EU LEONARDO DA VINCI PROJECT LT/01/B/F/PP-137 011

GUIDE

FOR OPTIMISATION OF VOCATIONAL EDUCATION AND TRAINING PROGRAMMES

CONTENTS

Introductory word

Curriculum optimisation is, perhaps, one of the most contradictory objectives in vocational education and training area. The term "optimisation" bears an economic connotation, therefore, programme optimisation requires not only to evaluate the situation in work sector and determine the undergoing changes and tendencies, but also evaluate and compare the vocational education and training programmes of one area within the scope of a concrete region or even the whole country. Vocational education programme optimisation, oriented to meeting new labour market needs and development of employability, requires a lot of time and efforts. On the other hand, during the process of vocational education and training programme optimisation, new qualification requirements emerge that have not been fixed in vocational occupation standards. It offers an opportunity to develop recommendations to renew vocational occupation standards, an important objective in the development of vocational education and training.

Vocational education programme optimisation also aims at expanding learner employment opportunities, and it also requires a lot of efforts and consideration while transferring activity sector needs into teaching programmes. A problem often arises when, after the investigation into work and qualification area, the results of the research are not utilized and teaching programmes are renewed on the basis of a rather superficial evaluation of the changing labour market demands.

The authors of this publication evaluated the experience of German, Finnish and Lithuanian educational institutions and suggest concrete programme optimisation steps which were piloted during the Leonardo da Vinci pilot project LT/01/B/F/PP-137 011 "Expansion of employability optimising vocational education and training programmes".

"A guide for optimisation of vocational education and training programmes" is a publication for the personnel of vocational education and training institutions, teachers and specialists who develop and renew programmes aiming at providing vocational school students with qualifications that correspond to today's labour market demands.

Authors of the publication

THEORETICAL FOUNDATIONS OF VOCATIONAL EDUCATION PROGRAMME OPTIMISATION

Vocational education and training programme optimisation directly relates to the optimisation of the curriculum seeking to satisfy labour market demands and interests and individual's expectations as much as possible.

The word "to optimise" (Lat. *optimus* – the best) means to find the best variant or possibility from the existing ones. Optimised *curriculum* should be realistic, economical and should guarantee employability and mobility in labour market.

Prof. R. Laužackas (Vytautas Magnus University) defines optimisation as coordination of the goal-based teaching with time and other resources. Optimisation resources lie in the strengthening of intersubject relationships.

Rapid economic, technological and social development exerts impact upon the need for new competencies and skills and often broadens the limits of current qualifications. This way, the process of vocational education and training optimisation creates new educational programmes that integrate knowledge and skills in different activity and science areas and also enhances the appearance and development of new vocations (a specialist in mechatronics, stylist-designer, etc.).

The structure and content of an educational programme oriented to the increase of learner employment opportunities should be rather different from a traditional vocational education and training programme with a narrow specialisation. The structure and contents of such a programme is more oriented to qualification standards or competencies based on the work, and the part of general education subjects is reduced to the minimum. However, the experience of the European Union countries shows that developing a vocational education and training programme oriented to the labour market demands, it is important to find an optimal relationship between professional knowledge and skill provision and personality growth. Orienting an educational programme to meet the requirements of labour market, educational methods have to be changed as well: learning methods particularly independent learning methods start gain preference over the teaching methods.

Experts from the German Federal Vocational Education and Training Institute Ute Laur-Ernst, Margret Kunzmann and Bernd Hoene (Development of Standards in Vocational Education and Training – Specification, Experience, Examples, 1999) present the following vocational education programme optimisation characteristics in the European Union countries:

- balanced structure, open to adaptation and situation requirements;
- activity and work basis providing more opportunities for practical experience-based learning;
- integrated, holistic attitude, when vocational education content coheres with general or academic subjects, and theoretical teaching is strongly related to the acquisition of practical experience;
- achieved balance between the teaching, oriented to labour market demands, and goals of individual personality development.

The following objectives of vocational education and training programme optimisation directed to the increase of learner employability can be discerned:

1. To focus attention on the environment favourable to independent learning, conferring mentor functions and objectives to the teacher and master and facilitating learner initiative.
2. To devote the main attention in the teaching curriculum and its organization to the most urgent qualification and competence demands.
3. To provide and develop competencies which would allow:
   3.1. To improve learner employment opportunities in the regional labour market. Means: cooperation with employers in the region, organization of practical teaching and on the job training in companies.
   3.2. To increase learner geographical mobility to improve employability. Means: cooperation with employers in other regions, their participation in vocational education and

training programme development, gathering and disseminating information about employment opportunities in other regions, organization of meetings with employers.

3.3. To empower the learners to find a job not only in one exact activity field (motor vehicle mechanics), but in other similar activity areas as well (industry: mechanics, mechatronics, equipment production and repair, etc). Means: to provide a broader set of subject competencies (technical knowledge, work with equipment and quality management skills), and core skills (communication, decision making and learning to learn skills).

3.4. To develop independent business creating initiatives. Means: provision of business knowledge and skills.

3.5. To increase the learner competitiveness with respect to Lithuanian and expanding European Union labour market. Means: constant technical, technological and organizational sector development in the foreign countries analysis and application of its results to the improvement of teaching programmes (e.g., with respect to implementation of new technologies in the sector and related new qualification demands), development of vocational foreign language knowledge and skills.

4. To take into account the increase of learning accessibility for people of various ages and vocational background: vocational school learners, employees, and the unemployed.

The implementation of these objectives allows for the use of various vocational education and training programme optimisation models. In this publication two vocational curriculum optimisation models are briefly discussed: a model based on work and learning fields which is popular in Germany and optimisation of the teaching programmes, supplementing them or changing different teaching modules adapting the content and teaching methods to the new demands and objectives of the world of work.

Work and learning fields based vocational curriculum optimisation consists of the following stages:

1. Evaluation of the initial learner vocational preparation level according to the chosen criteria. The purpose of the evaluation is to define learner vocational preparation adequacy to the requirements of the teaching programme. An interview method or test is used.
2. Adaptation of the learner current vocational preparation level and professional qualification to the qualification requirements defined in the curriculum. The purpose is to identify the gaps in competencies that are to be filled by teaching.
3. Learning and teaching stage. Learners learn in various modules.
4. Evaluation of the learning results – the acquired competencies and final adaptation to the concrete sector requirements (On the job training stage). At this stage learners, teachers and employers evaluate the acquired competencies by checking them in real work circumstances, possible correctable actions are foreseen that help to better adapt learner acquired competencies to labour market demands.

Vocational education and training, oriented to the learner employment opportunity growth, favours working process as a learning environment which determines appropriate teaching and learning methods: independent learning, learning in groups and project learning.

On the basis of work process analysis, the work didactical structure is discerned from the activity model. All the participants of the learning and teaching process should participate in the analysis of the work activity and its didactical structure: learners, employees, teachers of theory and practice, production masters. During the work activity analysis, learners and employees can provide information about such aspects of work that require more attention during the teaching process, due to their complexity and importance, should provide information where more vocational teacher or production master support and guidance is necessary.

Work activity analysis also helps to clarify assumptions for independent learning and its intensivity. Production masters and practice teachers can provide more comprehensive information about work activity technical and organizational requirements, activity organization process, technical means used, qualitative requirements for the work process and products, work safety and environment protection standards. Their major role in this process is to provide information about the workplace requirements for employee qualification.

Theory teachers, analysing work activity didactical structure, define the level of theoretical knowledge areas and theoretical preparation level, necessary to carry out the work activity; they look for methods of theoretical and practical teaching integration that guarantee the necessary theoretical and practical vocational preparation to carry out work assignments, investigate demands raised by general education knowledge areas (mathematics, physics, foreign languages, etc.) in solving concrete work tasks.

Masters and experienced qualified workers play an important role in the process of developing a vocational education and training programme optimisation model based on work and learning. Hans-Dieter Hopfner distinguishes the following curriculum designing work process-oriented methods: observation of typical work task performance carried out by qualified workers, interview of qualified workers and masters (Hopfner, 1995).

Performing work process observation and interviewing qualified workers and masters, the following work activity process aspects are discerned and analysed:

- The main tasks of a qualitative work peculiar to the work area under the analysis;
- Need for individual and group actions to carry out work tasks;
- Main criteria of qualitative work performance;
- Complexity of the performed work activities and their constituents.

Practically, the view would be as follows: workers are interviewed about the work they carry out; then a work activity task list is brainstormed. Later this list is checked, highlighting primary and secondary work activity tasks. In the text stage, workers define every work task in detail presenting the following information:

- Work content;
- Used work activity means;
- Used work activity methods and procedures;
- Work organization ways;
- Quality requirements for the performed work activity;
- Work safety and environment protection aspects.

The work task list with a detailed description of their content, thus, according to Hans-Dieter Hopfner, forms the basis of the curriculum oriented to the work process.

As it has been mentioned, learning environment plays a rather significant role in the work process-oriented vocational education and training; therefore, learning environment has to be similar to the real work activity as much as possible. The more teaching is related to modern work process, the broader the possibilities open for learners to acquire technical and social competencies that correspond to modern requirements (Hans-Dieter Hopfner, 2002). Due to this, theory teachers have to communicate with practice teachers and masters very closely organizing the teaching process together.

Nowadays in the European Union new tendencies are observed: vocational teaching programmes based on the teaching discipline are being changed by work process and competence based programmes. For instance, in Germany, "learning fields" are more and more being applied in vocational education and training programme development and design. "Learning fields" are didactically reflected work activity areas which make the basis of work oriented vocational education and training curriculum.

Discerning work area didactical content and transformation of the work areas themselves into learning areas is a complicated process that consists of work functional analysis and transfer of the necessary competence analysis results into the teaching programmes, and design of the learning and teaching situations similar and adequate to the activity process. Waldemar Bauer and Karin Przygoda (The Contribution of the German Pilot Project "New Learning Concepts within the Dual Vocational Education and Training System" Towards the Development of Work Process Related and Competence-Based Curricula, 2002) distinguish the following work problems in the process of designing work-oriented curriculum:

The problem of analysis

- How should work areas and work processes be analysed seeking to design a curriculum?
- What should be the methodology of work area functional analysis and its adequate methods?

The problem of transformation

- How to transform empirical work process functional analysis results to the curriculum taking into account the competence development issue? What are the pedagogical and psychological criteria of work functional analysis result transformation to vocational education and training curriculum?

The problem of systematisation

- How to cohere work area elements with the curriculum content aiming at vocational competence development process enhancement?

The main purpose of "learning area" based vocational education and training programme is to approach the process to the vocational work activity and foster the efficiency of the learning results in the area of increased employability. Therefore, for the construction of such kind of curriculum it is necessary to identify essential and most significant work

activity situations, as they encompass the most important learning potential.

Waldemar Bauer and Karin Przygoda, analysing "learning area" based curriculum pilot research, noted four criteria necessary for "learning area" construction:

- The origin of "Learning areas" lies in the main work areas;
- "Learning areas" have to be related to the processes of vocational work activity and business and have to express the processual nature of work and learning;
- "Learning areas" have to be described on the basis of competencies;
- "Learning area" content is structured according to the subject activity area logics.

Vocational education and training optimisation model requires thorough preparation and particularly comprehensive activity, and especially functional analysis, seeking to highlight the major programme inadequacies to the requirements of the world of work. Such programme optimisation and adaptation to the labour market demands is a long-term process, whereas the world of work is undergoing rapid technological and organizational changes. To evaluate these changes timely in the programmes of vocational education and training, their optimisation process have to be more rapid, and optimisation methods have to be flexible and adaptive. These features are characteristic to another model of vocational education and training programme optimisation, based on programme supplementing or changing by various modules, created according to the changing demands of the world of work.

Orientation of vocational education and training programmes towards the increase of employment opportunities implies re-orientation of vocational education and training from formal general vocational qualification standards and teaching subjects to more flexible modular work models that reflect the actualities of the labour market. Ute Laur-Ernst, Margret Kunzmann and Bernd Hoene distinguish two types of

dividing vocational teaching programmes into modules:

1. Division into separate teaching modules; learner achievement evaluation is carried out in every module separately.
2. Joining separate modules into a modular combination; learning achievement evaluation is carried out in all the modules together.

The choice of methods to be used in dividing the curriculum into modules depends on concrete teaching and learning situation demands and conditions.

Optimisation of vocational education and training programmes should be based on methodological principles which lead to different ways of solving vocational education tasks but allow to match the common curriculum content and structure. This does not suggest the appearance of identical teaching programmes all over the country. The main aim is to comprehensively evaluate the qualification needs in the target sector and research competencies necessary to perform tasks in identical work processes. One of such methodological principles was suggested during the GTZ project CURRENT (1998).

