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# **THESIS**

— **ABSTRACT** —

**"Research on the development of new interactive methods for  
developing technical skills of high school students"**

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## ABSTRACT OF THE PhD WITH THE TITLE

**“Research of the development of new interactive methods for developing technical skills of high school students”****Keywords**

Professional competence, interactive teaching strategies, information technology and communication, the European Qualifications Framework, assessment tools, educational system, professional training, focusing on pupils; focusing on skills, interactive methods, computer aided education, educational software.

**Introduction**

The need that *vocational educational training systems (VET) adapt both to the demands of the knowledge society and to the needs determined by the desire to improve the level and the quality of employment*, underlined by the European Council, the initiative “New Skills for New Jobs”, the increase of the gap between the level of competences and the job requirements in the VET systems can not more rapidly answer to the needs of qualification and skills, the need of various actions of developing new methods of teaching and assessment in accordance with the approach based on skills, led me to address the topic “Research on the development of new interactive methods for developing technical skills of high school students”.

Recent theoretical studies in education – curriculum, instruction, assessment, reveal that this area has become more complex in recent years and has known a special evolution. There is an international trend that confers to the competence the status of reference term for: the development of training programs and the assessment of their quality, the establishment of professional standards, the evaluation of qualified benefits in one area or another, the socio-professional promotion, etc.

A systematic scale of contemporary views (approaches, “currents”) focused on competence, on student-centred teaching, and on quality, is as much necessary as it is difficult.

Analysing the field of new teaching technologies, we can say that modern and informational technologies can influence the teaching and learning process by expanding the opportunities of training and development of necessary competences in professional activities, the personality formation, the removing of traditional “barriers” between teachers and students and in the hierarchy of educational structures.

**The aim of the thesis**

The paper aims to constitute into a theoretical and practical work, situated between concerns about the trends of development of technical and professional education and the needs of employers, the developing a common “language” that creates the link between education/professional training and the work to facilitate the understanding by citizens and employers of how key competences and learning outcomes are relevant to tasks and occupations.

The design of assessment tools and of development of technical skills in line with the common professional training principles of the European Union – the European Qualifications Framework (EQF) and key competences associated to it, for lifelong learning which describes the learning outcome in terms of: knowledge (theoretical and/or factual); skills (cognitive – the use of logical, intuitive, creative and practical – involving manual dexterity and the use of methods, materials, tools and instruments); competences (described in terms of a person’s responsibility and autonomy), in the electrical, electromechanical, electronic, mechanical areas, essential to everyday life.

The development of a methodology and of a software dedicated to the assessment of initial and final performances (per lesson, stage, training cycle), to the development of students' competences in technical colleges and of the persons involved in lifelong learning.

The thesis entitled "Research on the development of new interactive methods for developing technical skills of high school students" contains five chapters.

The first three chapters present the theoretical foundations of the investigated issue, and the following two chapters present the methodology of the realized researches, results and conclusions.

The paper contains a number of 199 pages, a bibliography with 162 positions of bibliographical work, the works published as main and co-main author, and 11 annexes.

Chapter 1 – **Introduction** – makes an analysis of technical and vocational education in terms of, on the one hand, the specificity of conceptual approaches, and on the other hand, the general context of the changes implemented in the Romanian education system.

The research was based on the results of a set of precise researches concerning the reporting of national qualifications systems to the European Qualifications Framework (EQF), and the encouragement of the use of an approach founded on learning results for standards and qualifications, assessment and validation procedures, education programs and quality assurance.

These researches aimed at the advance of knowledge in the field and propose new directions of ameliorative intervention in order to improve employability through education and training to meet the current challenges and the future labour market.

Chapter 2 – **The analysis of teaching strategies and methods in pre-university education** – summarizes a model of professionalism of training students in the vocational and technical education, in training environments, through interactive teaching strategies.

Different fragments of this complex model were implemented in exploratory experiments.

