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ROLE OF BIKEWAYS PLANNING IN EDUCATION OF STUDENTS CIVIL ENGINEERING, ARCHITECTURE AND SPATIAL PLANNING FACULTIES

summary

In paper is presented the role of bikeways planning systems in students' education in transportation sustainable development of students of civil engineering, architecture and spatial planning faculties.

Opinions presented in this paper are based on own didactic experiences in the tutorial work in the Faculties of Building, Architecture and Environment Engineering of Lodz and Warsaw University of Technology and in Interfaculty Studies in Spatial Economy of Warsaw Agricultural University, where ranges and tutorial forms are different /lecture, workshops, design exercises, seminars and diploma works/.

In the author opinion using methodology of bikeways planning system in the educational process of students is very well didactic and creative instrument to obtain knowledge in sustainable development, because it gives following possibilities of learning:

- interaction between land use, transportation system and environment,
- structure and conditions of work and development of transportation system in the agglomeration and towns in sustainable context, and specificity of bicycle infrastructure particularly,
- conditions influencing for transportation in towns and bicycle planning system particularly,
- role of different save energy transportation modes in service of towns and agglomerations,
- interaction between urban and country sprawl and traffic safety,
- design of particular solutions of intersections and sections between intersections equipped in bicycle infrastructure,
- traffic calming solutions.

It must notice that results of education with bikeways planning network give satisfaction to students and to tutor in professional - engineers and urban planners point of view as well as pedagogical aspects. Conducted activities are very interested to students as well as to tutor. Students permanently are surprised new ideas and correctness of designing solutions and modernisation of all bikeways system or part intersections than bicycle infrastructure should be implemented. Main tasks of courses are achieved. Author observes significant changes in students' mentality to sustainable transportation and spatial development.

1. INTRODUCTION

In paper is presented the role of bikeways planning systems in students' education in transportation sustainable development of students of civil engineering, architecture and spatial planning faculties.

Opinions presented in this paper are based on own didactic experiences in the tutorial work in the Faculties of Building, Architecture and Environment Engineering of Lodz University of Technology (LUT) and in Interfaculty Studies in Spatial Economy of Warsaw Agricultural

University (WAU), as well as in the Post Graduate Studies of Urban Planning and Spatial Economy in the Warsaw University of Technology (WUT).

In the mentioned academic institutions ranges and tutorial forms are different /lecture, workshops, design exercises, seminars and diploma works/, as well as expectations and needs are different.

In the author's opinion using methodology of bikeways planning system in the educational process of students is very well didactic and creative instrument to obtain knowledge in sustainable development, because it gives following possibilities of learning:

- interaction between land use, transportation system and environment,
- structure and conditions of work and development of transportation system in the agglomeration and towns in sustainable context, and specificity of bicycle infrastructure particularly,
- conditions influencing for transportation in towns and bicycle planning system particularly,
- role of different save energy transportation modes in service of towns and agglomerations,
- interaction between urban and country sprawl and traffic safety,
- design of particular solutions of intersections and sections between intersections equipped in bicycle infrastructure,
- traffic calming solutions.

2. AIMS, METHODS AND SCOPE OF TRANSPORTATION KNOWLEDGE IN ARCHITECTURE, URBAN AND COUNTRY PLANNERS AND BUILDING AND HIGHWAY ENGINEERS

In opinion of author aims of education of students of architecture and town-planning and civil engineering and spatial economy studies, as also of listeners of postgraduate studies in town-planning and spatial economies are similar. During lectures and of exercises project- students should recognize whole of problems of transportation in urban and country planning and engineering problems of designing and construction of solutions of transportation infrastructure.

In accordance with author on architecture and town-plannings and spatial economy studies transportation problems should be more steered on planning problems, instead on civil engineering studies should take into account more problems of engineering designing.