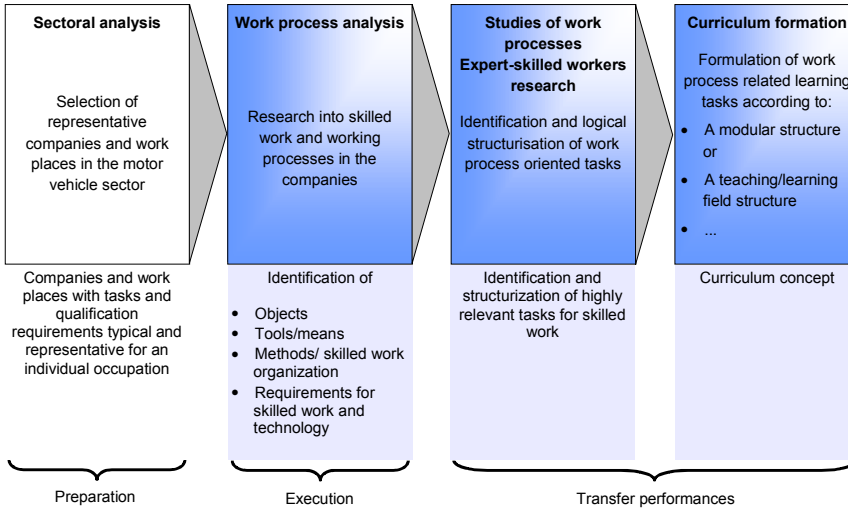

Fig. 1. Procedure and methodological framework preparing curriculum design

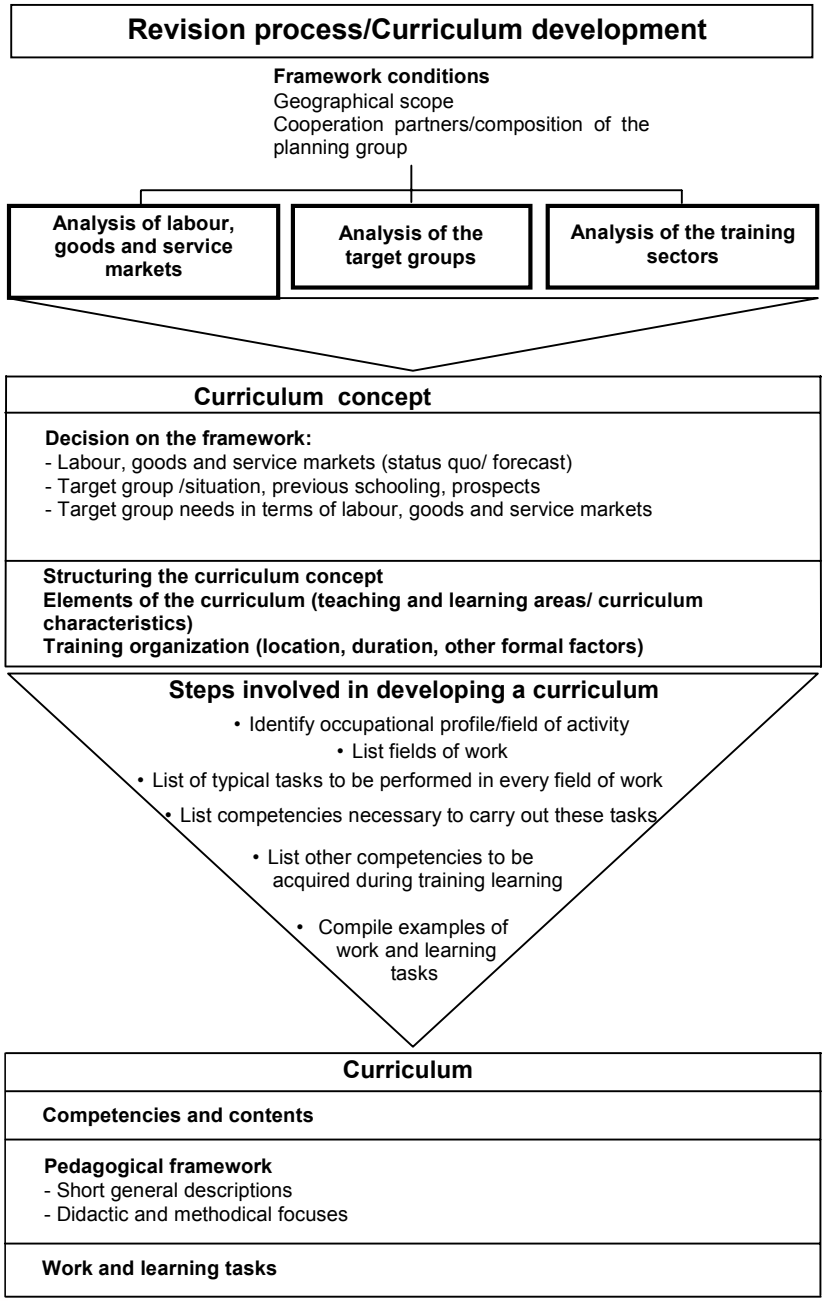

Fig. 2. Curriculum design and optimisation model proposed by CURRENT project.

The following framework for process analysis is suggested (Fig.1):

Step 1. Sectoral analysis.

Step 2. Work process analysis and evaluation of work tasks.

Step 3. Curriculum design.

In order to improve the current curricula by the development of new teaching modules it is recommended to perform the following curriculum optimisation actions:

- Work analysis including work sector research and qualification needs analysis.
- Qualification research and functional analysis.
- Analysis of the current vocational programme contents and its correspondence to the demands of the world of work.
- Improvement of the teaching programmes.

These actions of optimisation will further be more broadly discussed in other chapters of the publication. Here, their short definitions are presented:

Work analysis – research into the activities in a certain target sector (sewing, motor vehicle mechanics, administration, etc) in one's country and abroad: selection and analysis of the information about general and specific tendencies of work change in certain sectors.

Occupation (qualification) research - work process research aiming at the investigation of work activity vocational context – to search the vocational work activity from the inside, revealing all the work relationships, explore its goals, analyse organizational structures peculiar to that work activity, determine the competencies necessary to carry out a certain activity, identify learner current vocational knowledge and skills.

Curriculum comparative analysis is necessary to assess and compare what is required by the today's labour market and what is taught

at schools. Having chosen several major criteria (competence, final and intermediate teaching goals, relationship of practical and theoretical teaching, evaluation, etc.), analysis of some vocational education and training programmes in the same work area is carried out and adequacy/inadequacy of the teaching programmes to labour market demands is investigated.

Improvement of vocational education and training programmes – modification of the teaching programmes seeking to improve the teaching/learning process content, methodology and organization and increase the efficiency of the teaching process.

SECTORAL ANALYSIS

Analysis in the target work activity sector is the first step of programme optimisation (*curriculum* reconstruction) process. The analysis aims at collecting information about skilled work in a concrete work activity sector. Such information helps to identify the real demand for competencies needed to carry out work tasks in a skilled and qualified way.

During the sectoral analysis, the following factors significant for the work activity target sector are revealed and researched:

- work contents;
- employment perspectives;
- opportunities for mobility in the labour market;
- technological and organizational work activity innovations;
- number and distribution of companies and organisations in the target sector;
- need for specialization;
- challenges and demands caused by work changes.

Sectoral analysis includes the following areas:

- analysis of work structure in a concrete sector;
- research into employment conditions;
- work change and development tendencies;
- interrelation between work performers;
- technical and organizational work innovations;
- types of the existing and future products and services.

Action research is mostly performed when there is lack of deeper information about the nature of work activity in a certain sector, work models, applied technologies and work organization, qualification demands in the sector, etc. Action research is time consuming and is rather

complicated; however, it presents important and exact information necessary for further curriculum optimisation stages.

Major information resources for action research are as follows: statistical information provided by country statistical departments, review-analytical work sector articles, specialised publications, seminars and conferences oriented to the target sector.

Irrespective of a rather different motor vehicle mechanic work structure in partner countries, it is possible to find a number of unifying characteristics typical to this work and its sector: companies of various size work in the sector, work specialisation is diverse, initial and continuous vocational training is carried out in educational institutions and companies, etc. The analysis of these elements provides information necessary for the work process research. Due to the analysis, the necessary competencies and characteristics of skilled workers are discovered.

2.1. Research into motor vehicle work sector

In this chapter, a brief analysis of the work carried out in the motor vehicle sector will be presented.

The following work activity structure characteristics were researched:

1. Employment in the sector.
2. Job types (profiles) in the sector.
3. Number of companies.
4. Types of the companies.
5. Employees in the companies.
6. Business fields in the companies.

Characteristics of products and services (of motor vehicles):

1. Number of vehicles in the country and per inhabitant

2. Share of different types of vehicles
3. Technology trends in motor vehicle sector.
4. Customer needs.

Training institutions and their work fields:

1. Types of training institutions providing training for employees in the target sector.
2. Number of training institutions.
3. Number of graduates of the training institutions
4. Associations which support the sector (Chambers of Trade and Commerce, Trade Unions, etc).
5. Laws and rules regulating vocational education and training.

It is important to collect the necessary information according to all these criteria and assess its origin. The obtained information allows to estimate sector tasks relevant to qualification demands and assess the change tendencies in qualification demand.

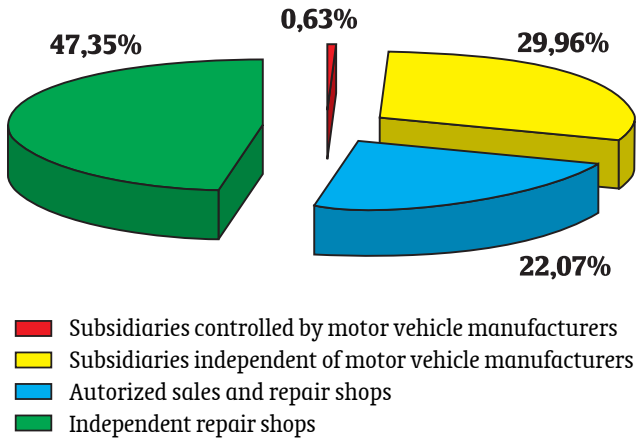

Fig. 3. Motor vehicle repair in Germany – sector structure.

Fig. 3 shows the structure of motor vehicle sector in Germany. Similar data can be obtained about other European countries. To clarify work contents in more detail, it is worth carrying out a case analysis of companies representing different work sector subgroups. It is not recommended to base the analysis only on, e.g., sale and repair shop subgroup analysis.

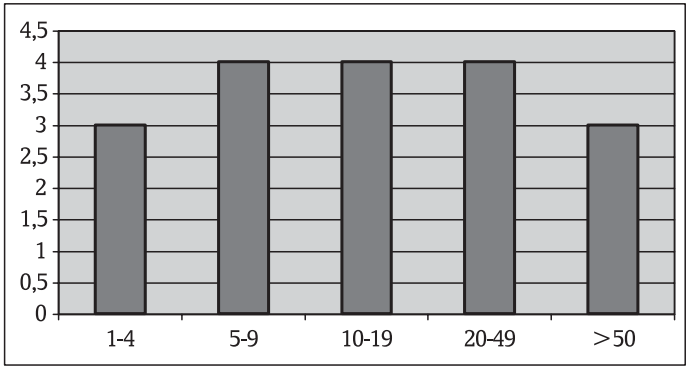

Fig. 4. Regional structure of motor vehicle repair workshops in Lithuania – distribution according to the number of employees.

Fig. 4 shows that in companies of different size, there exists different work organisation and employee responsibility.

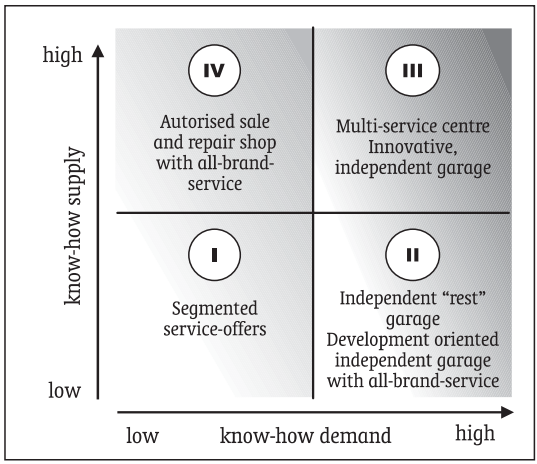

Fig. 5. Different types of motor vehicle repair workshops and their know-how demand in comparison with the available know-how supply.

It is possible to choose companies and training institutions for further work process research according to the sectoral analysis results. The selection of companies with typical employee numbers and business trends guarantees that the detected competence demand will be representative for the chosen sector.

Information presented in Fig. 5 indicates that such companies as individual "rest" garage do not require a large number of skilled workers, whereas multi-service centres need skilled employees able to provide all motor vehicle repair services. Thus, multi-service centres are more suitable for the analysis of work processes and work tasks.

Other criteria for choosing case studies are as follows:

1. Case distribution more or less corresponds to the structure of the workshop distribution within the target sector.
2. Companies provide continuous training.
3. Companies accept students for practical training.

Taking into account the above mentioned criteria, in Germany, 8 companies were chosen for qualification needs assessment, case studies and work process analysis.

Table 1. Selection of cases considering the results from sectoral analysis.

Cases	**Company type**	**Company size** (Number of employees)	**Trainees**
Case 1: BMW / town	C	III (18)	7
Case 2: VW / rural region	C	IV (39)	6
Case 3: Volvo / town	B	I (4)	2
Case 4: Audi / town	B	III (15)	3
Case 5: independent / town	D	III (15)	2
Case 6: independent / rural region	D	III (14)	4
Case 7: independent / town	D	II (9)	1
Case 8: independent / town	D	I (4)	1

Classification of companies:

A: Subsidiaries controlled by motor vehicle manufacturers.

E.g.: The car repair workshop is owned by BMW factory.

B: Subsidiaries independent from motor vehicle manufacturers.

E.g.: The car repair workshop is controlled by BMW, but it belongs to different owners.

C: Authorised sales and repair shops.

E.g.: The car repair workshop is has a private owner but this owner has a contract with the manufacturer (often called franchised car repair workshop).

D: Independent motor vehicle repair shops.

E.g.: Independent workshop without any contacts with any car manufacturer.

E: Motor vehicle dealers.

E.g.: The core of their business is motor trade, not repair service.

F: Repair shops specializing in the repair of components and aggregates.

E.g.: The car repair workshop only repairing single components, for instance, only electric systems.

E and F type companies were not selected for the research, as motor vehicle repair work is not carried out there. F type company specialisation is too narrow.

Motor vehicle repair companies in Europe are small (up to 50 employees), very often they are micro companies with up to 10 employees.

Table 2.

Classification / VET optimisation project (employees)		Classification / according to theEU (employees)	
I	1–4	S1	0
II	5–9	S2	1–9
III	10–19	S3a	10–49
IV	20–49	S3b	50–249
V	>50	S4	250–499
		S5	500–1999
		S6	>= 2000

Note: According to the EU standards, a small and medium company is defined as entity having not more than 250 employees, with an annual turnover up to 40 million EUR, an annual balance sheet total not exceeding 27 million EUR, and is not owned by 25% or more by a non-SME.

In Lithuania, project partners carried out a motor vehicle service survey, where participants were 18 Kaunas region companies. Motor vehicle service sector companies were selected by random sampling: 10 motor vehicle repair companies, 5 – truck/bus repair companies, 5 – agriculture motor repair companies. 10 companies were selected from towns, others from rural locations.

According to the number of employees, companies were grouped into 5 groups: 1-4, 5-9, 10-19, 20-49, and over 50 employees (Fig. 6).

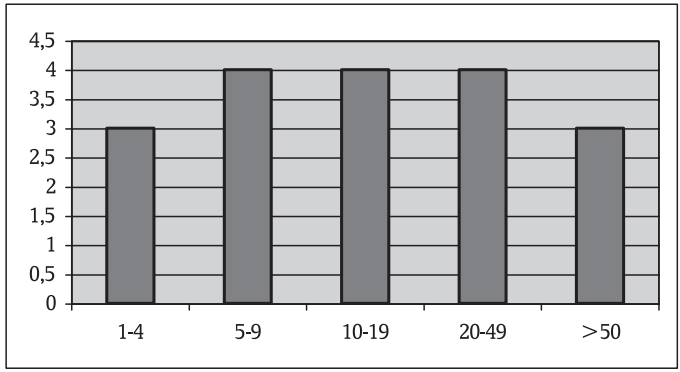

Fig.6. Companies according to the number of employees.

The average number of employees in small companies (from 1 to 4) is 4 employees, 5-9 – 9, in 10-19 – 14, 20-49 – 30 and > 50 – 67. The average number of the repaired motor vehicles is distributed respectively: – 4,9 – in companies with 1-4 employees, 3,9 motor vehicle – in companies with 5-9 employees, 8,1 – in companies with 10-19 employees, 16,9 – in companies with 20-49 employees, and 4 – in companies, where the number of employees exceeds 50 (Fig. 7)

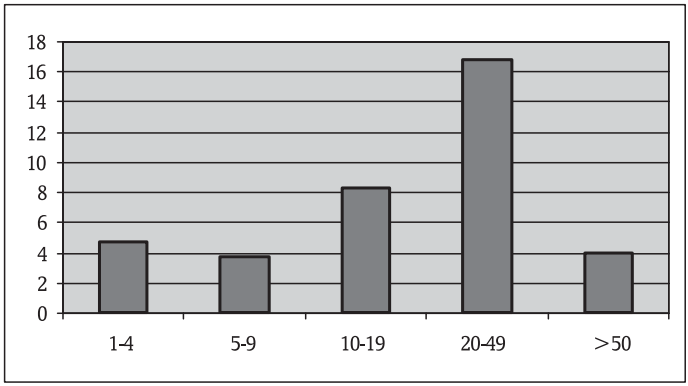

Fig. 7. Companies according to the number of repaired motor vehicles.