The model in question differs from similar training students models by:

(a) purpose – the professionalization of the process of training students in vocational and technical education;

(b) making training objectives through skills;

(c) the selection of contents in the proposed model is conditioned, on the one hand, by the rapid development of science and technologies, which means the founding of contents, and on the other hand, the need to develop to students the professional skills, which requires the use of contextualized contents;

(d) learning theories used in the model: (neo) behaviorism, cognitivism, (social) constructivism and connectivism, are not viewed as theories that exclude each other, but as parallel theories;

(e) traditional didactic principles are not excluded from training. Meanwhile, the proposed model is based on a series of didactic principles, which reflect the role and the possibilities of new technologies: accessibility (Internet provides access to various sources of learning at any time and any place); flexibility (possibility for the learner to choose the learning environment – real or virtual, to select sources of learning, to build his/her own network for learning, to learn at his/her own pace and so on, and for the teacher - the opportunity to propose, the learner/the team, learning situations that best fit the needs and the preferences of the trainees, etc.); interactivity (keeping in mind the functional interaction – between the user and the computer systems, but also the relational interaction – between the actors of the training system); customisation (modern technologies allow the creation of a personalized learning environment); participation (when the learner knows the results of his/her work will become public, he/she will show a greater interest and will make more effort so these will be as best as possible).

In this chapter we resorted to making a general theoretical founding, which shows, mainly, the current state of scientific knowledge on the issue of teaching strategies that determine the academic success, and of theoretical founding specific to empirical investigation, which lies in line with the overall and specific objectives pursued in our research.

For an overview of explanatory paradigms for the academic success and for the learning in vocational and technical education, we present the main models and theories developed by specialists for the understanding, the prediction and the improvement of these variables.

Of the many inventoried models in the specialized literature, we presented the main methods that have formed the basis of our experimental intervention: the interactive teaching method for computer-assisted instruction, the cube method, the pyramid method.

Chapter 3 – **“The identification of the graduates’ competences in vocational and technical education and of methods of providing these competences”** – realizes an analysis of the vocational and technical education in terms of building educational student-centered situations, of the training and development of skills in order to improve the capacity of employability through education and training, but also an analysis on the perception of employers about graduates’ skills of technical and vocational education to meet the current challenges and those of the future labour market.

This study sought to obtain responses from representatives of economic agents to questions related to the following issues: the importance of certain skills and abilities that graduated should have, the level of satisfaction of employers on the quality of these skills and abilities, the type of cooperation between economic agents and educational institutions, ways of increasing the employability degree of graduates, and so on.

For this study we used the survey as the method of investigation for economic agents, the questionnaire as a research tool, as for students we used various assessment evidences.

The assessment questionnaire on the employers’ degree of satisfaction about the quality of education and training has been applied to a number of 8 economic agents, representative in the region. The questionnaire and its results were the content of a website.

The term “competence” has become a key-term of didactic, political-educational and practical discussions. The evolution of the use of this term is justified mainly by changes in the work environment and their related requirements that become more complex for the members of the so-called knowledge society. The concept of competence promises a connection of the standards/ economic and pedagogical rules, of everyday learning with the continuous institutionalised education, of practical knowledge / experiential and of scientific knowledge, of what we know and what we can, of needs and requirements.

On the basis of the above characteristics, in addition to the definition released by OECD (Organisation for Economic Cooperation and Development) (2003), the term “competence”: means the ability, i.e. the potential to overcome complex requirements given by specific situations. Competent action requires both and adequate intake of knowledge and skills, and one of values, motivations and personality traits of the individual, which is influenced by the external environment and the framework conditions of a situation.

Chapter 4 – **“Overview on the basic professional knowledge in the field of electric drive systems in terms of graduates’ skills of vocational and technical education”**.

From the perspective of graduates’ skills of vocational and technical education, the realization of a knowledge basis specific to the domain, and of ways to use performance standards to achieve curricular integration is a necessity.

Focussing our attention on the curriculum of vocational and technical education, we have highlighted a set of knowledge and trends in its design and implementation. Thus, we were able to synthesize three dominants of organization corresponding to this level of training: (1) the choice of electric drive systems; (2) the control of electric drive systems; (3)

the choice of elements of source, command and protection of electric drives. I considered relevant to our work also the analysis of models of integration of the theoretical curriculum with the vocational one.

This chapter has allowed the exploitation of the domain of learning outcomes, specifically focusing on cognitive capacities. Thus, we join the belief according to which the use of the research results on cognition has become a sign of the reform of education and learning, because it focuses on the approach, the understanding, the recovery of mental mechanisms involved in knowledge, in solving problems and complex real situations. It thus emerges a new methodological framework for the design and the effective implementation of current school curriculum, which reorients its goals and objectives, contents, strategies, assessment criteria.