Problems of traffic and infrastructures for cycles on lectures conducted by author occupies different size. At lecture 15 h per semester is to a maximum 2h and is connected with problem of traffic calming (together 3h). At course of lectures (30h) - studies of spatial economy and postgraduate studies possibilities of introduction monographic problems of bicycle traffic and infrastructures are greater - to 4h, and together with problems touristic utilizations of cycle carry out to 6 - 7h in course.

On architecture and urban planning - and of civil engineering engineering studies in Lodz University of Technology leading object has to disposal also exercises project-, till now 30h on price(from year 2006 - 15h), where problems of bicycle systems are one from elements all exercises project-.

During participation in this classes student must obtain knowledge of the principles and bases of transportation and highways engineering.

Traditional range of exercise of transportation conducted by author of this paper concerns to project of transportation networks in part of town, as well as an inhabitant zone. Student's task is the elaboration of modernization of transportation system to assigned conditions. He should solve: highways network, with classification of the streets, project of stretch of street, typical sections with characteristic equipment and project of pavement, parkings and garages networks, bikeways and pedestrians networks, service of public transport

/itinerary and stops networks/ as well as a concept of modernization of selected intersection. Designing of bicycle infrastructure in program for all students, is only a one element of exercise and it is not main subject.

This knowledge is a basis to active application of transportation solution in other specialistic subjects, for example: in urban planning, architecture or regional planning, as well as diploma work, where transportation knowledge is integrated with another aspects of urban and architecture planning and in different scale /region, agglomeration or quarter of the town/. Transportation systems is an element of urban space and simultaneously it is an creative element of this space, that why it is very important part of education of future architecture and urban planner. In author's opinion program of introduction to transportation education should be complexed and relatively simple to understand. The simplicity means presentation of the principle elements of transportation systems and interactions between this elements.

Complexity means presentation to students:

- interdependence between transportation system and land use,
- role of transportation policy in urban planning policy,
- function of different urban transportation subsystems;
- demands of different transportation modes in the traffic and in the rest, as well as in relation into passengers and goods modes;
- modal split,
- role of different category of urban arterials and urban streets in the urban highways network and in the urban spatial structure.

It's worth to mention that Architecture and Urban Planning Section in LUT is a one of not many of polish architecture faculties, where subject "transportation" is obligatory in students education. Education in transportation there is conducted since II year in class "Transportation". This class includes 15h of lecture and 30h of design exercises. It's very important, because transportation questions is a fundamental knowledge and capacities of architectures and urban and country planners, too. Location of this class in early semesters is a very good opportunity to use this knowledge in courses in higher semesters. For example in Faculty of Architecture in WUT "transportation" is a facultative class, selected by students, at the last year of the studies, only 1 h per week /15 total/. More over this class is located in the program of architecture and urban planning studies in penultimate semester, in autor opinion a few semesters later.

In author's opinion including methodology of bikeways planning system in the education al process of students of architecture and urban planning and building engineering is a very good didactic instrument, which gives the following possibilities of knowledge of:

- interaction between land use and transportation system;
- structure and conditions of work and development of transportation system in the agglomeration and towns;
- the role of different transportation mode in service of towns;
- design of particular solutions of intersections and sections between intersections equipped in bicycle infrastructure;
- traffic calming solution in urban areas.

3. BIKEWAYS NETWORK PROJECT AS EXPERIMENTAL EXERCISE IN TRANSPORTATION COURSE IN ARCHITECTURE AND URBAN PLANNING STUDIES

During the few last years at the Architecture and Urban Planning Section in LUT, author was conducted experimental exercises **is steering** into bicycle plannig network.

Author implemented the project of bikeways system into program of workshops for the students who were declared a desire to fulfil other subject of design exercise than traditional. In every year in the experimental program have participated 15 - 26 students, which elaborated project

of bikeways system of Łódź (in small group of 4 students) which made the same subject small and medium size towns that it could be facilitation for them. In the majority towns excluding Łódź¹ have took to analyse, bicycle was important transportation mode. Participation of cycle in modal split was near by 7 – 15% of all travels. Generally should be note that bicycle infrastructure in the analysed towns was very small developed.

