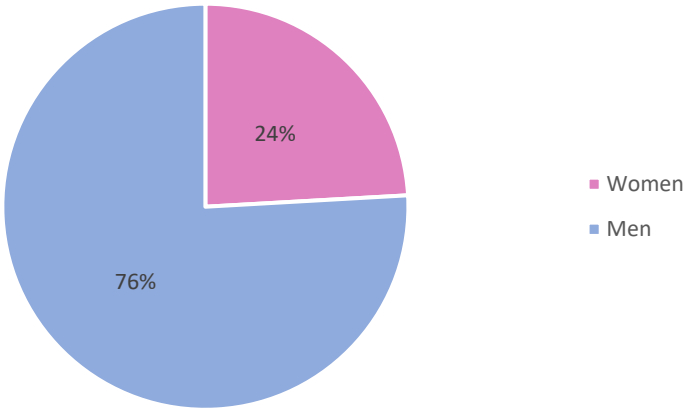

Figure 2. Structure of the respondents.

The demographic structure of the respondents who participated in the survey is presented in Figure 3.

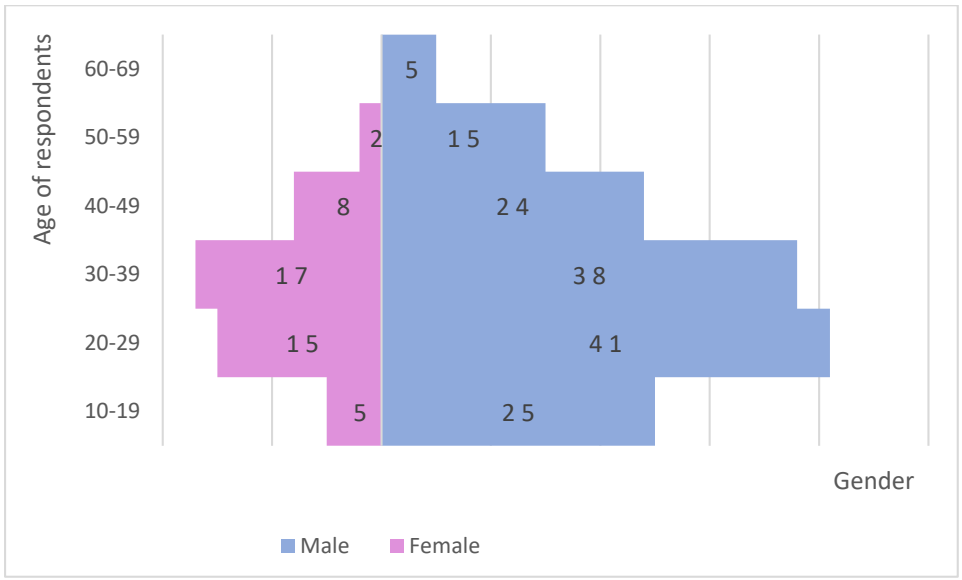

Figure 3. Demographic distribution of respondents.

As shown in Figure 3, the most numerous groups of respondents were people aged 20 to 29 (ca. 29% of respondents) and 30 to 39 (ca. 28% of respondents). The least numerous group was constituted by respondents aged 60 to 69 (ca. 3% of respondents). The respondents represented two levels of education: secondary (74% of the respondents)

and higher education (26% of the respondents). The structure of education is presented in Figure 4.

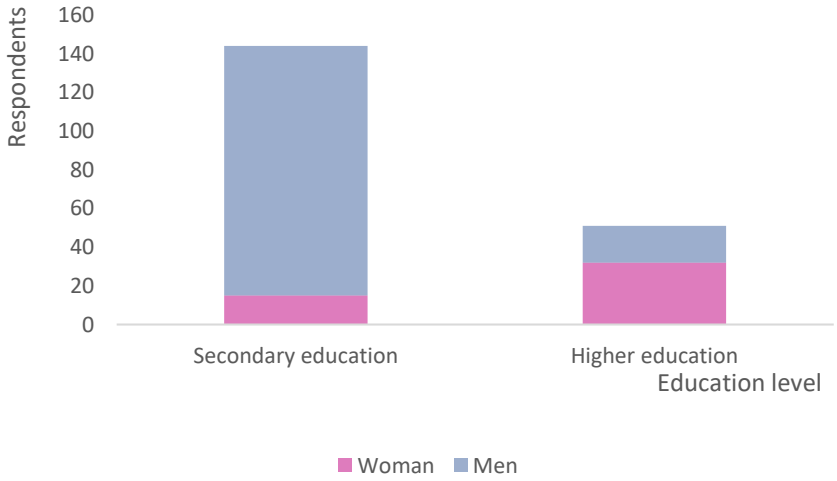

Figure 4. Structure of the level of education of the respondent.