In all five-company groups, skilled workers, engineers and sales specialists comprise the largest number of employees. In small companies (1-4 and 5-9 employees) there are no unskilled workers. The largest number of unqualified employees work in medium size companies (20-49 employees). The distribution of skilled workers and engineers is almost proportional in all the company groups. Trainees/students are mostly

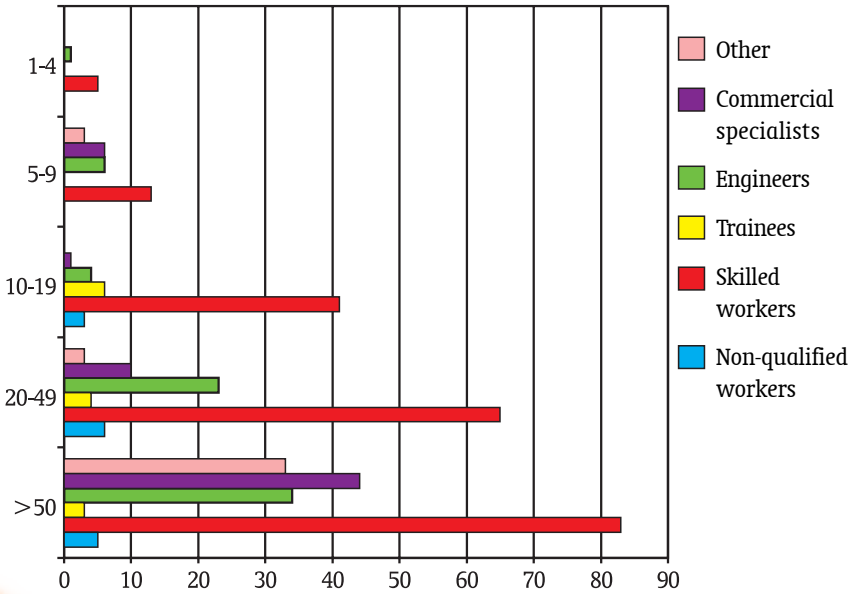

Fig. 8. Composition of company personnel.

employed by medium companies (10-19, 20-49 employees), whereas small companies do not tend to receive students for practical training. Sales specialists usually work in large and medium size companies (20-49, >50). The number of these specialists is directly related to more diverse and broad larger company activity. Large companies carry out repair work and carry out transit, logistics and similar services.

Medium service companies (20-49 employees) are best technically equipped. They have the highest number of motor vehicle lifts, computer technologies, software equipment, engine electronic inspection systems, diagnostic equipment, exhaust gas measurers, axle measuring equipment. Companies with 10-19 employees can be characterised by similar technical basis. Small companies are technically the weakest: only some of them have motor vehicle lifts, computers and programming software, engine electronic inspection systems, diagnostic equipment. Neither of the surveyed small companies had axle measuring and exhaust gas measuring equipment.

All the company groups are clearly specialised according to the repair tasks. In small companies, the largest amount of work is taken up by small repair work and additional installation and diagnostics. Work is performed taking into account the existing technical basis. Small companies do not perform car body repair work. Repair work makes up to 70% of all the work carried out in companies with 5-9 employees. As well as small companies, they do not perform inspection and body repair work. Companies with 10-19 employees specialize in repair work. Medium companies (20-49) are mostly occupied with inspection, repair, and body repair work; besides, communication with colleagues takes a large amount of time. Diagnostics and communication with customers take a smaller part of time. In large companies (>50 employees), repair work covers over 60% of the whole company work. In these companies, other kinds of tasks take a large amount of time as well. Summing up, it is necessary to state that companies mainly specialise in repair and body repair work. The broadest specialisation is found in medium companies (20-49 employees).

This research considers the responses of medium companies as most important because of two reasons: best technical basis and broadest

specialisation. Assessing competencies, incidental responses were excluded. For instance, if company responds that body repair work is important, but the company itself does not perform body repair work, such responses were excluded as insignificant.

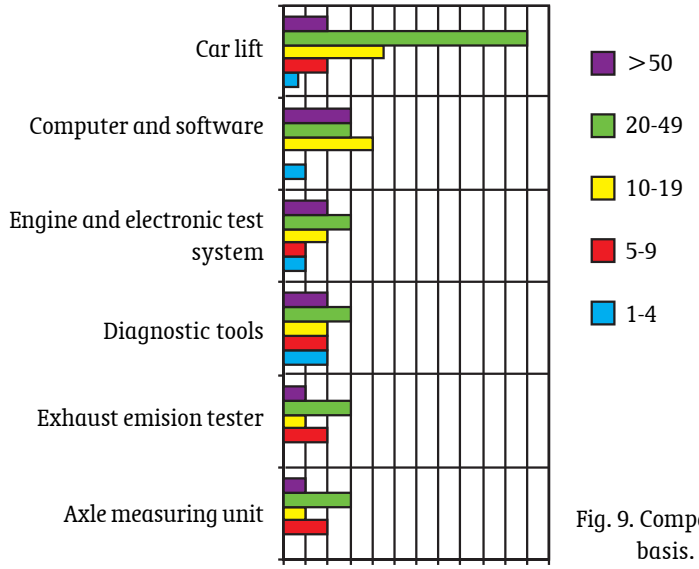

Fig. 9. Company technical basis.

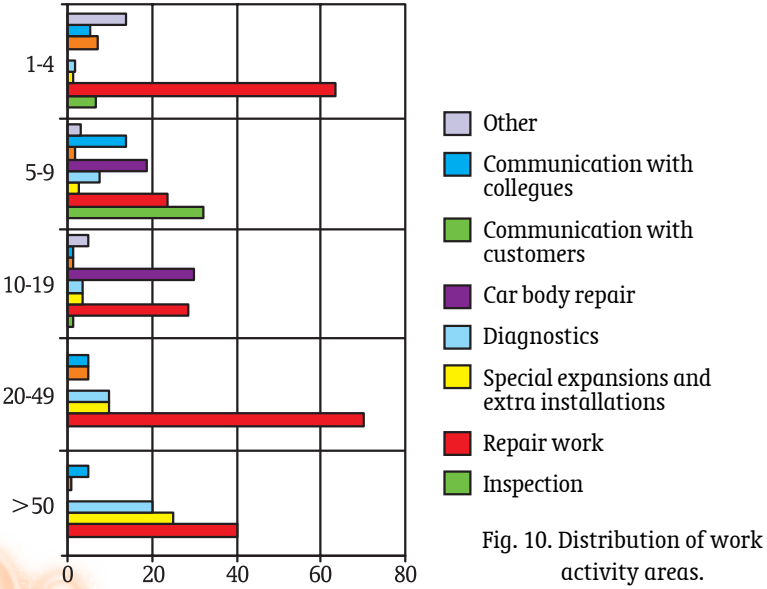

Fig. 10. Distribution of work activity areas.

OCCUPATIONAL (QUALIFICATION) RESEARCH

Occupational (qualification) research is:

- Identification of professional knowledge and competencies of skilled workers and mutual interaction in the learning process;
- Identification of knowledge and skills necessary to carry out the tasks.

Action research is performed by experts and skilled workers by sorting out typical work activity tasks according to a certain logical sequence. Experts are employees who have the highest qualification and sufficient work experience, able to provide a lot of information about work activity demands and tasks.

Occupational (qualification) research employs work activity observation, specialised interview or conversation with experts methods. In this case, immediate researcher relationship with actual practical work activity is of utmost importance. Researcher skills, competencies and use of specific work terminology play an immensely important role. Therefore, it is recommended to match expert conversations with direct work process observation.

Occupational (qualification) research oriented to vocational education and training has some specific characteristics in comparison with similar research in other areas:

- Work activity tasks and processes become the main research objects.
- Technology is analysed in the context of work and vocational education and training, not as abstraction, as it happens in exact and natural sciences.
- Qualified work and its formation, not general work performance characteristics, is the focus of the analysis.
- The main focus is on the issue of structurising awareness, favourable for learning and taken from practice, and its development logics, not on specialized systematisation.

- Vocational education and training didactics and aspects related to the world of work are more important than methods of uncontextual didactics.
- Action analysis and occupational research is enough to identify work structure and understand work relations. Action process research provides deeper analysis of the work content and determines the following: a) the level of work process awareness necessary for formation of vocational education and training processes and occupational standards (development of vocational education and training plans); b) insight into the formation of the relationship human-machine, computerized equipment and other work activity systems taking into account the quality of qualifications necessary to provide their service.

Occupational (qualification) research consists of the following stages:

1. Selection of work processes.
2. Analysis of objective realities that form the work process.
3. Identification and formulation of preliminary research questions.
4. Preparation for the research: identification of the research field.
5. Research performance.
6. Assessment of the research outcomes.

Occupational (qualification) research is usually used to carry out the following functions:

a) To determine central work objectives and work processes in the company.

b) To investigate and stream internal work relations and use this data to form appropriate special work objectives.

c) In a separate occupation there can be rather many work objectives (up to 80); therefore, they have to be reviewed and re-examined. This work activity can be carried out working together with an expert – a qualified employee.

Having performed the stages "sectoral analysis" and " work with an expert-qualified employee", essential curriculum optimisation work can be started. Up to that moment appropriate work relationships, general and specific work processes, objectives, certain activities and structures of the processes that make up these work activities, technological and technical work process relationships important to curriculum, structure design and development have to be analysed.

It is necessary to identify work objectives suitable for teaching/ learning and based on company work processes. To set learning and work objectives means to carry out the following tasks:

- to define company work goals,
- to examine their usefulness in creating **work –oriented** teaching;
- to assess the existing learning opportunities;
- to choose teaching goals and group processes according to a certain order;
- to organize and prepare a task and
- to formulate an assignment.

Vocational teacher is not the only person responsible for this process. Company authorities, "experts of practical training", skilled workers and learners themselves have also to be involved into this process (Fig. 2).

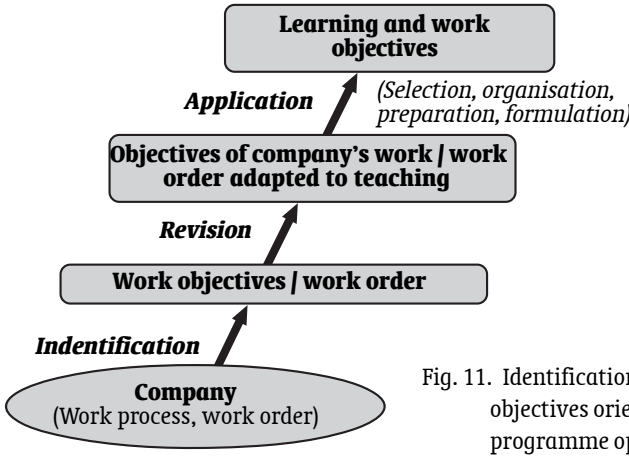

Fig. 11. Identification of learning and work objectives oriented to the teaching programme optimisation (scheme).

All vocational education and training participants should take part in the learning and work objective identification process. Several learning and work objective identification methods and procedures could be used:

- research into qualified work,
- research into work order in the companies where practical training is carried out,
- various projects, performed in companies where practical training is carried out,
- external situation analysis,
- preparation of supplementary material and supplementary teaching aids,
- exchange of ideas with the students and initiation of idea competition.

In order to develop learning and work objective justification and **check** if the objectives are suitable for the learning processes, the following major questions have to be answered:

- "What products are manufactured by the company or what products could it manufacture for its customers"?
- "What services are provided or could be provided for the customers?"
- "What is the structure and sequence of the whole business process including production and service provision (from the order reception to delivery)?
- "What task performance in this business process are the qualified workers of the researched occupation responsible for?"

It is quite easy to answer these questions. For instance, students can investigate these questions in companies and present the obtained data. The following information resources could be referred to: company documents, booklets, catalogues, technical drawings and plans of company departments, machinery and equipment, instructions, books and data bases. Besides, a lot of information can be found on the Internet.

In many cases it is advisable to plan company and its work research to get a more meaningful and deeper information about work objectives and order. A detailed questionnaire or detailed research scheme has to be prepared with the main research questions emphasised. Such an instrument turns an unsystematic visit into the company to target-oriented research. Without a careful preparation it is impossible to carry out a thorough and objective investigation of the work processes. Next to a comprehensive work relations' evaluation, it is very important to identify the details of the work place and survey the employees seeking to obtain more and diverse information. The most interesting aspects of such kind of research are those work objectives and problems that are solved by the surveyed employees themselves and that will have to be solved by the students in the learning process.

Research goals have to be agreed on with the company. It has to be emphasised that the research aims at finding more about qualified work, seeking to improve the process of vocational education and training and renew it according to the labour market demands. Company authorities usually tend to support such measures.

Research into the goals and objectives of the work carried out in a company/work sequence

- Kinds of service (repairing, maintenance, installation, assembling – fitting, supplementary objectives, document administration, delivery, etc.).
- Applied technologies, production equipment, machinery, tools, supplementary aids.
- Work organization, work methods, work processes (assembling - fitting, installation, regulation, filling in).
- New technologies, products, work forms.
- Produced products/sub products- components/, areas of their application and use.
- Requirements for final and interim services, production process, work organization.

- Requirements for employee qualifications.
- Applied technologies and work organization alternatives.
- Problems, "critical points", arising during production, service provision and activity organization processes.

The selected work objectives have to be investigated, analysing learner learning opportunities and related teaching content (Fig. 2). In the company, the appropriacy of objectives to teaching is assessed by subject and practice teachers.

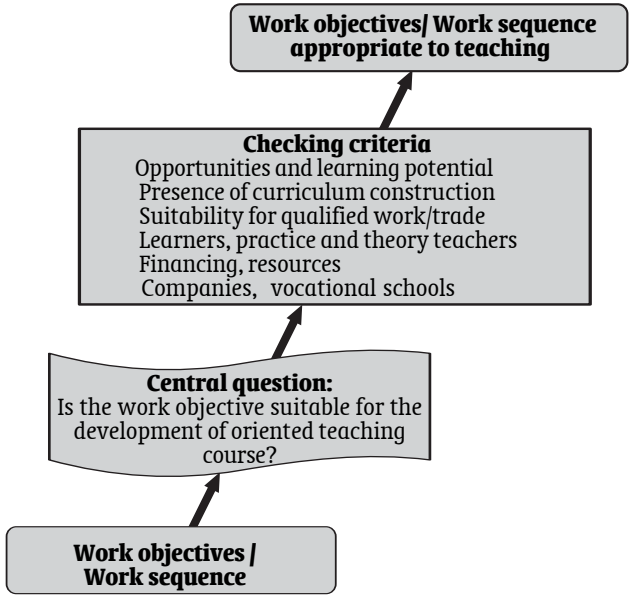

Fig. 12. Research into work objectives (schematic sequence)

3.1. Composition of occupational (qualification) research

It is possible to distinguish the following major occupational (qualification) research components:

1. Work process stages / activity specifications and their relationship of their mutual interaction.

2. Work objectives.
3. Qualitative requirements for work performance.
4. Work safety and environment protection requirements.
5. Technical, technological, organizational and methodological work place specifications.
6. Work organization specifications.
7. Competencies necessary to carry out the work.