Thus, in front of the generic objective of contemporary education, the creation of higher-level cognitive abilities, it may answer, being preoccupied, naturally, by the determination of the training content, but also by the stimulation and the development of functions and of capacities involved in studying these disciplines.

Electric drive engineering is unequivocally a key technology that encompasses all elements of modern industrial technology. This become obvious by the fact that in industrialized countries more than 50% of the electricity sent to the system is transformed into mechanical energy. The trend of increasing this percentage is based on the tendency of achievement of more and more intelligent plants, of drive systems with low power consumption but also the increase of the number of small motors used in actuations.

The main task of the electric drives is to ensure the electrical movement at the best possible output and if desired, to provide a dynamic and high accuracy. The broad field of applications, the complexity of the topic, of electric drives, requires knowledge in various fields of electrical engineering, namely: power systems, electrical machines, power electronics, simulation, tuning theory and others. Combining the results of these areas, the study of electric drives becomes particularly attractive and allows the development of new modern applications.

The object of study Electric Drive Systems was introduced in the curricula of all vocational qualifications in the technical profile, the electric, electronic, electromechanical, mechanical field, being a catalyst for teaching and research, to strengthen the interdisciplinary foundations of the professional curriculum.

Chapter 5 – “**Contributions regarding the use of interactive methods to develop the technical skills of students in high school education**” is dedicated to designing and implementing a formative psycho-pedagogical experiment that aims at improving the level of school success among students in vocational and technical education.

Analysing the existing models in specialized literature, it is noted that most of them are descriptive and exclusively theoretical, not being empirically or experimentally tested. This shortcoming involves the development of conceptual models for the analysis of school success, followed by their experimental testing to determine whether they can contribute to the improvement of the quality of the educational process. Following these directions, at this stage, we have intended the building and the experimental testing of an explanatory-interpretative model of school success.

The construction of the model that we have proposed has a double foundation: a conceptual, theoretical one, and a methodological empirical one.

The factors that contribute to the achievement of school success can be classified into two main categories: external factors (institutional structure of the educational systems; teaching organization of the educational process; family factors) and internal factors (biological and psychological).

The result, obtained after the analysis of the optimal selection of the determinant factors of school success, revealed that, in our study, the best predictors of the school success are: the systematic use of interactive teaching methods, of the educational software in achieving training in technical disciplines (electric drive systems), applied to the students of technical and vocational education, in terms of their interest for this discipline, and also from the perspective of initial and final performances (per lesson, stage, training cycle) obtained by them.

The proposed model is both a theoretical one, since it is based on explanatory models and theories of school success recorded in specialized literature, and a practical-applicative one as it provides a methodological framework for implementation in educational practice. In pursuing these objectives, in this experimental phase, we have intended to test the following hypothesis: the systematic use of interactive teaching methods, of educational software, to achieve training at technical disciplines (electric drives systems), applied to a group, from the perspective of the students' interest for this discipline and of the professional performances, which leads to improvements in the school success obtained by them.

The experimental results on vocational training in the Vocational and Technical Education – at the high school level that are obtained, emphasize the functioning of the conceived methodology.

The approach to the teaching methodology, as the main supporting factor of the educational-training activities, emphasizes the importance that the quality of teaching strategies have in increasing school performance. In this context, we defined three fundamental ways, “pyramid method”, cube method”, “method of computer assisted instruction”, also regarded by us as being significant for an interactive approach to teaching and learning. From the perspective of valuing the interactive potential of the three methods, there are also discussed other methods, techniques and teaching procedures.

In the ascertaining stage, we took into consideration the shape of a true image concerning the studied educational reality, which may act as a starting point for the following organization of an ameliorative step. In this regard, we sought to identify the training needs of the students in technical and vocational education and from the economic agents' perspective. Data processing was realized in the SPSS computer program (Statistical Package for the Social Sciences), using various statistical and mathematical methods (correlational analysis, the test of significance of the difference between two environments, multiline regression, ANOVA analysis techniques, etc.).

The answers to the questionnaires applied to the economic agents shown that the students' performances of the vocational and technical education are, primarily, related to their good training (knowledge, skills, attitudes, behaviour).

Teaching strategies have also imposed the use of the computer. Ways in which the computer can be used at classes of Electric Drive Systems are various. The simplest are those in which we use the Microsoft Office pack, but I have also presented the application CADdy ++Electrical that facilitates the realization of complex projects of electrical installations, of lighting and telecommunications, and PSpice, a program that realizes the real stimulation of a circuit.