In the case of questions regarding the preferred form of electric mobility, the most preferred services were e-bike sharing (27% of the respondents), followed by e-car sharing (25% of the respondents) and e-scooter sharing (22% of the respondents). The least popular were electric car ownership (14% of the respondents) and e-moped-sharing services (12% of the respondents). The heterogeneous distribution of the responses for this study was correct, as it was able to obtain answers to educational barriers and concerns about electric mobility from representatives of all forms of electric mobility. Detailed data are presented in Figure 5.

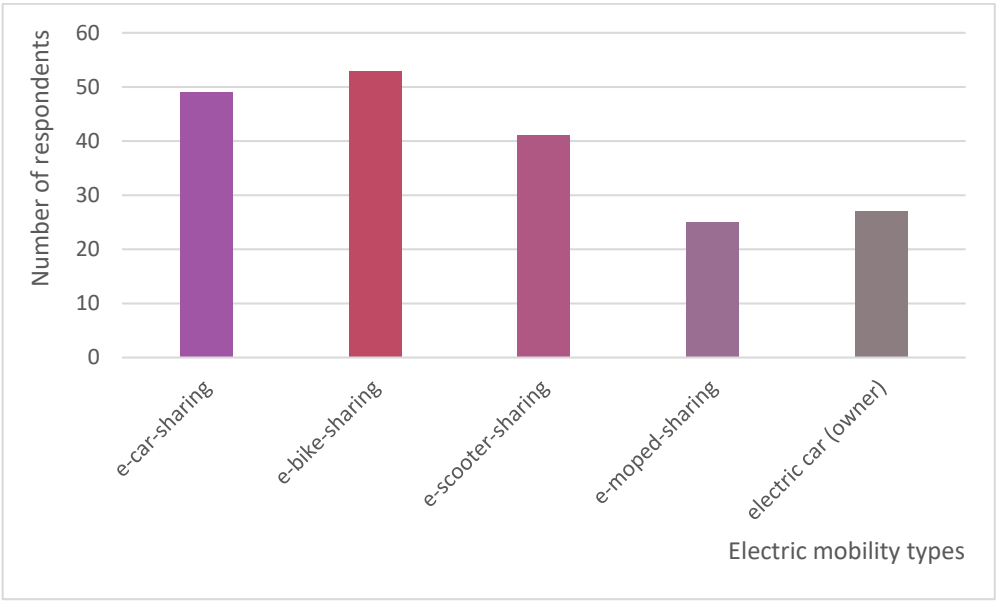

Figure 5. The preferred form of electric mobility.

The respondents had various levels of experience in the use of electric vehicles. As presented in Figure 6 most of them had one to three years of experience with electric mobility (58% of respondents), the second group had less than one year of experience (33% of respondents), and the last group had more than three years of experience with using electric vehicles (9% of respondents).

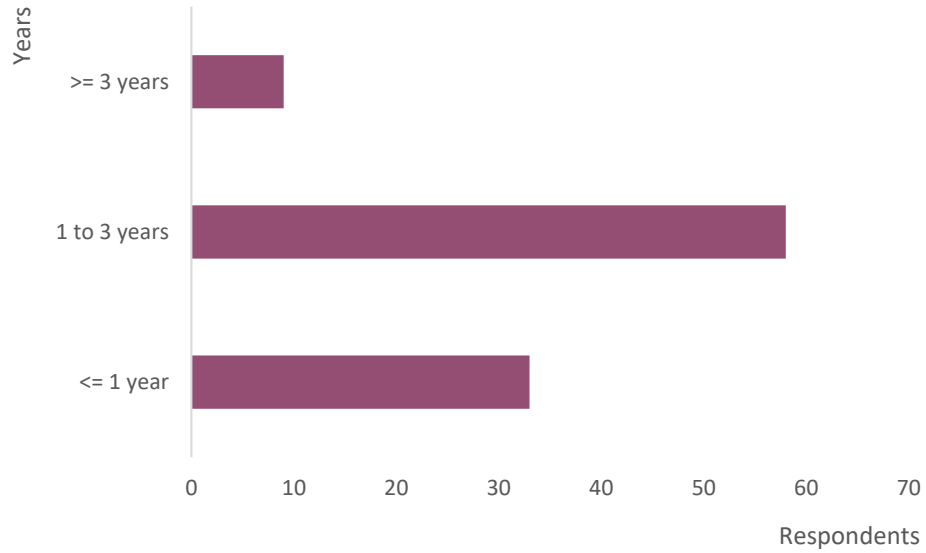

Figure 6. Experience with electric mobility.