3.2. Work process stages

Work process stages are determined and distinguished according to the inner logics of a work process. Bob Mansfeld distinguishes four main work process classification models:

- Linear work stage sequence, e.g. listening to the customer's complaints, trouble-shooting motor vehicle system or sub-assembly, repair work, checking the performance of the repaired units and systems, return of the motor vehicle to the customer and performance of payment operations.
- Cyclical work process structure: to design, realize, evaluate, and introduce changes in the designing stage.
- Differentiation of separate product and work results, e.g., perform chassis diagnostics, power-transmission diagnostics, engine control system diagnostics, etc.
- Differentiation of separate work processes and methods: to perform diagnostics, repair work, technical maintenance, etc.

Cyclical work process structure is applied for many production and service sphere work areas. Here, an important role is played by control function which interrelates the manufactured product or performed service quality control or service performance and planning stages. Classification method application depends much on professional work logics; therefore, it is important to choose such work stage classification method that is

adequate to this logics and is related to work functions. Thus, it is necessary to evaluate the place and importance of work stages for the general work context, taking into account specific work features related to the organization (e.g., in many large motor vehicle service companies customer reception, diagnostics and repair work is carried out by different employees or work groups, whereas in smaller companies these functions are performed by the same employees). In this case, it is necessary to consult the specialists of a concrete occupational area who could provide the necessary information about work process organization and its specific features.

3.3. Work objectives

Work objectives are determined with regard to the current realia and perspectives for its change. For this purpose expert method, work process observation, employee survey and other methods are used.

According to the nature of the work, work objectives can be grouped into the following categories:

1. Technical-subject objectives. These are specific objectives characteristic to the work area. For instance, to perform the diagnostics of the engine starter with the help of computerised diagnostic system, to change the shock absorber, to perform wheel balancing, etc.
2. Work process control and planning objectives which are closely linked to technical objectives. The main work process control objectives are to identify the material and technical resources necessary for the work performance, to plan the work process, to carry out quality control during the work process, to constantly check the suitability of the chosen work methods and implement them.
3. Professional communication and cooperation at the workplace objectives: to develop good cooperation and communication relations with co-workers, to cooperate efficiently, to communicate

with customers and co-workers, to apply work-in-groups methods.

4. Work organization objectives are related to problem solving, decision making, and suggestions regarding work organization optimisation, adaptability to the changing work requirements. For instance, work distribution among the employees; search for work productivity and efficiency increase possibilities.

3.4. Qualitative requirements for the work

These are qualitative requirements for the work and its products which can be informal, determined by the company's internal quality policy regulations, and formal, determined by official national and international work and its products quality standards. Qualitative requirements involve quality control for the work and its outcomes, prevention and correction of inadequacy procedures and measures.

3.5. Work safety and environment protection requirements

Work safety and environment protection requirements in many cases are universal in their nature; nevertheless, their importance for concrete work depends on the work area and work nature. Electrical work safety requirements can be taken as an example, requirements for its safety or rules of storage and utilization of the used oil products (lubricating oil, other lubricants).

3.6. Technical, technological, organizational and didactical workplace specifications

Information about the workplace specifications is obtained by workplace analysis. Analysing a workplace, the following parameters can be distinguished:

1. Schema analysis of a workplace, its role in the general work process and its functional purpose. A scheme is created depicting all the functional links, inputs and outputs characteristic to the workplace,

such as material provision, processing and interim or final outcome delivery to the customer or to another workplace for further processing.

2. Creating a logistic workplace material provision scheme, depicting the routes for all the necessary material provision.
3. Description of workplace technical and technological specifications: what equipment, appliances, instruments are used in the workplace, what are their technical characteristics, requirements for their maintenance and technical service, characteristics of economical exploitation, level of deterioration and depreciation parameters.
4. Description of workplace informational provision: what information necessary for the job (technical drawings, technical specifications, schemes, quality requirements, equipment service instructions, work safety requirements) is used in the workplace, how it is presented and located in the workplace (For instance, how safety requirements, technical drawings, schemes are presented, if an employee can always refer to the necessary information resource, etc.). How much is the workplace information, in its content and forms, adequate to the activity requirements? For instance, if quality requirements are clearly defined, if the whole necessary information (measurement tolerances, etc.) is placed in the schemes and technical drawings.
5. Characteristics and schemes of infrastructures used at work (electric power, water, gas, compressed air, etc.).
6. Specifications of workplace safety, such as what protective measures are used during the work process (protecting clothing, eye-glasses, earmuffs, ventilation measures, respirators, etc.)?
7. What are the employee's functions in the workplace maintenance, material and technical provision areas? For example, to inform motor vehicle workshop masters and suppliers about the needs and shortage of material, details and technical equipment.

3.7. Work organization specificities

In this area, work organization forms and their links with work specificity are analysed and described, efficiency of the applied work organization forms is analysed, recommendations for efficiency increase are presented. Analysis of the suitability and efficiency of work organization forms is performed taking into account the requirements of concrete work organization forms for employee occupational qualifications and competencies. For example, individual professional work in small companies and work in groups usually requires broad and polyvalent knowledge and skills. Professional work in large companies, distinguished by specialised work areas, requires even deeper professional knowledge and skills in separate work areas.

3.8. Competencies necessary for the work performance

On the basis of the information collected during the occupation (qualification) research stages and with the help of experts in a concrete work area, it is possible to define the necessary competencies, their nature, relation between general and subject-technical competencies, the depth and povalency of the necessary knowledge and skills for every work stage.

In every occupation (qualification) research stage it is important to take into account the perspectives of work change: changes happening in work organization, quality requirements, technical, technological and logistic parameters of the work place, work safety and environment protection requirements and their impact upon the demands for occupation competencies.

Occupation (qualification) research outcomes can be presented in tables and schemes.

3.9. Technological and organizational work sector change and its impact upon optimisation of vocational education and training seeking for employment growth

Sector: motor vehicle technical diagnostics and repair

Technological change			
Current situation	**Current situation in most developed motor vehicle industry and service countries**	**Tendencies of future technological changes**	**Impact of changes upon the optimisation of vocational education and training of motor vehicle mechanics**
In Lithuanian, the majority of motor vehicles are used motor vehicles, imported from Western Europe, made at the end of the decade before the last – beginning of the last decade. The number of modern motor vehicles with the most advanced computerised engine control, transmission, comfortability and safety systems is rather low. The most developed motor vehicle service activities are chassis and engine diagnostics and repair and car body repair	Implementation of new technologies in motor vehicle industry: electronic and microelectronic motor vehicle sub-assembly and mechanism control systems: engine, petrol injection, ignition, navigation, transmission, four drive wheels, driving gears, ABS, electronic ETC/ASR control, safety systems. New materials: plastic, electroplate, high power steel cover, insulating materials, catalysts. Implementation of complex mechanical, hydraulic and pneumatic systems. Rapid tendencies in car industry technology rationalization and standardization are observed; motor vehicle producers transfer the growing part of industry (production of sub-assemblies and mechanisms) to the third companies, whereas themselves concentrate in construction, design, technological research and assemblage areas. This has impact upon the tendencies of assimilation and standardisation of construction of separate motor vehicle units. However, individual producer characteristics prevail in such areas as diagnostics, especially engine diagnostics. Motor vehicle service technological basis also changes, especially in the area of diagnostics: computerized diagnostic equipment is used for engine control checking or laser diagnostic system is used for driving gear tuning. New requirements for exhaust gas control cause the appearance of special exhaust gas checking technologies. Meanwhile, old motor vehicles, having no elements of the above mentioned newest techniologies, disappear from the market.	Main tendencies: 1. Implementation of computer management technologies in motor vehicle systems: chassis tuning, wheel angle alignment, control of lightning intensity, etc. 2. Motor vehicle construction optimisation aiming at increasing ecological and economical qualities of car maintenance (Ultra Low Emission Vehicle), use of new materials - use of light steel for car body and chassis production, production of metal catalysts reducing the quantity of exhaust gas, etc. 3. Further standardisation of motor vehicle industry, assimilation of car sub-assemblies and mechanism constructions produced by different manufacturers. Implications for car service technologies: 1. Development of the use of high technologies in motor vehicle diagnostic and repair areas (engine and chassis diagnostics and repair). 2. More attention to the maintenance of motor vehicle maitenance economic and ecologic characteristics.	1. New knowledge and skills necessary in the special areas of electronics and microelectronics; related new demands for formal and continuing vocational education and training. 2. Necessary knowledge and skills in a new car diagnostic system use. 3. Knowledge and skills in work with new materials area, requiring a close cooperation between car industry, sales and service company employee vocational training areas. 4. Demand for specialised knowledge and skills in a complex mechanical, hydraulic and pneumatic system diagnostics and repair area. 5. Rapid changes in motor vehicle industry technologies place demands on motor vehicle diagnostic and repair specialists to get more interested in motor vehicle industry technologies and their change. 6. Due to the growing standardisation of motor vehicleconstructions and technologies and changing work organization in motor vehicle service companies, the demand increases for motor vehicle service specialists with broad qualifications.

Having carried the functional analysis, general competencies should be taked into account; they are important for today's world of work and often trespass the limits of several occupations. Thus, having identified the need for qualifications and carried out the functional analysis, it is possible to design teaching programmes oriented to both, to special knowledge and skills necessary for the chosen sector and to the general competencies.

Dertouzes (1989), Kristensen (1998), Schienstock (1999), and Hitt (1998) distinguish the following most important general competencies:

- Intercultural cooperation competencies;
- managerial competencies;
- social competencies and communication skills;
- traditional competencies determining approach to the activity (reliability, rigour);
- creativity and entrepreneurship.

3.10. Practical recommendations how to perform occupational (qualification) research – interview with specialists and work observation

Occupational (qualification) research requires investigation of the actual work process, analysis of its parameters and specifications. Depending on the size of the target sector and types of different companies, it is necessary to choose a different number of companies to reveal the actual situation.

Work place research is an essential instrument not only for researchers, but also for teachers as well seeking to determine the major work areas and main competencies necessary to perform a concrete vocational work activity. The advantage of such research type for teachers is the opportunity to be introduced with the main problems, applied equipment (apparatus), methods, work organization, etc. This allows to organise teaching and learning oriented to the work objectives and problems and increase

motivation (when learners test their knowledge practically in motor vehicle service companies).

It is important to relate workplace research in the companies and educational institutions to compare qualification demands with the teaching supply.

Practical advice:

1. Contact company owners or other responsible persons and ask for permission to visit workshops and perform employee interview during 1-3 days. If possible, ask for permission to use recording equipment.
2. Prepare a questionnaire for the workshop authority people.
3. Prepare a questionnaire for the workshop specialists.
4. Observe the whole process of the customer orders starting from the first contact to the return of the motor vehicle to the customer. Assess the following:
   - Which employees participate in all the work process stages;
   - The number of orders and smaller work tasks in each of the working areas;
   - Papers and forms in the business and work processes.
5. Observe the work of specialists to understand the difficulties they face and the necessary competencies for solving the workshop problems.
6. Talk to specialists (skilled workers) and find out how they overcome the difficulties (what kind of equipment is are necessary, how they handle it, how they communicate during the work process, how they share and use each other's experience, etc).
7. Explain the purpose of your visit to the company's employees and ask them to fill in the questionnaire.

The main case research outcome is a received overview of the following:

- The working areas (their contents, their share in the common work);
- The work organisation in the company;
- The competencies of the skilled workers necessary to solve the problem and perform the tasks.

Having researched the work process during the workplace research, using observation and interview methods, the research outcomes are evaluated further.

The following aspects of the work objectives are important for vocational education and training optimisation evaluation:

- *complexity*
- *frequency* and
- *importance* for the profession.

Assessment is performed after the interview of the skilled workers has been carried out.

For the work process research and for the assessment of its outputs it is important to choose such companies and such employees that best represent the experience in the sector. Work process analysis requires performing a deep overview and reflection of the skilled employee work content. Further some practical advice follows:

- Skilled workers should accept you. Respect their cultural background and experience.
- It is necessary to speak and discuss technical questions.
- Allow an employee to be aware that you are interested in his experience and knowledge.
- Ask an employee to “think aloud”.

- Clarify every observable employee's action which you do not understand or think that the observable action should be performed differently. Avoid criticising his actions immediately after getting acquainted with the employee.
- After some time you will be able to differentiate the most important and complicated work objectives. Gather all the information about how to perform and achieve these objectives (techniques how to use appliances, equipment, materials, information resources, cooperate with other employees) and what necessary competencies you have noticed.
- Try to group these work tasks (e.g., changing brake shoes, discs, tyres is changing worn out parts).

Outcome samples

The main outcome of work process analysis is detailed information about the competencies exercised during the work trying to solve various work tasks.

Usually a list of hundreds and thousands of small work tasks is made. Grouping and organizing these tasks according to the logics of the development (simplifying: from simple to more complicated tasks) allows to create an orderly list of vocational work tasks (12-18) for the specification of teaching.

Outcomes of work process analysis – grouped work tasks of motor vehicle mechanic's occupation:

1. Performance of inspection and technical maintenance work.
2. Motor vehicle maintenance competencies.
3. Changing simple worn out parts of the motor vehicle systems.
4. Administrational service objectives.
5. Application of expansion and extra installations.
6. Basic inspection including seasonal inspection.
7. Service tasks.

8. Repair of faults.
9. Search for faults / fault finding and elimination.
10. Special expansion and extra installation.
11. Repair of aggregates.
12. Special diagnostics and repair.
13. Emergency repair and defect elimination.
14. Dealing with customers' complaints.
15. Trial of alternative systems.

The groups of this work tasks bear a similar meaning for learner development. Therefore, these tasks should not be taught one after another, but in the following sequence: in the beginning, more attention should be devoted to the tasks at the beginning of the list, at the end of teaching – to the final tasks (cf. Rauner/Spottl 1995).

The assessment of the work tasks performed by skilled workers, having long work experience and a lot of knowledge about work process in the motor vehicle service area, can help to inspect the results and sequence work tasks from the beginning of teaching till the end (Fig. 10).