The program included 60 hours of training and was conducted over a period of two academic years (2011-2013), being implemented in teaching activities, in the module Electric Drive Systems.

At the level of design between subjects, based on the comparison of the results by the subjects in the experimental group in both phases of the experiment (pre-test and post-test), we can say that the specific hypothesis was confirmed, as, from the experimental intervention, was found the improvement of the educational outcomes, especially among students with performances below standards. The result registered by the control group in the post-test

phase reveal the absence of statistically significant variables between the medium scores obtained by the subjects at the level of dependent variables included in the investigation; these results support the idea that, in the school success, there can not be produced significant changes in the absence of systematic interventions.

In these circumstances, I consider that the implemented formative intervention proved to be statistically relevant. The specific hypothesis was validated by the obtained results, in the sense that, after the experimental intervention, there were produced significant improvements at the level of school success among students in the experimental group.

Chapter 6 – “**Conclusions and contributions**” – presents conclusions, original contributions of the author, and also the directions for future researches in this area.

### Conclusions

Through this thesis I studied the use of new technologies in education, in the vocational and technical education, a field at the intersection of electrical engineering, the specialization obtained through my license, and the education systems in which I work.

The research presented in this thesis was focused on the development of a training, design and implementation system. The main objective of this system is to develop a user-friendly environment both for pupils, and especially for teachers, given that, in a very large extent, the success depends on the availability of teachers to populate this system with quality educational content and a set of methods relevant in number and content.

The needs identified in the critical investigation and the rigorous examination of their own practices, of the school curricula and development, had, in general, an impact on teaching strategies used in classroom.

Professional competence is the ability to apply, transfer and combine knowledge and skills in various work situations and environments, to realize the required activities at work, at the quality specified in the standard.

Professional competence is a harmonious combination and use of knowledge, skills and attitudes to achieve the expected results in the workplace.

Being competent means: to apply specialized knowledge, to use specific skills, to analyse and make decisions, to be creative, to work with others as member of a team, to communicate effectively, to adapt to specific working environment, to deal with the unexpected.

The combination of interactive methods with the solutions offered by ITC leads to the improvement of performances. This was found both at good students and at the worst students, specifying that those in the first category, the good students had a greater benefit.

At the same time it was found that intelligent and high learning capacity students are able to assimilate the material and have very good results regardless of how it was taught. Instead, at less gifted students, with a less learning capacity, it turned out that the most important factor determining the assimilation of the material is the way of content presenting and processing.

The way of content presenting and processing increases the level of the learning process outcomes, and the student's ability to collect, record, process and interpret the informational message.

Cooperative learning outcomes – in our case, applying the cube method – shows that students who had the opportunity to learn in this way, learn faster and more effectively, retain easier and look with more fun at the educational process. It is a method of teaching students to link and develop their teamwork skills. In cooperative groups, each student has a specific task, each student must be involved in the project, and no one is allowed to stay away. Group success depends on the work success of each one.

The consistently use of modern methods stressed the idea that an effective method must, necessarily, be continuous and complete. Controlled and assessed through systematic checks

during the training program, in smaller stages, the student had the possibility to develop self-evaluation capacity, and the difference between his/her own judgement (of the examined student) and his/her result at the summative assessment decreased significantly.

Marking a comparison between the results obtained from the initial evaluations and those obtained in the final evaluations, we can notice that at the end of learning units, there was a percentage of solving tasks higher than at the summative assessment at the end of control units, which determines me to say that the use of modern methods gives a meaning to learning.

*Conclusions regarding the use, the application of the Cube Method for the development of technical skills of the students.*

Using the cube method for various learning units will form for the student the competence to equally treat different problems going through the same general stages (describes, compares, analyses, associated, applies, argues).

By approaching a learning unit in the same way, the student develops a method to approach and to solve problems. The results prove the registered progress.

*Conclusions regarding the use, the application of the pyramid method for the development of technical skills of the students.*

The use of the pyramid method develops the ability to deliver innovative solutions to problems and to tasks, and the development of the team spirit and mutual help. The individual activity followed by team work, offers the students the possibility to formulate their own opinions and to check them, to improve them and to change them according to the responses of other group members.