The next task for respondents was to identify the most common knowledge and education gaps in their own experience during the everyday use of electric vehicles. The answers obtained were sorted and classified according to technical, social, economic, ecological, legal, and safety aspects and presented in Table 2.

Table 2. Diagnosed deficiencies in education in the field of electric mobility.

Area	Gaps in Education
Technical Issues	• Lack of or insufficient knowledge of how electric vehicles work, • Lack or insufficient knowledge of how to "refuel" the electric vehicle, • Lack or insufficient knowledge of how to connect or disconnect the electric vehicle to the charging station, • Lack or insufficient knowledge of the behavior when charging the electric vehicle, i.e., the order in which vehicles are loaded, • Lack or insufficient level of knowledge concerning technical aspects of vehicles' use, for example, connected with the necessity or lack of necessity to have additional equipment (i.e., a cable for charging a vehicle).
Social Issues	• Lack of or insufficient knowledge about the so-called new mobility culture connected to an inadequate level of education on the benefit of electric vehicles in urban transport systems, limited awareness of the privileges of using electric vehicles, lack of proper promotion related to the use of electric vehicles.
Legal Issues	• Lack or insufficient knowledge about the use of vehicles in electric sharing systems and technical or legal issues related to this, i.e., whether the vehicle is to be connected to the charger by the user or is performed by the system operator for it; whether sanctions etc. will be imposed on exceeding the permissible vehicle battery charge limit.
Economic Issues	• Lack of or insufficient knowledge related to the real costs of driving an electric vehicle, • lack or insufficient knowledge related to appropriate tax breaks or other discounts and applicable low-carbon mobility programs.

Table 2. *Cont.*

Area	Gaps in Education
Environmental Issues	• Lack of or insufficient knowledge related to possibilities of improving the quality of life and the impact on sustainable development thanks to the application of electric mobility in practice, • Limited awareness of the carbon footprint and clean transport zones.
Safety Issues	• Lack or insufficient knowledge related to the safety of using electric vehicles, i.e., issues of connecting the vehicle to the charger; concerns about the possibility of electric shock.

Another question asked of the respondents was to identify the main concerns related to electric mobility. The responses obtained the most frequently were sorted and presented in Table 3.

Table 3. Diagnosed main concerns in the field of electric mobility.

Area	Detailed Concerns
Technical Aspects	• Insufficient number of charging stations, • Insufficient performance of the charging station, • Poor technical condition of the charging station, • Lack of appropriate equipment at charging stations (cable), • The too short range of vehicle batteries, • Fear of poor quality vehicles.
Economic Aspects	• Increase in vehicle charging costs, • too high prices to own electronic vehicles.
Social Aspects	• Stressful use of vehicles related to the fear of not charging, • masquerading as a person using an electric vehicle.
Legal Aspects	• Unclear regulations, lack of precise regulations indicating clear tax exemptions or privileges
Environmental Aspects	• Fear of environmentally hazardous materials used in the production of electric vehicle batteries, • Fear of abandoning vehicles without recycling them, as in the case of scooter-sharing scooters, • Fear of the environmental risk of damaging the vehicle's battery,
Safety Aspects	• Fear of the battery exploding in the vehicle.

4.2. Results of Expert Research

From the point of view of expert research and the question of skills and competencies related to the use of electric mobility, the results made it possible to indicate which main educational aspects should be considered when teaching about electric mobility. The following aspects have been identified:

- Basic knowledge of the construction of an electric vehicle and its principles of operation,
- Basic knowledge about the maintenance (including daily maintenance) and servicing of an electric vehicle, e.g., how to check it is ready to drive,
- Ability to connect the vehicle to the charging station,
- the ability to assess the distance that can be traveled at a certain energy level in the vehicle,
- Basic knowledge of places where driving electric vehicles is allowed,
- Detailed familiarization with the model of the vehicle, especially the rented one–for example, in many cases of scooters, the braking or acceleration method of the vehicle differs,

- The right sense of speed–electric vehicles accelerate much faster than vehicles with combustion engines, which in the case of a sudden start or fast reversing may have unpleasant consequences.