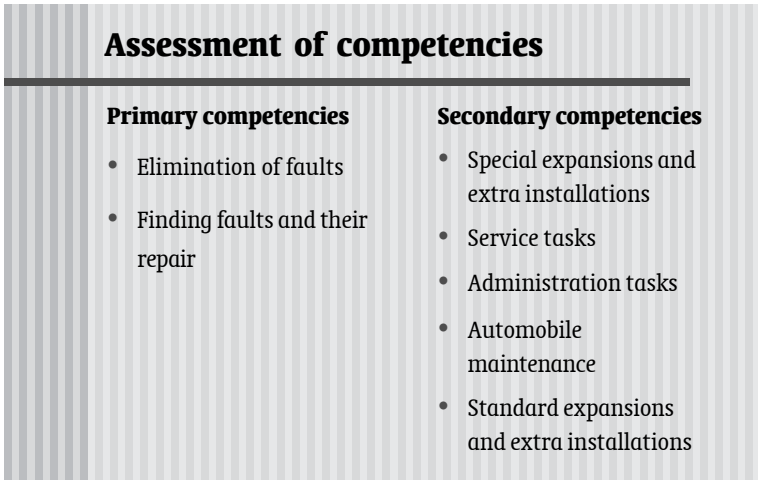

Fig.13. Most and least important motor vehicle mechanic occupational activity tasks in Lithuania

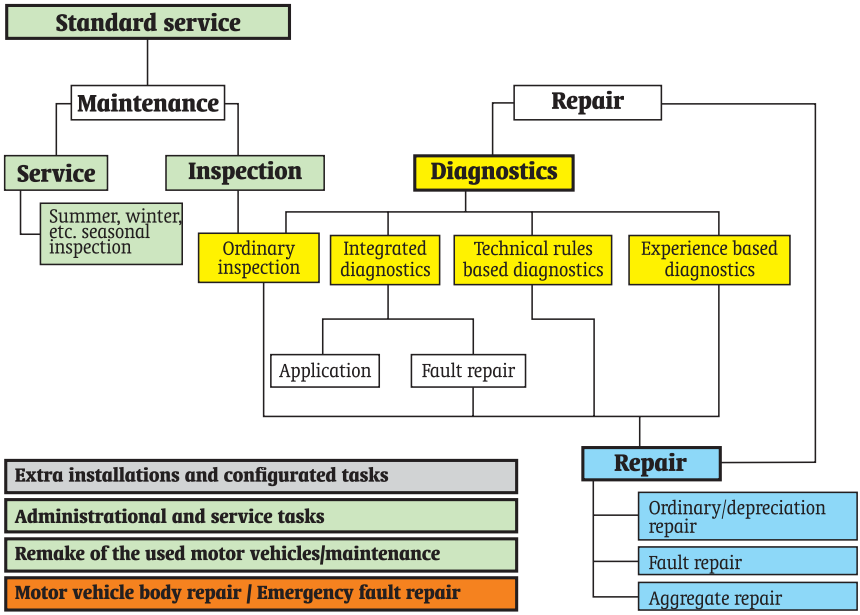

Fig. 14. Areas of motor vehicle mechatronics activity

Standard service includes the objectives of motor vehicle inspection and technical maintenance and extra service tasks such as summer, winter seasonal inspections. These tasks can be defined as:

Technical maintenance: technical maintenance is defined as a regular performance of certain tasks necessary for constant motor vehicle functioning without trouble.

Inspection: inspection includes performance of technical maintenance tasks and extra inspection of the selected motor vehicle system functioning (daily diagnostics).

Standard service tasks usually demand to perform all the work according to the producer standardised plans (e.g., inspection plans). These plans are related to quality standards which are supplemented with extra inspection lists and descriptions (e.g., "Exact technical maintenance schedule", "Instandhaltung genau genommen" VW). Thus, it requires

quality-oriented approach which provides learners with many perspectives, whereas a lot of standard service tasks can be performed from the very beginning of the practical training. Service workshops use standard information systems to identify motor vehicles, determine spare parts and carry out work plans. They are based on rather complicated information and communication systems (ICT) partly linking services and motor vehicle producers.

Repair tasks are based on a clear repair work sequence. They can be distinguished into

1. Replacement of worn out parts.
2. Repair of faults.
3. Repair of aggregates.

Typical samples of *deteriorated part replacement* are replacement of brakes shoes, tyres, silencer, starter, dampers. These tasks can be characterised by common features, but amount of individual work necessary to carry out every task is different. These tasks can be performed without any specialisation or special experience, directly according to the producer instructions and recommendations.

Repair of faults-malfunctioning focuses on the repair area of the broken aggregates, their components and systems. The location of the fault is known, but the fault itself and its impact have to be evaluated. Typical examples of this kind of repair are after-accident repair of motor vehicle axis breakage or fractures (axles), connectors, functional drive parts and clutch defects as well as repair of vehicle electric control system and vehicle body.

Aggregate repair consists of complete repair of components and units, such as gearbox, engine as well as repair of components and details such as cylinder head inspection and repair. These work tasks require very thorough and comprehensive repair skills as well as good knowledge and skills in diagnostics.

Diagnostics is a part of almost all everyday service activities. Diagnostics tasks are usually carried out together with other everyday service tasks; therefore it is difficult to distinguish them. Often it leads to loss of quality, as complete diagnostics requires assessment of broken systems and foreseeing further repair steps. Everyday ordinary diagnostics is often performed within the framework of standard service (reading the memory of faults and reprogramming, determining technical maintenance intervals, inspection, examination during the vehicle functioning, etc.). The scope of integrated diagnostic tasks is constantly increasing. This kind of diagnostics includes such tasks as adaptation of characteristic schemes, activation of sensors for the inspection purposes, parametric tasks, assessment of fault content and general assessment of the vehicle state by using diagnostic data and compiling them in control equipment. Diagnostics that is carried out according to manufacturer standards also plays an important role. In this case search for faults has to be performed according to the set rules, shemes and strategies. In many cases diagnostics of this type is performed using computerised and expert diagnostic systems. Experience based diagnostics is applied in those cases when diagnostics according to the manufacturer standards is not efficient and cannot be carried out or it is too expensive or demands too much time. In order for skilled workers to develop their own diagnostic strategies based on their experience, they have to be provided with a lot of comprehensive information and support. Diagnostics of this type is applied diagnosing small causal faults and is not documented in producer instructions.

3.11. Functional analysis of motor vehicle mechanic's work

Work area: chassis diagnostics and repair

Work specifications Work stages	Work tasks	Work qualitative requirements	Work safety and environmental protection requirements	Workplace specifications	Work organization specifications	Competencies necessary to perform work activity
1. Receiving the customer	1. To listen to the customer's complaints about the motor vehicle's technical condition and his requests 2. To assess company's technical, technological and human resource capacities to solve the customer's problems related to the chassis functioning disorders.	Representation and correctness of communication. Elicitation of the necessary comprehensive information.			Activity is performed by the receptionist or master depending to the size and specialization of the motor vehicle service company	Skills in communication area; Ability to understand the customer's needs and capacities to meet those needs. Ability to foresee, calculate, raise the possible preconditions causing the motor vehicle disorders
2. Assessment of the chassis technical condition.	1. Visual inspection of suspension, axis and wheels. 2. Inspection pf suspension, axis and wheels by listening to the sounds produced during vehicle functioning. 3. Inspection of wheel balance by measuring. 4. Inspection of the chassis units technical condition applying diagnostic devices and equipment. 5. Inspection of tyre depreciation. 6. Analysis of diagnostic data, identifying faults, their causes and foresee-	Accuracy of diagnostic procedure performance. Insurance of reliability of the obtained data by inspection. Coordination of various diagnostic methods aiming at obtaining more reliable data. Accuracy and thoroughness of the information presented to the customer about the detected breakdown and faults in	Labour security requirements for work with elevating gears	Car lift (2 columns, 2,5 t lifting power) Wheel alignment ruler, wheel balance stand, stand for damper checking, car wheel angle regulation stands. Computerized chassis diagnostic equipment Tools: meters, keys. Work place information mate-	Performs specially assigned motor vehicle repair specialized work activities (in large companies), or the same employee receives the customer's orders and performs repair work (in small and medium motor vehicle repair shops) Relationships with other work places: presentation of the obtained data to perform repair work, informing the customer about the diagnostic results, explanation of the	Vocational technical knowledge and skills: theoretical knowledge in motor vehicle mechanics (chassis construction, technical characteristics of its components and its functioning parameters, main causes of the chassis and its units faults, etc.), ability to practically identify faults by using simple and complicated diagnostic means. Work organisation knowledge and skills: work place organisa-

Work specifications Work stages	Work tasks	Work qualitative requirements	Work safety and environmental protection requirements	Workplace specifications	Work organization specifications	Competencies necessary to perform work activity
	ing ways of cause elimination. 7. Registering and documentation of the diagnostics outcomes.	chassis performance. Deeper interest into the customer's needs request, helping the customer to make the right decision regarding the necessity and scope of the repair.		rial: instructions in stands, manufacturer instructions and catalogues, chassis instructional technological cards		tion, ability to work in a group. Core skills: knowledge and skills in communication with customers, analytical skills – ability to raise assumptions about the possible breakdown on the basis of the functioning disturbance symptoms, ability to check the assumptions.
3. Planning the chassis repair work.	1. On the basis of the diagnostic results, to foresee the repair work stages. 2. To choose repair work technology and technical measures. 3. To choose the necessary material.	Correspondence of the repair plan to the customer's orders (the scope of the performed work, economy of the carried work, work performance terms, etc.) Rationality and economy.			Can be carried out individually or in groups.	Planning and organisation knowledge and skills; ability to search for alternative solutions.
4. Repair of chassis and its parts.	1. To disassemble chassis units: suspension, axles, and wheels. 2. To detect chassis suspension and axis parts	Choosing qualitative parts used in changing Following the requirements for wheel balancing	Safety requirements for work with lifting devices, safety instructions placing	Technical devices: Motor vehicle lift, wheel balancing stand, wheel mounting stand, wheel alignment ruler, dy-	Individual work and work in groups and their combination. Cooperation and communication	Vocational-technical knowledge and skills: theoretical knowledge in motor vehicle mechanics (chassis construction, technical

	3. To replace the worn out or broken parts (springs, pull rods, etc.) by new parts. 4. To perform wheel balancing and alignment (toe-in, toe-out). 5. To assemble the chassis.	precision (e.g., 5 g precision) Meeting the requirements for work tidiness and work culture - placement of equipment and devices, handling tools according to the purpose.	spring compression tools, safety requirements for work with compressed air, dismantling and reassembling. Environment protection requirements: tyre utilisation rules, damper replacing environmental protection aspects, change and utilisation of protection rubbers	namometer key, tyre repair tools, special tools for assembling suspension barrels, special tools for pressing springs, air compressor, hydraulic press, wheel alignment stand for motor vehicle and its supplements; Lift for wheel alignment (toe-in, toe-out), damper changing devices for cars and microbuses (K 70; K 101; K 40), spring clamping tool; pneumatic screw driver. Materials: spare parts, tyres, and springs. Infrastructure: electricity, compressed air. Means of information: motor vehicle repair instructions in the stands, chassis instructional technological card, manufacturer instructions, other additional literature, and teacher or master guidelines.	between work places according to the work process technological sequence and work efficiency requirements.	characteristics of its components and functioning parameters, main causes of chassis and its units breakdowns and ways of their elimination, etc.), skills in broken element defecting, work with equipment skills (work with motor vehicle lifts, wheel balancing and mounting), skills in dismantling and reassembling. Work organisation knowledge and skills: work in groups knowledge and skills, decision-making, work process quality assurance knowledge and skills, work culture and tidiness skills.

Work specifications Work stages	Work tasks	Work qualitative requirements	Work safety and environmental protection requirements	Workplace specifications	Work organization specifications	Competencies necessary to perform work activity
5. Testing chassis after its repair and inspection of its technical condition	1. To determine if the repaired chassis unit functions according to the manufacturer maintenance requirements. 2. Having detected inadequacies, to examine their causes and foresee the measures for their elimination	1. Repair work quality inspection should correspond to the manufacturer quality requirements.		Technical devices: diagnostic measures and instruments, wheel alignment (toe-in, toe-out) ruler, computerized chassis diagnostics system. Infrastructure: electricity, compressed air. Means of information: car repair instructions in the stands, chassis instructional technological card, manufacturer instructions, other additional literature, teacher or master guidelines	Performed by the same employees who carried out repair work under the supervision of masters and participation of customers. Having found mismatching, the whole route of diagnostics and repair work is reviewed and work is started from the required stage in order to eliminate the mismatch. Control results are fixed in company accounting documents and customer documentation.	Vocational-technical knowledge and skills: knowledge in qualitative chassis functioning parameters, knowing the standards of report work quality, chassis functioning diagnostic technology knowledge and skills. General competencies: critical reasoning, accuracy, ability to analyse, decision making, information selecting and communication skills.

3.12. Analysis of the research into competencies

Research steps:

1. Company selection criteria are defined (criteria table).
2. Potential companies are selected for the questioning.
3. Questionnaire is prepared.
4. Questioning is performed.
5. Questionnaire analysis is carried out.
6. Main competencies are distinguished.

Company selection criteria for competence research

Types of companies	Company specialisation									Regionality	
	According to the work fields - diagnostics, repair, technical inspection				According to the vehicle types			Company status		Cities	Small towns
	Engine	Chassis	Electrical-electronical system	Body	Cars	Trucks	Agricultural machinery	Local	Foreign manufacturers	Towns	Rural regions
Large companies	1, 2, 3, 4, 5, 6, 8, 9, 10, 11,	1, 2, 3, 4, 5, 6, 8, 10, 11	1, 2, 3, 4, 5, 6, 8, 9, 10, 11	1, 2, 3, 4, 5, 6,	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	21, 22, 23, 25, 26	27, 28, 29, 30, 31, 32	1, 2, 4, 9, 10, 11	3, 5, 6, 8	1, 3, 6, 8, 11	2, 4, 5, 9, 10
Individual and SME companies	7, 13, 14, 15, 16, 17, 18, 20	7, 13, 14, 15, 16, 17, 19, 20	12, 14, 15, 16, 17, 18, 20	7, 13, 14, 15, 16, 17, 19, 20	7, 12, 13, 14, 15, 16, 17, 19, 20	24		7, 12, 13, 14, 16, 17, 18, 19, 20	15	13, 14, 15, 16, 19	7, 12, 17, 18, 20

Company selection criteria for competence research

According to the chosen criteria 32 companies were selected in Kaunas and Marijampolė regions, which were distributed into the table. It was aimed to distinguish companies according to the following criteria:

a) company size;

b) regionality;

c) work field;

d) work according to the motor vehicle type.

3.13. Competence assessment

The survey of motor vehicle repair workshop company employees and top personnel was carried out using the questionnaire prepared by Flensburg university representatives. Research data revealed the following tendencies:

Responding to the question about the importance of motor vehicle mechanic's competencies, small companies (from 1 to 4 employees) referred to the competencies related to their work specialisation: fault finding, their repair, replacing worn-out parts or systems. Whereas competencies related to the system work, service goals and motor vehicle maintenance were evaluated as less important.

Competence assessment distribution by the personnel in companies with 5-9 employees is rather equal. Almost all the activities related with motor vehicle repair, diagnostics, maintenance, etc. were evaluated as important, including system testing, finding incidental defects, special diagnostics, repair, fault finding and repair work. Special expansion, additional installation work was evaluated as less important.

Competencies related to aggregate repair, customer incidental complaints, incidental defects, special expansions, additional installations, inspection and maintenance work, system testing, repair of the worn-out systems and their parts are very important in companies having 10-19 employees.

Medium size companies estimated the knowledge and skills in the following areas as less important: administration service, special expansions, additional installations, and motor vehicle maintenance. Competencies related to such work as special diagnostics, aggregate repair, breakdown repair, fault finding and repair, and repair of worn out parts were evaluated as very important.

Large companies indicated competencies in the following areas as most important: system testing, breakdown detection and repair, work

with customer complaints, incidental defects, seasonal inspection.

Summarising it can be concluded that the majority of companies indicated breakdown detecting and repair as one of the core competencies.

3.14. Continuing vocational education and training in motor service companies

The results of the research showed that 10 out of 18 researched companies organize measures of continuing vocational training or participate in them. Small companies take part in training organised by educational institutions or larger companies. Companies with 10-50 employees organise training themselves or participate in manufacturer-organised training. All company groups indicated that they use manufacturer recommendations, descriptions, instructions and other literature.

Small company (1 - 4 employees) top personnel indicate that weak points in motor vehicle mechanic's work are lack of experience, lack of knowledge about engines and electric systems. They particularly lack specialists in motor vehicle body repair and electronic system repair. Small companies take part in training, and also try to use motor vehicle manufacturer technical catalogues and instructions.