The progressive increase of the group dimensions implies a repeated confrontation with new ideas and considerations. The gradual increase of the complexity of the items, each phrase being built on previous steps, simplifies the approach of the problem, synthesizes it and reduces it to its essence.

Practice shows that learning outcomes are different at the same student in compliance or non-compliance with its rate of work/learning.

The quality of training – provided by the teacher's personality, principles of organization and reconstruction of knowledge, teaching methodology and technology, transdisciplinary nature of teaching, leads to the increase of school performance.

The experimental model used triggered for most students a state of interest and emulation, although there were not missing some reserve attitudes and even disbelief. Final tests, comparatively applied, highlighted, on positive effects on general preparation, the mitigation and even the cancellation of under-mediocre percentages of disciplines where we worked according to the model.

*Conclusions on the comparison of the efficiency of the pyramid method, the method of the Computer Assisted Education, the cube method.*

Analysing the relationship between the averages obtained by the students and the type of the used teaching method, we can say that the averages obtained by students differ from the used teaching method.

Analysing the tests results we find that the difference of the averages between the experimental group (the use of interactive methods) and the control group when participating at the first training program (the cube method), comparatively to the participants at program 2 (the pyramid method) is in favour of the cube method, which allows us to state that the subjects participating in the program 2 need more time in order to form an algorithm for solving problems compared to those participating in program 1.

Comparing the results of the persons involved in program 2 (the pyramid method) comparatively to those involved in program 3 (the method of Computer Assisted Education), we can state that the subjects participating in program 3 (the method of Computer Assisted



Education) were more motivated than the subjects participating in program 2 (the pyramid method), the results of their action being immediate.

Summarizing, we can say that program 2 (the pyramid method) differs significantly both from program 1 and from program 3, reason for which, in the replication of this intervention in this program, we can compare it to the project method.

The Computer Assisted Education method enables the development of complementary skills, skills of design schemes and verification through stimulation.

The results obtained in the analysis showed that, in our study, the best predictors of the school success are: the systematic use of interactive teaching methods, of educational software to achieve training in technical disciplines (Electric Drive Systems), applied to the students in the vocational and technical education, in terms of students' interest for this discipline, and also from the perspective of initial and final performances.

Personal contributions

*Contributions to the development of interactive methods for the development of technical skills*

1. There was proposed a complex method of the professional training, which differs from the known models by formulating the training objectives through skills, the selection of contents so as to take account of the rapid development of science and to ensure the development of professional skills.

The proposed model uses a series of teaching principles that reflect the role and the possibilities of new technologies: accessibility, flexibility, interactivity, personalisation, participation.

*Contributions regarding the use, the application of the cube method for the development of technical skills of students*

1. The cube method was applied for the learning unit "Drives with synchronous motors", the teaching unit "Starting the asynchronous electrical motors".

2. It was conceived an instrument to group students on work groups for the application of the cube method so that it fits the basic knowledge on the unit "Drives with asynchronous motors".

3. There were customized the general steps of the cube method (*describe, compare, analyse, associate, apply, argue*) for the teaching unit "Starting the asynchronous electrical motors".

4. There was developed a variant of the cube method obtained by combining the basic method with the computer-assisted education.

*Contributions regarding the use, the application of the pyramid method for the development of technical skills of students*

1. The pyramid method was applied for the learning unit "Drives with asynchronous motors", the teaching unit "Electric schemes of drives with asynchronous motors".

2. There was conceived and instrument to group students on work teams for the application of the pyramid method so that it fits the knowledge concerning the symbols of the command schemes and the names of these symbols.

3. There were customized the general phases of the pyramid method (*the introductory phase, the phase of individual work, the phase of pair work, the phase of meeting in bigger groups, the phase of reporting solutions in a groups, the decision-making phase*) for the teaching unit "Electric scheme of drives with asynchronous motors".

*Contributions regarding the use of the Computer Assisted Education method for the development of technical skills of students*

1. The Computer Assisted Education method was applied for the learning unit "Drives with asynchronous motors", the teaching unit "Electric schemes of drives with asynchronous motors".

2. There was used an instrument of software type, named OMRON-ZEN Support Software.

3. There was applied the instrument OMRON-ZEN Support Software to start by direct coupling to the network and the reverse of the rotation sense of a three phase asynchronous motor.

4. There was used an instrument of software type, named CADdy++Electrical.

5. There was applied the instrument CADdy++Electrical to start by direct coupling to the network and the reverse of the rotation sense of a three phase asynchronous motor.