The next step in expert research was to indicate what kind of educational content should be provided to electric mobility users to increase their awareness. The answers obtained, sorted by level of educational advancement, are presented in Table 4.

Table 4. Expert recommendations regarding knowledge in the field of electric mobility at various levels of education.

The Level of Advancement of Knowledge in the Field of Electric Mobility	Recommendations
Primary	• What is electric mobility? How are electric vehicles different from conventionally powered vehicles? What are the advantages and disadvantages of such vehicles? Where electric vehicles are used. Basic information about public transport based on electric vehicles, shared mobility, and e-automotive.
Intermediate	• What are the economic benefits of using electric vehicles? How to calculate the cost of using an electric vehicle? How to use electric vehicle chargers? What are the options for buying or renting electric vehicles? How to safely use electric vehicles while driving? Basic principles of maintenance of electric vehicles.
Advanced	• Technical issues related to the use of electric vehicles. What is the electric mobility market like in the world? What are the types of charging stations? How to plan the creation of its charging station at home? Principles of energy sharing. Rules for the use of electricity in transport and logistics. How to promote electric mobility?

5. Discussion and Results and the Concept of Teaching about Electric Mobility

The obtained results showed that there are many educational gaps and concerns related to electric mobility. The answers showed that most of the shortcomings are related to technical issues. Those issues relating to the construction of an electric vehicle, its equipment, basic information on its operation, and maintenance aspects. It should be noted that in the case of cars and scooters with conventional drive, issues related to the construction of the vehicle and maintenance are discussed in the core curriculum of driving licenses. When analyzing the current core curriculum for driver education in Poland, no detailed content related to the rules of driving vehicles with electric engines [37]. Interestingly, an analysis of electric mobility curricula showed that technical issues arise most often in graduate or postgraduate studies related to transport and logistics [38]. Then the main teaching issues are aspects related to electric and hybrid vehicles construction, operation of electric and hybrid vehicles, and electric mobility and renewable energy [37]. On the other hand, when analyzing teaching programs in the field of transport in Polish universities, it can be concluded that scientific specializations related to electric mobility are just beginning to emerge and technical issues related to electric vehicles are emerging in current education programs [37]. Therefore, it can be said that technical studies in terms of the use of electric mobility should have graduates of technical studies in the field of transport and logistics.

When analyzing other barriers and concerns the importance of social and legal aspects should be emphasized. Research indicates that there is a need of creating educational content concerning the basic nomenclature relating to electric mobility, as well as legal appeals regarding provisions implementing the Act on Electric mobility also in the context of European law. The approach from the point of view of social issues is also important. In

the case of Poland, an electric vehicle is considered a good luxury good [39]. Due to this, there may be many problems related to exclusion, including transport exclusion. Therefore, it is recommended to provide an appropriate introduction to electric mobility based on social aspects in educational content.

Another group of educational deficiencies is profitability and financial issues. It is worth considering the ambiguities in the field of taxation and allowances for electric mobility users. In the case of Poland, the subsidies for the purchase of electric vehicles undergo very frequent changes; therefore, it is important to first include this type of content in educational programs and then check the validity of these data [40]. It should be noted that the content of the program should include:

Issues related to the Low-Emission Transport Fund;

- Information on financing options;
- The number of funds and forms of support;
- Details of the procedure;
- Eligible people for support, conditions;
- Evaluation criteria;
- Support limits;
- Types of costs [40].

From the point of view of environmental aspects, when analyzing barriers and concerns, it is worth considering the statutory rules for the functioning of electric mobility in Poland, with particular emphasis on clean transport zones. It is also worth considering inspections and sanctions, as well as conditions for entering clean transport zones [41]. In addition, the results indicate that it is worth paying attention to the issues related to the circular economy and the aspects related to the recycling of electric batteries.

The research also showed how important it is to include information on the safe use of electric vehicles in educational programs. with particular emphasis on not only responsible behavior in road traffic but also issues related to proper behavior at the charging station and handling electricity.