Company with 5 - 9 employees top personnel indicate that they lack electronic system, body repair, motor vehicle painting, and preparation for motor vehicle painting, motor mechanics specialists. In their opinion, vocational school graduates have only a general understanding about motor vehicle mechanics; however, they have competencies in communicating with customers and independent work. Employees in this group of companies participate in training organized for motor vehicle painting, preparation for painting, axis measuring work. According to their representatives, it is purposeful to organise training to teach people work with new equipment.

Top personnel of companies with 10 - 19 employees indicate that vocational school graduates lack practical skills, theoretical knowledge, initiative and responsibility. In their opinion, more attention should be devoted to the development of the following competencies: painting work and communication with customers. Employees indicated lack of knowledge to perform electric work, motor vehicle body repair, chassis, engine and aggregate repair, injection system work.

Representatives of medium size companies (20 - 49 employees) indicate lack of motor vehicle mechanics' competencies in body repair, painting and electronic area work. Companies agree that in the future more motor mechanics of broad specialisation will be needed which will be able to repair, weld, to repair chassis, read technical literature, will have basics in foreign languages, skills in communicating with customers, will have computer literacy skills, will be responsible for their work, will know quality requirements and will be able to work independently. Employees of medium size companies take part in marketing, diagnostics, technical repair, work organization, sales area training.

Representative of large companies (over 50 employees) indicate they lack milling and turning equipment operators, electricians, diagnostics, aggregate repair and electronics specialists. Companies themselves organise training in work organisation, customer service IT system and management fields.

Almost all the researched company employees lack knowledge and skills in electronics and motor vehicle body repair fields. They also lack core skills such as knowing foreign languages, work with computer, initiative, responsibility and technical reasoning.

ANALYSIS OF THE TEACHING PROGRAMMES

Having performed work sectoral analysis and functional analysis, the current certified and used teaching programmes should be analysed. This would help to clarify the current work fields and competences included in the existing teaching programmes and would allow to explore the gap between the developed teaching programmes and sectoral needs.

Teaching programme analysis takes into account the following aspects:

1. Economical aspect – how much the qualifications provided by the teaching programme meet the requirements of the world of work. In this case the achievement criteria are developed in cooperation with employers.
2. Pedagogical aspect which indicates:
   - if the teaching programme equips the learner with reliable skills to plan, perform and monitor his vocational activity;
   - if the programme creates opportunities for learners to participate in continuing vocational education and training activities seeking to sustain the acquired vocational competencies.
3. Teaching quality aspect which includes requirements for pedagogical staff qualification, relationship between general education and vocational education and training in the teaching programme, relationship between theoretical and practical teaching, assessment requirements and their role in ensuring the growth of the teaching quality.
4. Aspect of programme systematicity which indicates how a concrete programme is appropriate in the context of vocational education and training system and occupational standards.
5. Aspect of occupational mobility indicating what occupational mobility opportunities are provided by the acquired qualification and its accreditation system.
6. Aspect of further accessibility of learning and studies which expresses the possibilities of the programme to continue education.

Teaching programme analysis criteria depend on the fact if the vocational education and training programme under analysis has the certified vocational training standards which define the main relevant occupational requirements: occupational qualifications, main educational goals, content, final evaluation and qualification accreditation procedure. Standards are developed taking into account labour market demands and requirements for the concrete qualification, and also with regard to vocational education and training traditions in foreign countries and Lithuania. Standards indicate key educational goals and assessment of learner knowledge, skills and abilities; however it provides the right for educational institutions to change the teaching content at their own discretion. Schools can create apply various educational forms and methods to achieve the set goals. Thus, the standards determine the standardised teaching programme parts.

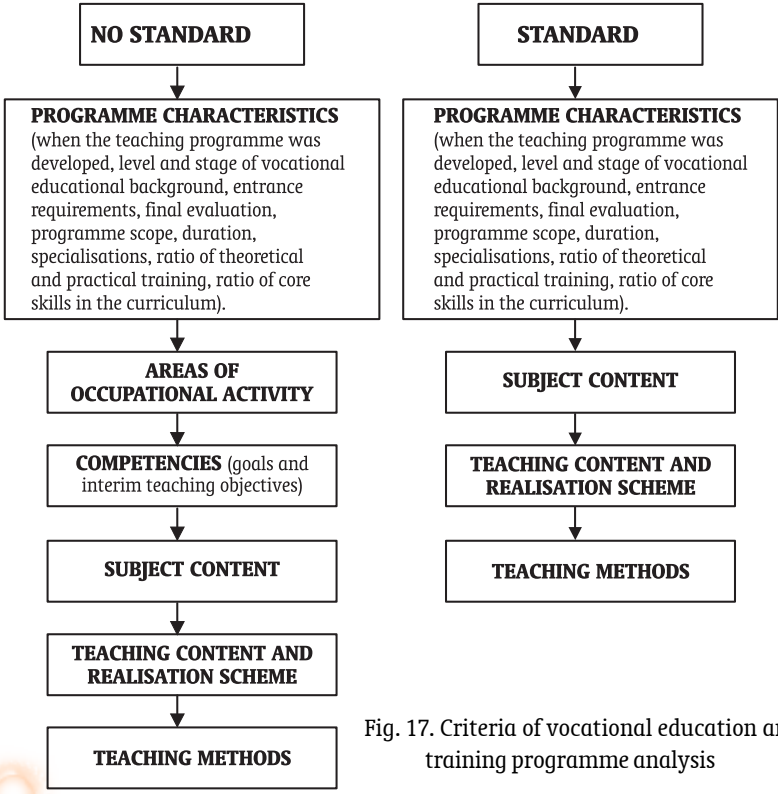

Fig. 17. Criteria of vocational education and training programme analysis

Vocational education and training programmes can be analysed in the vocational education expert, concrete work area expert and employers discussions. The number of the analysed programmes should not be lower than 4-5 teaching programmes.

4.1. Teaching programme characteristics

Comparing teaching programmes it is important to take into account that the teaching programmes that are being compared correspond to the same educational background and the same stage of particular work activity skills. Different vocational education background levels differ in their content, time resources, and necessary skills, teaching and learning methods.

Teaching programme is also characterised by the entrance requirements, i.e. competencies (often related to general education) which are required from the person who aims at acquiring vocational competencies defined in the standard. There are general requirements accredited in the Ministry of Science and Education (applicant age, health status, documents certifying basic or general education, etc.). However, to determine the specific skills of the applicants, vocational education and training institutions can apply other means such as tests, etc.

Final evaluation of the achieved teaching goals takes up an important part in the teaching programmes. Final evaluation is performed after the completion of the whole teaching programme and is used as the basis for vocational qualification recognition. In Lithuania, such achievement recognition is most often held during final examinations. Their results allow to determine if the learner has achieved the necessary vocational qualification upon the completion of the intended teaching programme. The key parameters of the final examination are always included in occupational standards. If a standard of a certain occupation does not exist, it is necessary to compare the procedures, sequence and criteria of the checking the acquired professional knowledge and skills.

Provision of the core skills is not planned in the teaching programmes.

Core skills can be various and they often are based of the achievements of the personal nature. These are social skills (communicability, tolerance, partnership, discretion, etc.), personal skills (accuracy, honesty, responsibility, thoroughness, etc.), formal skills (analytical thinking, systemic thinking, creativity, ability to concentrate, etc.). As this parameter of teaching programme comparison is not defined in the standard, core skills are integrated with special competencies both, in the teaching programmes and on the goal level.

If the standard of a certain occupation is certified, vocational activity areas and competencies are clearly defined and there is a closed (unchangeable) teaching programme part. Work areas characterise the profile of a concrete occupation. Standard defines vocational activity areas, i.e. what tasks are to be carried out and in what sequence (e.g., independently or according to the instructions) in order to successfully implement the work, relevant to the occupation. The standard also describes competencies necessary to carry out concrete work activity functions, i.e. employee occupational and core skills based on they knowledge, abilities, dispositions and attitudes.

If there does not exist a certified occupational standard, it is necessary to compare work areas of the same occupation, the same vocational background level and stage as well as relevant competencies.

Lithuanian vocational education and training standard standardises goals (competencies) and intermediate objectives. Whereas direct and small aims lie within the competence of the school and the teacher who plans concrete teaching measures. Determination of the **scope** of knowledge, cognition and actions necessary to achieve the goals, independent **teaching subjects** or modules, forms, **methods** and ways of achieving concrete direct goals also lie within the competence of the school and the teacher.

The ration of theoretical and practical teaching is also a significant indicator of vocational education and training programmes oriented to the increase of learner employment opportunities.

4.2. Teaching programme analysis

On the basis of the information gathered and summarised by the project partners, the Centre for Vocational Education and Training Research at Vytautas Magnus University carried out a comparative analysis of occupational standards and programmes of motor vehicle mechanics' vocational educational level 3 in Lithuania, Germany and Finland. Research compared the following parameters of vocational training programmes: programme titles, provided qualification, training duration, entrance requirements, specialisation indicated in the programmes, the ratio of theoretical and practical training, the targeted competence.

The comparative analysis showed that according to many parameters Lithuanian, German and Finnish motor vehicle mechanic's curricula are similar. German motor vehicle mechanic's vocational teaching programmes differ from Lithuanian and Finnish programmes by more comprehensive and sequential motor vehicle mechanic's competence descriptions, appropriate to motor vehicle and its system and aggregate repair technology and sequence. In these programmes, differently from Lithuanian and Finnish, great attention is paid to work process planning, constant inspection of work and its results quality, environment protection and efficient raw material use, right to work and negotiations with employers competence. In Lithuanian motor vehicle mechanic's occupational standard and teaching programmes, differently from German and Finnish programmes, core competencies are not distinguished into a separate group. It is obvious that German and partly Finnish motor vehicle mechanic's vocational education and training programmes are more oriented to the requirements of the world of work. German motor vehicle mechanic's vocational education and training programme is more clearly oriented to employer needs in the area of provided competencies and prospective worker needs and interests related to social and juridical safety.

German and Finnish motor vehicle mechanic's vocational education and training programmes, in comparison with Lithuanian motor vehicle mechanic's vocational education and training standard are more flexible

in the provided vocational qualifications and specialisation areas. They provide learners with greater professional mobility and better opportunities to adapt to the changing labour market requirements. Despite certain differences, the comparative analysis indicates that countries have sufficient possibilities to develop common modules of motor vehicle mechanic's vocational education and training.

4.2.1 Comparison of motor vehicle mechanic's work functions indicated by Lithuanian, German and Finnish motor vehicle mechanic's level 3 vocational education and training programmes

Work functions	Lithuanian motor vehicle mechanic's occupational standard	German motor vehicle mechanic's occupational standard	Finnish motor vehicle mechanic's occupational standard
1. General vocational education and training subjects		Reading of technical documentation, use and preparation Electrical and electronical technologies Technologies of hydraulics and pneumatics	Technical drawing Basics in electrotechnics (electric engineering) Basics of hydraulics and pneumatics technologies Physics and chemistry (related to vocational area) Information technologies in motor vehicles Material science – material technologies Motor vehicle construction
2. Technical inspection and diagnostics	Motor vehicle technical diagnostics and maintenance Work with motor vehicle technical maintenance and repair equipment and devices, processing of diagnostic information and data	Inspection and measurements Fault finding and determining their causes	Basics in diagnostics Fault finding in mechanical system Fault finding in electrical part

Work functions	Lithuanian motor vehicle mechanic's occupational standard	German motor vehicle mechanic's occupational standard	Finnish motor vehicle mechanic's occupational standard
		Inspection of exhaust gas and pollution harmful to the environment reduction equipment Inspection, regulating and actuating mechanical, hydraulic, pneumatic, electric and electronic systems and units. Assessment of motor vehicle breakdowns and faults	 Analysis of caults and repair cost evaluation
3. Repair of motor vehicle systems and aggregates	Repair of motor vehicle systems and aggregates Selection and change of spare parts, aggregates and technical maintenance materials ensuring the necessary quality of motor vehicle technical state. Work with motor vehicle technical maintenance and repair equipment, processing of diagnostic information data.	Repair of motor vehicle systems and components Repair of motor vehicle structural and covered components and aggregates Installation of extra units and systems, mounting of supplementary elements Assemblage Mechanical (manual) processing Mechanical processing using equipment Welding, thermal cutting Quality assurance of the work that is being performed including adjacent operations	Maintenance and repair of the chassis and transmission Maintenance and repair of the engine and electrical part Vehicle body repair Repair of vehicle body parts Metal processing (practice) Technologies of mechanical processing and assemblage Practice of electrical part work Materials and welding

Work functions	Lithuanian motor vehicle mechanic's occupational standard	German motor vehicle mechanic's occupational standard	Finnish motor vehicle mechanic's occupational standard
4. Technical maintenance of motor vehicles, their systems and aggregates	Technical diagnostics and maintenance of motor vehicles Cleaning and washing motor vehicle parts, checking their quality Lubrication and oil filling work Work with motor vehicle technical maintenance and repair equipment, devices and processing diagnostic information data	Technical maintenance Dismantling and assemblage of components, aggregates and systems performing technical maintenance Technical maintenance of the motor vehicle	Motor vehicle technical service
5. Administrative tasks and customer service	Financial accounting of motor vehicle technical maintenance and repair work Communication with customers Motor vehicle driving Skill in looking for employment and work	Work law, law of collective negotiations, work security requirements Work safety, environment protection and rational use of energetic resources Work process planning and preparation, control and evaluation of the work results	

4.2.2. Motor vehicle mechanic's vocational education and training programmes: comparative analysis of Lithuanian, German and Finnish programmes

Title of the programme, training duration, level, entrance requirements provided qualifications	Work functions	Competencies and core skills	Ration of theoretical and practical training	Specialisation	Technical and technological training basis
LITHUANIA					
Motor vehicle mechanic Duration and level: 2 – 3 years / level 3 (According to ISCED: Initial vocational training / ISCED 97 3 level) Minimal scope of the teaching programme – 2960 teaching hours. Requirements for the entrance to the training: For level 3 teaching – basic secondary education (9 years). Conferred qualifications: motor vehicle me-	1. Technical maintenance and diagnostics of motor vehicles. 2. Repair of motor vehicle aggregates and systems. 3. Cleaning and washing the parts and their quality assurance. 4. Lubrication and oil changing work. 5. Selection of spare parts, units and operational material and changing ensuring the necessary level of motor vehicle	1.1. To evaluate the technical state of motor vehicle systems and aggregates on the basis of external characteristics of the motor vehicle. 1.2. To determine the parameters of motor vehicle mechanism and system functioning using instruments and devices of technical diagnostics. 1.3. To perform the determined technical maintenance procedures according to manufacturer instructions and recommendations, meet the set work safety and environment protection requirements. 1.4. To use fitter tools and technological technical maintenance equipment safely and purposefully. 1.5. To perform fitter metal and similar material work. 1.6. To have the necessary welding skills and competencies: gas welding, electricity welding, brazing. 1.7. to dismantle motor vehicle mechanisms, aggregates and systems according to manufacturer technological requirements. 2.2. To determine breakdowns (fault finding), their causes and eliminate them.	**Practical training** amounts to at least 70% of the whole training time (minimum 800 hours of practical training in workshops) in 2 year programmes; the ration of theoretical and practical work is: theoretical training 30% …37%/ practical 63% …70%. In 3 year programmes the ratio of theoretical and practical training is:	According to the motor vehicle type: - Repair and technical maintenance of cars, trucks, buses, motorcycles, etc. - Repair and technical maintenance of agricultural mechanisms and motor vehicles: tractors, combine harvesters, etc. According to the service functions: 1.Reception and diagnostics. 2.Repair. 3.Technical	Equipment and tools: Motor vehicle lifts – 3; Wheel mounting stand; Wheel balancing stand - 2; Electrical device control stand – 2 Injection test and tune-up stand – 1 Light adjustment stand – 1 CO gas analyser - 1 Body repair and geometry reconstruction stand – 1 Painting equipment