Students working in Łódź area was divided into small groups /3-4 persons/, which elaborated projects to particular quarters of this agglomeration. Groups of medium size towns designed the bicycle network in all town. It must be noted, that all participants or head of group of experiment were inhabitants of the towns where they worked. They were active bike users in majority, too.

General purpose of executive exercise was elaboration of bikeways network in the town to existing stage of development of spatial structure and transportation system with selected detailed solutions of it's elements.

Scope of exercise was following:

- inventory of transportation network and urban functional space with evaluation of possibilities to create of bikeways network along the streets or crossing green zones,
- identification of principals places of sources and purposes of bicycle trips,
- identification of bicycle traffic model elaboration of desired lines,
- elaboration of bikeways model network,
- elaboration of bikeways network in the town, with classification of design network, according to types of bicycle routes,
- elaboration of specification of length by bikeway types and coefficients describing of designed network,
- elaboration of proposition of partial realisation of bikeways network,
- elaboration of schemes of situation plans of intersection before and after implementation of bicycle infrastructure, with conception of vertical and horizontal traffic organisation,
- elaboration of schemes of typical normal sections in the sections between of intersections before and after implementation of bicycle infrastructure;
- elaboration of elements of equipment of bikeways network, as parking elements, racks, schedules, directional signs and others elements of small architecture.

Inventory of transportation network and urban spatial functions, as well as analyses of plan of the town were generally principal sources of data of existing stage. Students made photoinventory to obtain data concerning of length of streets between building lines, length of existing walkways, carrigeways, green space, etc. Function and classification of streets network were taken from by Urban Master Plan of Town or other specialistic documents concerned transportation system. On the base of data of the same documents and on the base of own observations traffic conditions of traffic - road /volume of traffic and medium speed of traffic/ were evaluated and segregation or integration of bike and car traffic were decided. Characteristics of length and segregation space using of normal section have gave opportunities to estimate the type and localisation of bicycle ways. This method was used in Łódź.

Methodology applied to medium size towns was more complexed. Students obtained from Municipality results of survey of traffic volume and structure as well as data concerning of traffic safety /killes, injuries and accidents according the streets and type of accidents/. Therefore more detailed analyses of road and traffic conditions were accomplished in Płock.

¹ It must be note, that Łódź is a agglomeration in the centre of Poland where live 800 000 inhabitants and developed on the turn of 19th century and planned in typical of rectangular schedule. A bicycle infrastructure is composed of limited numbers of streets equipped with bikeways /to Łągiewniki Forest and to Pabianice/. There is also the large pedestrian zone in central part of Piotrkowska Street /main street/, where bicycle traffic is permitted. In majority of medium size town bicycle infrastructure is small developed, too.

Projects were elaborated in following spatial scale:

- master plan of bikeways network: - in Łódź 1:20000 /1:25000/ and in Płock 1:10000;
- schemas of modernisation of intersections 1:500;
- schemas of modernized sections: 1:100.

Generally all effects of presented experiment can be estimated as very good. Experiment provided very interesting results. Students elaborated preliminary projects of bikeways systems to Łódź and to selected medium size towns in the Region of Lodz /correspondingly 300 km and 60 km of length of different types of bikeways, as well as 60 and 30 of intersections and normal sections (before and after)/. Participants of experiment were very engaged in their work, because projects were practical, necessary and utilisable to development of bikeways systems in these mentioned towns.

Effects of experiments can be evaluated in two aspects: professional - engineers and urban planners and pedagogical. From professional - engineers and urban planners point of view, students have known:

- a new part of urban planning knowledge,
- a new domain very applicable in future professional live. They had possibilities to know professional literature concerning transportation system /author offered facilities of volumes of Velo-City and Velo-Mondial Conferences, too/. They elaborated projects at good professional level that can be submitted to Municipal Authority, as a presentation of possibilities of development of bikeways network in mentioned towns.