When analyzing the barriers and fears considering the possible courses and trainings in Poland, it should be noted that most of them are dedicated to people at the secondary education level [42]. However, it should be noted that the courses and training mainly concern topics related to electric vehicle charging infrastructure for electric vehicles, electric mobility in the logistics sector, strategies for the development of electric mobility, implementation of electric mobility solutions for local governments [43]. No courses or training dedicated to children. What is more, in primary-schools there is a core curriculum covering Communication Education, but it also does not contain references to electric vehicles. According to the core curriculum, the subject aims to teach about 'safe participation in road traffic as a pedestrian, passenger, and cyclist' [44]. Detailed guidelines relate to the interpretation of road signs for pedestrians and cyclists, the maintenance and adjustment of its bicycle, as well as the preparation of it for safe riding [44]. Unfortunately, this base only considers the bicycle [44]. Therefore, it is not expected that a child can use an electric scooter or an electric quad as its driver. Instead, there is a real need to develop new program content, considering current mobility trends.

Furthermore, it is worth mentioning that both in the core curriculum of education and in the detailed syllabuses of courses and subject cards at higher education in Poland, there is no detailed information on the methods by which education about electric mobility could be communicated.

The Concept of Teaching about Electric Mobility

According to the established research plan, the next step was the development of the concept with a juxtaposition of educational issues in the field of electric mobility and education methods adapted to the level of education. The concept of education in the field of electric mobility was developed based on the results of the questionnaire, the recommendations of experts, and the education methods presented in Table 1. This section

presents the concept of an educational program adapted to the level of progress of students from primary school education to adult education and long-life learning. For each level of education, methods are proposed that can be used to impart knowledge.

- Teaching electric mobility in primary-school.

Content submitted at the primary school level should apply to the basic knowledge of electric vehicles. It is important to provide the student with the basic terminology and the necessary information related to the use of the electric vehicle. It is also important to shape the attitude of respect toward other road users, including other people using public chargers for electric vehicles. It is also important to focus on explaining the differences between an electric vehicle and a classic vehicle that indicate the benefits that the use of such solutions can bring to society and the environment. In addition, it is also important to familiarize students with the basic safety rules of using electric vehicles as a driver, for example, scooters, skateboards, or electric quad bikes.

Proposed educational methods: description and storytelling, videos and cartoons, talk cups, work with the book, quizzes, educational games, study visits.

- Teaching the electric mobility in secondary-school.

Teaching electric mobility in secondary school should be an extension of the information from primary school. It should be noted that, in addition to the descriptions or work with the book, students should be presented with many experiments, simulations, or videos that will present the use of electric vehicles in practice. Besides, as these are already people who can apply for driving licenses, it is important to present content related to the vehicle's operation, the right approach to charging the vehicle, vehicle maintenance, or the presentation of basic information about car-sharing electric systems. Furthermore, attention should also be paid to the issues of safe vehicle movement. It is important to form the attitude of a responsible user of transport, so it is also worth presenting the ideas of electric mobility against the background of the concept of sustainable development. Due to the shaping of social attitudes, attention should be paid to the presentation of social issues in the context of the perception of electric vehicles and their users. In the era of high youth advancement in Internet-based issues on Web 2.0 solutions, WebQuests or education using e-learning platforms, for example, to teach about environmentally friendly behavior.

Proposed educational methods: description and storytelling, mind mapping, movies, work with books, instruction, E-learning, E-content, applications, simulations, Web 2.0 tools, webinars, mind mapping, ICT platforms, thematic blogs, video-sharing platforms, study visits, meetings with experts.

- Teaching electric mobility in an undergraduate school.

The topics covering issues related to electric mobility will vary depending on the direction and academic discipline of the studies. In general, it should include comprehensive knowledge related to electric mobility. Students should be presented with comparisons of systems operating in the country and abroad. In addition, it is also important to focus on the presentation of vehicle operation in practice through study visits or demonstrations, or comparisons of a conventional vehicle and electric emissions. It is also important to use modeling and simulation to indicate the development of vehicles in transport systems. It is also worth presenting basic information related to the possibility of using an electric vehicle without the need to buy it, e.g., using car-sharing systems. Presentation of financial and legal issues is particularly important due to the work with people who are already at the stage of selecting a vehicle for their needs. The idea of electric mobility should also be presented from the point of view of sustainable transport development. It is important to use, in addition to classical teaching methods, Internet solutions such as e-learning or education while using ICT platforms.

Proposed educational methods: mind mapping, visualizations, WebQuest, web sites, video-sharing platforms, E-learning, E-content, applications, simulations, Web 2.0 tools, webinars, ICT platforms, thematic blogs, video-sharing platforms, study visits, meetings with practitioners.