Title of the programme, training duration, level, entrance requirements provided qualifications	Work functions	Competencies and core skills	Ration of theoretical and practical training	Specialisation	Technical and technological training basis
chanic, motor vehicle driver, specialist in agriculture technical maintenance and repair	quality. 6. Work with motor vehicle diagnostic, technical maintenance and repair equipment, and diagnostic information and data analysis. 7. The first medical aid for the injured. 8. Financial accounting of motor vehicle technical maintenance and repair work. 9. Communication with the customers. 10. Driving. Fostering employment.	2.3. To assemble, tune-up, adjust and test motor vehicle mechanisms, aggregates and systems. 3.To wash and clean parts, perform part defectation in a qualitative way. 4. To check the level of oil and consumables in mechanisms and systems, evaluate the state of oil, lubricants and other running liquids, to oil, change oil, lubricants and other running liquids. 5. To select the necessary and suitable spare parts and change the defected parts, properly select the appropriate construction and running material. 6. To apply measuring, diagnostic, quality assurance instruments and equipment; to find the necessary technical and technological information from various resources and use it in technological process. 7. To deliver the first medical aid to the injured. 8. To perform and manage initial motor vehicle maintenance and repair work accounting; to control work accounting processes and analyse company work results. 9. To develop polite communication with customers in the native and foreign language skills; to explain to the client the technical state of his (her) motor vehicle, its impact upon the safety of motor vehicle exploitation, environment, economic parameters of maintenance, to provide the customer with comprehensive and precise	**theoretical** 40% **practical** 60%.	maintenance of motor vehicles and their systems. 4.Managerial functions of motor vehicle repair workshops – financial accounting and work with customers. Specialisation of such time is peculiar to large service companies. Vocational schools are oriented to training motor vehicle mechanics of broad qualification.	Engine diagnostics stand Lithuanian vocational schools working in the motor vehicle mechanic vocational training area renovation and reconstruction of the current technical basis.

		information about the detected faults, ways to eliminate them, duration of the repair and work costs. . 10. Good driving skills and knowledge. 11. To know the business environment to evaluate one's possibilities to find a job; to apply the acquired professional knowledge in starting own business.			
GERMANY					
Motor vehicle mechanic, Duration: 3,5 years. Vocational training level: initial vocational training / ISCED 97 level 3 Requirements for the entrance to the training: 9-10 years of the basic secondary education Conferred qualification: qualified employee in motor vehicle mechanics	1. Vocational education and training. 2. Structure and organisation of educational institutions. 3. Work law, law of collective negotiations, work safety, environment protection requirements. 4. Work safety, environmental protection and rational use of resources. 5. Work process planning and preparation, work result evaluation and monitoring. 6. Reading of	1. Work planning, quality assurance, work organization. 2. Inspection and measuring work in motor vehicles, first of all, related to: 2.1. Ability to dismantle and assemble motor vehicle systems. 2.2. Ability to read and use chain diagrams, flow charts, technical drawing during faultfinding, know the marking of terms and symbols of connecting elements. 3. Perform repair tasks in various motor vehicle type systems (feed of electric current including generator, light system, warning and signalling equipment, engine, engine accessories, cooling system, exhaust gas equipment, start-up equipment/starter, engine control and fuel feed, gear/transmission and clutch, brake system, axle control, chassis with wheel and tyre mounting, body parts and internal cover). To be able to use breakdown assessment technical means and prepare to deliver the motor vehicle to the customer. 4. To perform technical maintenance and inspection work according to the manufacturer instructions and legal requirements.	**Theoretical teaching**: 30% **Practical training**: 70%	Three directions of specialisation during the third and fourth year of the programme: 1. Technical maintenance of the motor vehicle 2. Technical maintenance of trucks 3. Technical maintenance of motorcycles. Every mechanic can work in all three areas irrespective the specialisation chosen in the teaching programme.	Technical-technological training basis: 1. Diagnostics instruments (expert systems, scanning devices). 2. Technical information systems. 3. Computerised measuring equipment (automatic inspection programme for engine control system diagnostics). 4. Equipment for chassis and axles diagnostics. Special instru-

Title of the programme, training duration, level, entrance requirements provided qualifications	Work functions	Competencies and core skills	Ration of theoretical and practical training	Specialisation	Technical and technological training basis
	technical documentation, use and preparation. 7. Checking and measuring. 8. Assemblage. 9. Manual processing. 10. Mechanical processing. 11. Technical maintenance. 12. Welding, thermal cutting. 13. Electric technology, electronics. 14. Hydraulics, pneumatics. 15. Dismantling and assembling of components, aggregates and systems during the motor vehicle technical maintenance. 16. Technical maintenance of motor vehicles. 17. Inspection, tuning and connecting mechanical, hydraulic, pneumatic, electric and electronic systems and units. 18. Inspection of exhaust gas and reduction of dangerous pollution elimination to the environment equipment. 19. Fault finding, detecting their causes. 20. Repair of motor vehicle systems and their components. 21. Repair of motor vehicle structural and covered components and aggregates. 22. Extra units and installations mounting work. 23. Estimation of the breakdowns and damage done to a motor vehicle. 24. Monitoring of the work being performed.	5. To perform diagnostic work using measuring devices and fault detecting scanners; to evaluate breakdown codes and use faultfinding strategies according to diagnostic instructions; to determine breakdown causes. 6. To perform visual inspection and check by using sound hearing method. 7. To perform exhaust gas analysis. 8. To perform chassis measurements. To inspect breakdowns on the basis of the customer's evidence and determine the repair costs.			ments and devices for diverse motor vehicle system repair.

FINLAND					
Motor vehicle mechanic Programme duration: 120 training weeks (3 years) Vocational education and training level according to ISCED 97: 3. Requirements for the entrance to learning: basic secondary education 9 – 10 years. Conferred qualification: motor vehicle mechanic.	***General education subjects:*** native language and communication, Swedish language, English language, mathematics, physics and chemistry, practical training, social studies and law, optional courses. Basic occupational subjects (30 training weeks): Information technologies in the motor vehicle. Technical drawing. Material technologies. Metal processing practical training. Mechanical processing and assemblage technologies. Basics in electrical engineering. Practical training in electrical engineering. Basics in hydraulics and pneumatics. Motor vehicle construction. Motor vehicle technical service. Special occupational subjects (60 training weeks): Chassis and transmission technical service Engine and electrical equipment technical service Basics in diagnostics Automatics engineering Mechanical breakdown detection Electrical par fault finding Material science and welding Repair of motor vehicle parts Body repair Analysis of breakdowns and calculation of repair costs Body measurement Motor vehicle painting Optional occupational subjects (10 training wheels): Engine repair Engine control system repair Body repair	1. To perform mechanical and electric system breakdown detecting and defect diagnostic work. 2. To perform technical maintenance and inspection work according to manufacturer instructions. 3. To perform body repair and painting work according to the manufacturer instructions. 4. To follow work safety requirements and rules.	**Theoretical teaching**: 30% **Practical training**: 70%	Exceptional direction of specialisation: racing cars technology.	Technical-technological training basis: 1. Diagnostics devices. 2.Computerised measuring equipment. 3. Cylinder head repair equipment. 3.Wheel balancing system (4 – points). 4. Dynamometer. 5.Test stand. 6.Body repair platforms and measuring equipment. Painting camera.

Conclusions of the comparative analysis

1. In their general features the teaching programmes under analysis and standards are similar. This is particularly well illustrated by the following parameters: programme duration (3-3,5 years), vocational education level (ISCED 97 level 3), entrance requirements (basic secondary education – 9, 10 years).

2. The content of competences in the programmes under analysis is rather similar. German vocational education and training programmes distinguish themselves by comprehensive and accurate technical motor vehicle occupational knowledge and skill descriptions which provide more information about the content of motor vehicle qualification.

3. Motor vehicle specialisations in the analysed programmes are also rather similar. A general feature is intention to train specialists of broad qualification in motor vehicle vocational education and training programmes and standards in all the countries. Motor vehicle mechanics can work with vehicles of various types – cars, trucks, and motorcycles.
   As Lithuanian partners included into their analysis training programmes for preparation of the specialists for agricultural machinery service and repair in agricultural schools, their analysis indicates this specialisation. Finnish partners indicated racing cars technology specialisation.

4. The ration of theoretical and practical training is similar in all the programmes under analysis: theoretical training takes up 30% on average, whereas practical training - 70 % of the whole training time.

5. Localisation of practical training differs. In Lithuania, the larger part of practical training is provided in school workshops. Company involvement in this area is comparatively low. In Germany, practical training is provided on the job place in companies and, in addition, in training centres founded by the companies (iberbetriebliche Berufsbildungsstotten). In Finland, practical training is provided in local motor repair workshops (garages).

DEVELOPMENT OF THE TEACHING PROGRAMMES

Knowledge about the analysed work processes can be transformed into the development of the teaching programme based on learning and work goals, using three work and learning dimensions:

- qualified work objects,
- qualified work tools, methods and organization,
- work and technology requirements.

Practical recommendations (more detailed information is provided in Sptl/Gerds 2002):

1. Write down the titles of occupational activity tasks. If you have decided to develop modules, think how to relate every module with the previous and the following module to guarantee the development of learner competences.
2. Describe the task.
3. Note down the specifications of the competencies that are acquired having finished a certain programme stage or module.
4. Note down three work and learning dimensions of this task.
5. Develop learning and work task performance plans evaluating the content of these three dimensions. This should be performed by teachers with the help of the equipment, learner group characteristics and school environment.

Vocational education and training programme development is the last programme optimisation stage which starts from an overview of the teaching goals. Goals are formulated having evaluated the outcomes of the previously performed optimisation stages.

Vocational education and training optimisation can include modules due to their flexibility, an exceptional feature, important for optimisation process. Module flexibility is ensured by the following qualities:

- a training module is an independent vocational education and training unit;
- a separate module can be characterised by: goal, content, didactic and methodological methods and evaluation;

- a module is narrower in its scope than the whole teaching programme;
- a module can be a constituent part of several teaching programmes.

The structure of a modular teaching programme can be constructed according to the classification of work process stages. In this case, work process stage classification proposed by Bob Mansfeld was used. Work process stages are classified into linear, cyclic work process sequences, distinguishing separate product and work results and separate work processes and methods.

In the development of motor vehicle mechanic's programmes, the main attention was devoted to approaching work and learning specifications to actual work process requirements, programme flexibility and occupational mobility and continuing vocational training and learning opportunities provided by the programmes.

Designing the structure of motor vehicle mechanic's modules, linear work stage sequence was taken as a basis. Expanding motor vehicle mechanic's work into modules was based on motor vehicle structure principle.

The choice was determined by several reasons:

- Specific specialisation of motor vehicle diagnostics, repair and technical maintenance sector which is partly based on the principle of distribution according to the structure of the motor vehicle.
- Specificity of labour market and motor vehicle service development and demand when motor vehicle service related to diagnostics, repair and technical maintenance of various motor vehicle units have different demand. For instance, the sectoral motor vehicle analysis revealed that in Lithuania, there is more demand for chassis technical maintenance and repair as well as motor vehicle body repair. These differences in their turn have impact upon the work sector demand for the development of labour force qualification needs.

Thus, the designed module parameters include three elements:

1. Work specifications – work process structure – work task characteristics.
2. Learning specification is created for every work specification, i.e., work competences necessary to perform work tasks are listed, as well as learning fields where these competences are acquired.
3. Assessment specifications which provide a certain standard for assessing the competences necessary to perform the work activity in a qualified way.

5.1. Motor vehicle mechanic's vocational training modules

The Centre for Vocational Education and Training Research at Vytautas Magnus University together with the representatives from Marijampole Vocational Training Centre designed the outline of motor vehicle mechanic's vocational training module programme. Motor vehicle mechanic's vocational training module programme parameters consist of eight modules related to diagnostics, repair and technical maintenance of chassis, transmission, engine, engine control system, body, motor vehicle control system, motor vehicle electrical-electronical system and feeding unit system. Three modules out of eight have been fully designed and piloted: chassis diagnostics, repair and technical service, transmission diagnostics, repair and technical service, and engine control system diagnostics. For other modules only the main parameters have been formulated, on their basis and on the grounds of the designed and piloted module samples it is possible to design completed training modules.

Preparing the modules it is recommended to take into account the following aspects:

1. Learning specifications or competences necessary for the work are derived from work specifications or work descriptions. For instance, skills in finding engine control system faults by using computerised diagnostics systems are derived from motor vehicle engine control system diagnostic activity.

2. Learning specifications indicate knowledge areas that have to be appropriate to learning objectives as much as possible. For instance:

Learning specifications	
Learning objectives	Knowledge areas
3.1. To explain to the customer the state of the parameters of engine control system.	3.1. Work parameters of engine control system and its units.
3.2. To indicate to the customer the causes of faults and breakdowns.	3.2. Technical requirements of engine control system maintenance and manufacturer instructions.
3.3. To indicate to the customer the price and terms of fault elimination.	3.3. Work accounting and price setting.

3. Characterising work and learning specifications, the use of inaccurate, misleading and ambiguous descriptions should be avoided. For instance:

„to perform chassis technical maintenance *properly* "

should be changed into:

„perform chassis technical maintenance in a *qualitative way, according to the manufacturer standards*";

„ to explain the customer the causes of engine control faults *sufficiently* "

should be changed into

„to explain the customer the causes of engine control faults *thoroughly* ";

„to perform diagnostics of transmission according to appropriate requirements and standards"

should be changed into

„ to perform diagnostics of transmission according to *manufacturer requirements and service workshop quality standards*, etc.