### **Contributions to the creation of tools and methods**

1. There was conceived an instrument of forming work teams based on sets of  $m \times n$  of cards containing separate elements of basic knowledge in the teaching unit.

2. There were applied different methods for the same learning unit and the same teaching unit, for the comparison of the efficiency of the method and for the development of complementary skills.

3. There were created assessment tools of skills under the form of questionnaires respecting Bloom's Taxonomy and the specifications matrix.

4. The use of statistic methods for the analysis of the results obtained by subjects in the assessment tests.

The data processing was done in the computer program SPSS, using various statistical and mathematical methods (the correlational analysis, the test of significance of the difference between two averages, the multiline regression, the ANOVA technique).

### **Experimental contributions**

1. The assessment test for the learning unit "Drives with asynchronous motors" was applied to Class XI, Technician CAD Designer. The results were statistically processed and presented as a graph, a histogram, a chart.

2. There were determined *The indicators of the general tendency*: the medium value; the median value; the dominant value, *The indicators of dispersion*: the field of values, the standard deviation.

3. There was designed and developed specialized software, dedicated to:

- the evaluation of the satisfaction of employers concerning the quality of education service and professional training

- the evaluation of initial and final performances (per teaching unit, learning unit), for the development of students' skills in technical colleges and persons comprised (involved) in lifelong learning.

4. We have conceived and developed *computerized tests* for the module Electric Drive Systems: <http://formulare-online.wikispaces.com/>, for: monitoring students' results.

5. There were statistically processed the results:

- the data processing made in Microsoft Visual C++6.0 MFC. The realized application allows the introduction of the name and the grades at 4 tests, calculates the average and displays the records in alphabetical order or ordered by the 4 grades or their arithmetical average. The data is stored and restored in a text file.

- the data processing realized with the SPSS software (Statistical Package for the Social Sciences). By using the software SPSS, we pursued the calculation of some aspects of our research as the size of the effect or the statistical power.

- I determined *The indicators of the general tendency* (the average value – X, the median value – M, the dominant value – D), *the indicators of the asymmetry* (histogram, frequencies polygon).

- I used the test "t" for paired samples (correlated/dependent), for the comparison of the results obtained by two groups, given that the two groups are related to each other by the

intervention of the experimenter and the natural correspondence of elements in the two groups.

6. There was developed and applied the questionnaire of investigation of the requirements of the economic agents concerning the professional skills of future employees.

### **The scientific novelty of the obtained results**

The novelty in the creation of interactive methods for the development of technical skills of students in high school education is given by the proposed complex model of professional training, which is different from the known models by formulating the training objectives through skills, the selection of the contents so as to take account of the rapid development of science and to ensure the development of professional skills. The proposed model uses a series of didactic principles that reflect the role and possibilities of new technologies: availability, flexibility, interactivity, personalization, participation, from the perspective of students' interest for the discipline of Electric Drive Systems and of the professional performances, for the development of students' skills in technical colleges and the persons comprised (involved) in lifelong learning.

The proposed model leads to improvements in the achieved educational success and to the improvement of the employability on the labour market.

### **Applied value of the work**

The proposed model for the development of technical skills of students in high school education using interactive methods, allows the systematic and the unitary approach of the fundamental processes: the design, the implementation and the assessment of the curriculum, increases the confidence degree of graduates and of economic agents, values the researches in the educational field – curriculum, instruction, assessment, innovations, especially in the area of vocational training based on three pillars: competence, student-centred teaching and quality. The competence is explored from different perspectives: there are critically examined the definitions of competence, its structural elements, the types of competences representative for the field of vocational and technical education, some ways of training, aspects concerning the evaluation of competences. Also, there is developed a certain model of competence with which is consistently operated. Moreover, the competence is a constant in our thesis – being situated in different contexts in all chapters of this work.

The applicability of the results obtained in this paper is demonstrated in research reports in results dissemination.

The obtained result are useful both for teachers from other disciplines, from other schools, economic agents in the region and can be immediately applied, in order to solve the problems of school success, in order to improve the employability through education and training to meet both the current challenges and the future ones on the labour market.

### **Dissemination of results**

The results of the thesis were supported and presented at 15 conferences, 3 seminars/workshops, 4 research reports; 19 scientific papers were published in specialized journals or in proceedings of national and international conferences.