- Teaching electric mobility in post-graduate courses.

The topics presented during post-graduate courses should be one of the most extended program contents. These should be training dedicated directly to electric mobility. It is important to then raise issues such as knowledge and the shaping of the skills necessary to conduct the technical assessment and operation of electric vehicles. In addition, it is also important to focus on explicit content related to economic education and balance sheet characteristics of energy transport systems based on electric mobility. It is necessary to pay attention to economic and legal issues, especially tax issues.

Proposed educational methods: WebQuest, video-sharing platforms, E-learning, E-content, applications, simulations, Web 2.0 tools, webinars, mind mapping, ICT platforms, video-sharing platforms.

- Teaching the electric mobility in adult education.

The content provided during education should be adjusted, so that information on electric vehicles is affordable both for people for whom such transport solutions are completely new and for people advanced in technology. Then it is important to demonstrate the benefits that the use of electric vehicles can bring to users with special consideration of financial benefits. It is also important to educate about the privileges that people using vehicles can get and to motivate users to change their transport attitudes by promoting electric mobility. It is important to develop educational blogs or create ICT platforms that can provide an additional source of knowledge, an alternative to a book that adults do not always want to find enough time for.

Proposed educational methods: work with the book, E-learning, E-content, applications, simulations, Web 2.0 tools, webinars, ICT platforms, lectures, seminars, video-sharing platforms.

- Teaching the electric mobility in long-life learning education.

The content provided during education should include presentation of the main assumptions of electric vehicle operation and the implementation of electric mobility. In addition, they should focus on indicating examples of using such solutions both on the domestic market and, in comparison to foreign markets. In addition, particularly strong emphasis should be placed on demonstrating the innovation of the solution and possibilities and perspectives offered by electric mobility at the national level and, above all, at the global level, following the main assumptions of the long-life learning method. It is worth focusing on legislative and financial issues that indicate possible benefits for society.

Proposed educational methods: work with books, E-learning, E-content, applications, simulations, Web 2.0 tools, webinars, ICT platforms, lectures, seminars, thematic blogs, video-sharing platforms, international lectures.

6. Conclusions

In conclusion, the work showed that in the era of current trends focused on the global development of the electric vehicle fleet, it is important to properly prepare participants for the transport revolution. This type of adaptation could be achieved using appropriate educational methods. However, it should be remembered that the content should be appropriately adapted to the methods and levels of education.

Research has shown that there are technical, social, legislative, economic, environmental, and user safety deficiencies in education and concerns about electric mobility. Furthermore, the research results indicate that currently, despite the development of electric mobility services on the Polish market, especially shared ones, there is a deficit in educational programs. Courses and training covering technical aspects have been shown to be dedicated to internships at the tertiary level, while a few courses covering general knowledge are available to the society of secondary education. It has also been shown that there are no courses and training dedicated to children. Moreover, the core curriculum implemented in primary schools does not consider any knowledge of electric mobility.

Gaps in knowledge about electric mobility are noticeable not only by its active users but also by industry experts. In addition, the research also revealed shortcomings in practical skills related to the use of electric vehicles.

The article presents an outline of the division of teaching into the content of an electric mobility program that can be applied at different levels of education. Based on the outline of the core curriculum presented in the text, educators can better develop appropriate scientific subjects. In addition, business leaders, influencers, and innovators, based on a prepared list of methods, defined concerns, and barriers, can prepare their services, products, and content according to the needs of the society. Additionally, the scope of knowledge presented in the text can also be used to create blog content, create e-learning materials, ICT platforms, and influencer content. Regardless of the method chosen, each form of dissemination of knowledge in the field of electric mobility could raise public awareness and focus its attention on solutions leading to the creation of the so-called responsible mobility. This solution has a chance to increase society's knowledge and thus can be used to achieve the intended educational goal in the process of creating and implementing innovations.

The proposed methodology applies to the Polish market; however, due to the broad approach to education at various levels of advancement, elements of the concept can be used successfully used in other countries that want to improve their education for electric mobility.

In further studies, the authors plan to carry out extended analyses to check the level of knowledge of electric mobility users representing other European and world countries. Moreover, in subsequent studies, the authors also want to focus on a broader spectrum of aspects related to the use of electric mobility, that is, issues related to security or open innovation. Thanks to this, it will be possible to make a comparison and prepare a general education program on electric mobility, for example, for the area of the European Union.

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