5.2. Parameters of motor vehicle mechanic's vocational training modules

5.2.1. Motor vehicle body repair and painting

Module objectives	Target group	Module outcomes	Module content	Form of assessment	Module range and forms
1. To acquire knowledge and skills in motor vehicle body diagnostics (material science, body diagnostics technology, etc.) 2. To acquire knowledge and skills in motor vehicle body repair (sheet metal processing technologies, metalwork). 3. To acquire knowledge and skills in motor vehicle painting and surface finish (types of material used for body painting and their use, body priming, putting and painting, inspection of the painted surface and finishing technologies).	Vocational school students, the unemployed learning in labour market vocational training programmes, service workshop employees	Module participants will acquire the following skills: 1. To evaluate the technical state of motor vehicle body. 2. To identify body breakdowns, defects, and deformation features. 3. To select appropriate and rational method to repair motor vehicle body. 4. To repair motor vehicle front and rear wings, doors, thresholds (altar), boot, to abride, putter and prime body parts. 5. To prepare motor vehicle body for painting. 6. To choose pain according to the mark, colour, glance, resistance to impact and deformations. 7. To choose paint and primer dissolvent and hardeners. 8. To use polishing, painting and drying devices and equipment. 9. To paint motor vehicle body. 10. To determine and eliminate defects of the painted body surface.	1. Motor vehicle body faults and defects. 1.1. Body faults, defects, deformations and their kinds. 1.2. Corrosion causes and ways to eliminate it 1.3. Anticorrosion material qualities and their application ways. 2. Motor vehicle body repair technology. 2.1. Motor vehicle body repair methods. 2.2. Body diagnostics and dismantlement. 2.3. Mechanical processing of sheet metal. 2.4. Dismantlement, planishing, repairing, putting and priming of body parts: bonnet, front and rear wings, front panel, roof, door, luggage compartment bottom and lid, sills, porėmio sijų, front and rear bumpers. 3. Motor vehicle body painting technology. 3.1. Preparation of motor vehicle body for painting. 3.2. Materials used for body painting, their marks, and chemical and physical qualities. 3.3. Painting tools and equipment, their maintenance. 3.4. Drying ways and regimes of the painted surface. 3.5. Finishing of the painted surface, tools and equipment used for grinding and polishing. 3.6. Quality assessment of the painted surface. 3.7. Work security and environmental protection requirements.	Final examination	320 hours

5.2.2. Technical maintenance and repair of motor vehicle control equipment

Module objectives	Target group	Module outcomes	Module content	Form of assessment	Module range and forms
1. To acquire knowledge and skills in motor vehicle control equipment technical maintenance (materials and parts used in hydraulic and pneumatic system maintenance, tune-up of hydraulic and pneumatic brake system). 2. To acquire knowledge and skills in motor vehicle control equipment repairing (hydraulic and pneumatic brake system repairing, metalwork, etc.)	Vocational school students, unemployed training in labour market vocational training programmes, service workshop employees.	Module participants will acquire the following skills: 1. To understand car and truck steering wheel and brake construction peculiarities, hydraulic vacuum brake servo functioning, ABS system functioning. 2. To assess the technical state of motor vehicle control mechanism aggregate, units and parts. 3. To regulate motor vehicle control equipment functioning parameters: motor vehicle parking brake control, steering rod joints, steering wheel freewheeling, brake shoe clearance, brake pedal freewheeling, pneumatic brake valve gear and brake linkage, to release air from hydraulic brake system. 4. Defect and change parts: air compressor's gear belt, steering linkage joints, front and rear wheel brake shoes. To change the amount of oil in hydraulic pump tank.	1. Motor vehicle control equipment. 1.1. Purpose, structure, types of motor vehicle control equipment. 2. Purpose, construction, functioning and types of wheel. 2.1. Steering linkage and mechanism, its structure, functioning and breakdowns. 2.2. Functioning, structure, breakdowns of hydraulic hydrosteering gear. 3. Brake systems. 3.1. Types, purpose, structure and functioning of brake systems. 3.2. Construction, functioning and maintenance of hydraulic brake system. 3.3. Functioning and breakdown of vacuum-hydraulic master servo, parking brake of hydraulic brakes. 3.4. Construction, purpose, functioning and breakdowns of pneumatic brake system. 3.5. Air compressors, brake valves, bulbs, reductors, valves, trailer air control valve, wheel brake actuators, parking brake, its functioning and tuning-up. 3.6. Brake ABS purpose, structure, functioning and types, possible breakdowns, their causes and ways of eliminating. Work safety and environmental protection requirements in performing technical inspection of motor vehicle control equipment.	Final examination	120 hours

5.2.3. Diagnostics, repairing and technical maintenance of motor vehicle electrical equipment

Module objectives	Target group	Module outcomes	Module content	Form of assessment	Module range and forms
1. To acquire knowledge and skills in motor vehicle electrical equipment technical (electrotechnical material science, theory of electrotechnics, measurement devices, technology of electrical equipment diagnostics). 2. To acquire knowledge and skills in motor vehicle electrical equipment repairing (making electrical schemes of electrical equipment, metalwork, etc.)	Vocational school students, unemployed, training in labour market vocational training programmes, service workshop employees.	Module participants will acquire the following skills: 1. To make up and read schemes of electrical connection. 2. To assemble and dismantle motor vehicle electrical equipment. 3. To connect the source of electrical power correctly. 4. To perform the diagnostics of motor vehicle electrical equipment with the help of various measurement devices applied in electrotechnology. 5. On the basis of general requirements and manufacturer instructions, to perform motor vehicle electrical equipment repairing work: 5.1. Repairing the defected electrical parts. 5.2. Replacing the defected electrical parts with the new ones 6. On the basis of general technical requirements and manufacturer instructions, to perform technical inspection of motor vehicle electrical system and its parts: technical maintenance of accumulators and generators, technical maintenance of relays, starters, ignition systems, lightning equipment, switches and installations. 7. To obey the electrotechnical work safety rules of in the work process.	1. Basics in electrotechnics. 2. Types, kinds, features and use of electrotechnical materials. 3. Types and purpose of motor vehicle electrical equipment. 4. Means of motor vehicle electrical equipment diagnostic measuring. 5. Technology of motor vehicle electrical equipment diagnostics. 6. Technical maintenance of motor vehicle electrical equipment. 7. Basics in metalwork. 8. Terminology in electrotechnics used in foreign manufacturer instructions and similar documents.	Final examination	400 hours

5.2.4. Diagnostics, repairing and technical maintenance of motor vehicle feed system

Module objectives	Target group	Module outcomes	Module content	Form of assessment	Module range and forms
1. To be able to evaluate technical state of the feed system and perform diagnostics. 2. To acquire knowledge and skills in repairing motor vehicle feed systems. 3. To acquire knowledge and skills in technical maintenance of motor vehicle feed systems.	Vocational school students, unemployed training in labour market vocational training programmes, service workshop employees.	Module participants will acquire the following skills: 1. To identify the technical state of the feed systems and their work parameters. 2. To diagnose breakdowns in motor vehicle feed systems with the help of control measurement and diagnostic means. 3. To eliminate the detected feed system combustion performing dismantling, assembling, part repair, part replacement and adjusting of the assembled system. To perform technical maintenance of motor vehicle feed systems (fuel tank, pipes, filters, fuel pumps, nozzles, carburettor, inspection and adjustment of their functioning).	1. Material science – fuel, motor vehicle running liquids. 2. Structure and functioning of compression ignition engine feed system. 3. Structure and functioning of petrol low compression engine feed system. 4. Petrol injection systems, their structure and functioning. 5. Diagnostics and repair of compression ignition engine feed systems. 6. Diagnostics and repair of petrol low compression engine feed system. Diagnostics and repair of petrol injection systems.	Final examination	400 hours

5.2.5. Diagnostics, repair and technical maintenance of motor vehicle engine and its systems

Module objectives	Target group	Module outcomes	Module content	Form of assessment	Module range
To acquire theoretical knowledge and skills in diagnostics, repair and technical maintenance of motor vehicle engine and its systems: 1. Identification of the engine mark, engine work parameters under various rotations of engine main shaft. 2. Identification of engine cooling and ignition system work parameters. 3. Identification of the general technical state of the engine. 4. Performance of engine dismantling and assembling work. 5. Defectation and repair of the engine cylinder block and cylinder heads. 6. Defectation and performance of the repair of crankshaft and connecting rod mechanism. 7. Defectation of gas distribution mechanism, repair of its parts or replacement. 8. To perform diagnostics, repair and technical maintenance work of engine ignition system. 9. Performance of engine technical maintenance operations: replacement of oil, cooling watert, tuning of the generator and distribution mechanism belt tension.	Vocational school students, unemployed, training in labour market vocational training programmes, service workshop employees.	Module participants will acquire the following skills: 1. To identify technical state of the engine and its work parameters. 2. To diagnose motor vehicle engine breakdowns with the help control measurement and diagnostics means. 3. To check the engine water cooling system, fan functioning and replace engine water cooling system, replace cooling water. 4. To check the lubrication system, replace the oils. 5. To check the appropriacy of engine ignition system units and aggregates for exploitation, to strain or replace generator belt. 6. To dismount the engine out of the motor vehicle 7. To identify and eliminate breakdowns in engine cylinder block and cylinder heads. 8. To defect and repair or replace the main shaft- connecting rod mechanicsm parts. 9. To defect and repair or replace parts of gas distribution mechanism. 10. To perform the repair of spark plugs, ignition wires, distributor and induction-coil in the engine ignition system. 11. To identify the defects of electric power sources, perform repair or replacement. 12. To identify ignition advance angle. To check contact, contact-breaker triggered system and to repair it.	1. Engine types, structure and functioning. 2. Engine units and systems. 3. Engine technical maintenance. 4. Motor vehicle engine repair technology: 4.1. Engine dismounting and preparation for repair. 4.2. Engine dismantling and assembling methods and requirements. 4.3. Removing, defectation and repair of engine cylinder block and cylinder head. 4.4. Defectation and repair of the main shaft, choice and fitting of inserts. 4.5. Defectation and repair of connecting rod–piston group, choice and fitting of pistons, cylinders and piston rings. 4.6. Defectation and repair of gas distribution mechanicsm, choice of inlet and exhaust valves, valve seating and regulating of the necessary thermanl clearance. 4.7. Delivery of the reapired engine to the location and testing with the help of various diagnostic measures and equipment. 5. Repair technology of the motor vehicle ignition system.	Final examination	360 hours

5.2.6. Diagnostics of the motor control system

Module objectives	Target group	Module outcomes	Module content	Form of assessment	Module range
1. To find the symphtoms of the motor control systems faults. 2. To localise the faults of the motor control system using the computerised diagnostics measures. 3. To implement the systemic diagnostics of the motor control systems : 3.1. To execute the routine diagnostics 3.2. To execute the integrated diagnostics of the motor control systenm using the digital diagnostics systems. 3.3. To make a diagnostics referring to the instructions of producer. 3.4. To make an experience based diagnostics. 4. To define the resources for the diagnostics operations – materialos, consumables etc.. 5. To settle the plan of the diagnostics operations. 6. To check the validity of the diagnostics results, to verify the quality of the execution of diagnostics operations. 7. To implement the correction measures into diagnostics operations.	Vocational school students, unemployed, training in labour market vocational training programmes, service workshop employees.	Module participants will acquire the following skills: 1. To find the symptoms of the engine control system faults and localise the faults by consulting the customer, visual control, checking in action, using registering of signals with the differenrt loadings of engine and turning speed, implementing digital sytems of diagnostics. 2. To implement the systematic evaluation of the work of vehicle engine control system using the analysis of the diagrams of work characteristics, control of activators, evaluation of the fault memory contents, fault finding according to the regulations of producer, strategies and schedules of the diagnostics. 3. To analyse and evaluate the relations between the received results of the vehicle engine control diagnostics, which indicate the faults and damages of the system.. 4. To analyse and evaluate the impact of the engine control system faults to the work of the vehicle and the environment. 5. To determine the resources of the diagnostics. 6. To schedule the diagnostics operations. 7. To assure the quality of engine control systems diagnostics operations. 8. To explain to the customer the parameters of his vehicle engine control system work, to comment the results of diagnostics and the impact of the detected faults to the work of vehicle and environment.	1. The types of engine control systems, composition of engine control systems. 2. Equipment of the engine control system diagnostics. 3. The technology of the engine control system diagnostics: routine diagnostics, integrated diagnostics, diagnostics according to the plans and regulations of the producers, experience based diagnostics. 4. Electric schemes and diagrams of the engine control system. 5. Instructions, schems, plans and strategies of engine control system diagnostics issued by the producer. 6. The environmental impact of the work of engine control systems and its faults and environment protection requirements. 7. The planning and quality assurance in the engine control system diagnostics.	Final examination	360 hours

PRACTICAL POLITICAL RECOMMENDATIONS

Improvement of the employment possibilities influences the perspectives of the development of the person, social group, as well as the state and society in the constantly changing social-economical environment. The complexity of social and economical problems caused by unemployment urges to search for the certain strategies and programs how to solve them. The optimization of the existing vocational training curricula provides the real possibilities to cope effectively with the unemployment through improvement of the qualification potential of the labor force and increasing its employability. Referring to the results and experiences of the Leonardo da Vinci program pilot project "Expansion of the employment possibilities through the optimization of the vocational training curricula" we can present some political and practical suggestions concerning the improvement of the vocational training curricula.

1. The optimization of the vocational training curricula aiming at the improvement of the employment possibillities should be based on the principles of integration, effectivenness, correspondance to the up-to-date requirements, partnership and reality.

   Principle of Intergration means, that the optimization of the vocational training curricula encompasses a lot of factors of vocational education and labor market: training and learning processes; researches of the labor market, skills needs analysis and vocational training reasearches presented in this books as well as their results; the improvement of vocational training methodology and methods; representation of the interests of different social partners and their groups; references to the experience of all the participants of vocational training process.

   The principle of the effectiveness express the resultative and useful application of the intellectual, material, technical and organizational ressources in the process of the optimization of vocational training curriculum.

   Correspondance with the up-to-date requirements means that the

vocational training curricula shall go together with the changes of the labor market needs. The partnership of the vocational training system and the world of activities is the crucial condition to fulfill this requirement.

Partnership principle : vocational training can provide the better employment possibillities only on the condition, that the world of activities and vocational training institutions assure the close co-operation in the creation of the training curricula, evaluation of training results, organization of practical training, continuous vocational training and other fields. Partnership principle also means the determination of partners for the effective development of the co-operation by purposefuly sharing the reponsibillities and fully exploiting the advantages of each partner.

Reality principle: the vocational training curriculla aiming to the improvement of the emplyment possibillities can be designed and optimized only referring to the vocational, economical, social, cultural and regional realities. The designers of the vocational training curricula have to set the clear targets and foresee the means how to achieve the goals foreseen in the curriculum, what kind of knowledge, skills and abilities will get the trainees and how it will influence their employment possibillities. Assurance of the feedback with the trainees is one of the most important factors of the optimization of vocational training curricula.

2. This book presents the optimization approach of the existing vocational training curricula by adding to the existing training programs new modules, which correspond to the actual and up-to-date labor market needs. The authors also present the approach of the curriculum optimisation referring to the training based on the „learning fields“ of work. Authors recongize that there is no universal method how to improve the vocational training curriculum. By application these and other approaches it is necessary to evaluate many factors of the learning and work environment at the micro-level (aims, needs and interests of the

trainees, qualification and skils of the trainors, experience of the training institution, etc.) and macro-level (vocational edeucation and training system, labor market conditions, economical and educational policies, etc.).

3. Employers could take more active part in the development and optimization of the vocational training curricula both for the primary vocational training and for the continuous training. One of the most important issues in this case is to choose priorities of development and optimization of continuous training curricula. This process should aim to the development of wide and polyvalentic skills and knowledge and should not focus on the narrow and short-term needs of the labor market. Effective continuous training focused on the improvement of the employment possibillities shall refer to the professional experience of the trainee, but in the same time it should provide new skills and knowledge, which are needed in the constantly changing work environment situations.

4. The optimization of the vocational training curricula is not possible without the positive approach to the innovations and their implementation. Therefore is is necesary to seek for the compromise between the standartization of curricula and the implementation of innovations. The openness of the vocational training standards to the improvements is the necessary condition for the optimization of the vocational training curricula.