From pedagogical point of view didactics purposes were obtained too. Only two teams doesn't finish your job however they finished their project one semester later. Students had possibilities to learn collectivity and co-ordination of work between different teams, while are important skills for the future architects and urban planners. Collective work gives the possibilities to learn the comradeship and friendship. During fulfilling of inventory of urban space, they had possibilities to know better their own towns, as well green zones and urban structure. They improved their capacities of application of computer technic as well as manual drawing and photo capacities.

In the author's opinion using methodology of bikeways planning system in the educational process of students of architecture and urban planning is very good didactic instrument, because it gives following knowledge:

- elasticity of bikeways planning itinerary in urban space is a mean of better performance of duty of different elements of land use,
- needs of transportation service by different transportation means and by bike as well.
- design of bikeways systems as an element of ecological education and formation of mentality of sustainable development of future architects and urban planners.

For Author of this paper above experiment was a good occasion to hand over a part of own experiences concerning of transportation planning in agglomeration and designing of bicycle infrastructure to young colleagues.

In the part of tutor, this experiment required:

- professional and methodological capacities of "bicycle infrastructure" problems,
- preparing of essential materials,
- permanent supervision of teams design;
- permanent co-ordination between teams and learning students of this skill.

It has to be noted that the results of experiment would be presented to local authorities soon. This should inspire to the rapid development of bikeways infrastructures of these urban areas.

4. BICYCLE PROBLEMS IN DIPLOMA WORKS

Problems of bicycle traffic bicycle and infrastructures for cycles finds one's own image also in diploma works of I and II level of civil engineering studies conducted in in organizational units of Civil Engineering, Architecture and Environmental Engineering Faculty.

Problems of bicycle systems concerning to:

- integral element of diplomas works, which refer:
 - transportation services of select areas in town and agglomeration, in this of downtowns and of inhabitants areas,
 - element of designing road itinerary or interchangers, in this of itineraries of traffic calming through small towns and villages,
 - part of programme of improvement of road traffic safety in town or in administrative district,
 - zones and traffic calming itineraries,
 - transportation policies in great and large cities and agglomerations,
- with main problem in diploma work, as:
 - project of bikeway,
 - project of bikeways system of bicycle in town or in part of town,
 - subject of evaluation of bikeways system.

Range of bicycle problems in every from types of works mentioned above is different. Each work, although is elaborated in the base of typical methods their realizations is different, similarly as cities and sections of road itineraries which refers. Diploma works determine also object of application of methodical studies and of methods worked out by author of this report. Diploma works are also range of investigations of cases, which then are investigative material to scientific works.

Similarly as in semestral classes of design, executing of works relating to bicycle traffic traffic and infrastructure is large and interested intellectual survival for students and they participate with large engagement in their realization. Several from diploma works in especially high essential level supervised by author were presented in competitions high school diploma works of Ministry of Transportation and Building or in Polish Society of Urban Planners where had recived distinctions.

Most of works after their end is presented to authorities of cities, of which concerning or to different level of roads administration. Best works find application in municipal and district units or in units of road administration. This procedure concerns final diploma works executed on civil engineering studies in Faculty Building Engineering, Architecture and Environment Engineering of LUT and postgraduate from range of town-planning and spatial economies studies in Faculty of Architecture in WUT, too.

5. CONCLUSIONS

It must notice that results of education with bikeways planning network give satisfaction to students and to tutor in professional - engineers and urban planners point of view as well as pedagogical aspects. Conducted activities are very interested to students as well as to tutor. Students permanently are surprised new ideas and correctness of designing solutions and modernisation of all bikeways system or part intersections than bicycle infrastructure should be implemented. Main tasks of courses are achived. Author observes significant changes in students' mentality to sustainable transportation and spatial development.

Generally, it can say, that bicycle traffic and infrastructure is important question of sustainable development in high education in different studies concerning transportatation systems and urban and country sprawl.