DEFINING KEY PSYCHODIDACTIC STRATEGIES IN BRANCH (PROFESSIONAL) DIDACTICS AND THEIR IMPLEMENTATION IN UNDERGRADUATE EDUCATION OF TECHNICAL TEACHERS

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Abstract

Today's society is characterized by scientific and technological progress, an information explosion, and at the same time is marked by considerable environmental, economic and social problems. Pedagogy and the school system must also respond to this trend.
Technical education has an important position not only in the teaching process, but also in the pupil's leisure time. An individual who learns flexibly, creatively solving complex problems, cooperating with others, but also promoting their own thoughts and opinions, is more likely to become a successful and valid member of society. The issue of optimal content definition of practical training of future teachers and increasing their professional competencies in the area of implementation of teaching strategies is at the center of interest of the didactics. The identification of adaptive teaching strategies and the application of a cognitive-oriented approach for developing pupils' critical and creative thinking and other key strategies in professional didactics is part of the project APVV-15-0368 Practice in the Center of Professional Didactics. The paper presents partial results of the project solution and definition of some key strategies.

1   Introduction

Practice of complex activities and technologies in technical education has lately been supplemented by the emphasis on acquiring critical and creative thinking as well as independent work and teamwork practice. Critical thinking is ranked first in the general objectives of education and training, as well as in key competences for lifelong learning, pedagogy and pedagogical psychology, particularly in relation to the results of international measurements done by OECD, PISA, TIMSS. The results and conclusions of the foreign research indicate the lack of innovation in the system of practical training of teachers in the field of strategies of critical and creative thinking in concrete subject field didactics.

Quality curriculum, its application as well as its application in practice is important for the development of the pupil's personality, from the behavioral and cognitive point of view. Within the framework of the project APVV-15-0368 Practice in the centre of the subject field didactics, subject field didactics in the centre of preparation for practice, we verified through the research the application of critical and creative thinking in education. The main objective of the project is to identify adaptive teaching strategies using a cognitive-oriented approach for developing critical and creative thinking of pupils and other key psychodidactic topics

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and strategies in concrete subject field didactics and their implementation in undergraduate practical training for secondary education teachers through an excellent practical training center (Duchovičová a kol. 2017).

Tackling the problem requires assessing the extent to which both the critical and creative thinking strategies of pupils are included in teaching by teachers as well as by students - future teachers during their teachers training.

The most recent problems of subject field didactics include the optimal content and scope of practical training of future teachers in undergraduate training and the development of their psychodidactic competences to implement adaptive teaching practices and strategies between student learning processes and teaching processes with an emphasis on building the knowledge capacity of the students. These are strategies for stimulating the critical and creative thinking of learners. Both concepts, critical and creative thinking, are closely related. While critical thinking is an ability that is a prerequisite for prudence, caution in seeking, using and interpreting information, creativity builds on these activities. At the same time, a critically thinking person is a creative individual who is characterized by quick, flexible and divergent thinking. It is also characterized by the ability to solve problems, the ability to transfer experience and knowledge, the ability to create something original, unexpected and useful.

Completing of vocational training and practice is an essential part of a quality preparation of a person for effective participation in a productive professional life. In the preparation process of future teachers, they complete their trainig and practice in technically oriented fields as well as in a particular field (Kozík, Depešová, 2007).

The role of this training, especially pedagogical practice, is to participate to a large extent in shaping the teachers' creative professional identity, namely:

Table 1 Tasks of pedagogical practice

Teaching practice	to positively motivate the students to the teaching profession
	gradually change the attitude from the role of student to the role of teacher
	to improve pedagogical communication
	apply theoretical knowledge
	gain experience in direct teaching activity
	develop the ability to respond adequately to a particular educational situation during the educational process
	to teach the student self-reflection

2 Training of future teachers and critical thinking

Effective integration of theory and practice in the teaching practice of students in the teacher education programs currently requires some innovation in the existing form of teaching practice so that, while preserving the positive elements of its current state, it also takes the possibilities offered by the means of information and communication technology into account. Information and communication tools offer one of the possibilities how to solve the complex problem of providing pedagogical practice for future teachers of pedagogical faculties at primary and secondary schools and at the same time create a system of pedagogical practice that will become more interesting for students. As well as more effective in the context of dedicated finances and time for the completion of the teaching practice.

Achieving the complexity of teaching in terms of completeness in pedagogical understanding is a prerequisite for successful teaching. Complexity - completeness is related to the integration of content and the outcomes of learning.

The requirement for the development of professional skills by improving the quality of practical training results from the standpoint of the Minister of Education of the Slovak Republic and from the Report on the State of Education in Slovakia. In order to improve the training of future teachers with an emphasis on developing critical and creative thinking, we focus on defining teaching strategies utilising the cognitive-

oriented approach to developing critical and creative thinking of pupils and other key psychodidactic topics in the undergraduate practical training of secondary education teachers.

Critical thinking is ranked first in the general education goals as well as in key competences for lifelong learning.

In connection with the term „critical thinking", the concept of quality of teaching also comes to the forefront. In recent years the quality of the education has been discussed and referred to as a process in which the teacher and his competencies and the application of teaching strategies developing pupils' critical thinking and communication skills are crucial. Strategies represent the methodological approaches that the teacher chooses to achieve the set of educational goals in accordance with pupils' learning styles and the interests of the whole society (Valentová, Brečka, Depešová, 2017). Observable and measurable partial steps or procedures are meant to be taken to achieve a well-thought-out arrangement to create an overall procedure - strategy (Škoda, Doudlík, 2011).

The term critical thinking has been used extensively in the pedagogical theory and practice in recent years. From the definitions of multiple authors, we can mention the following:

Critical thinking

> the ability to assess new information, to examine it carefully and critically from several perspectives, to make judgments about its credibility and value, to assess the importance of new ideas, information for its own needs (Grecmanová, 2000)

> thinking that is targeted and purposeful, thinking to create judgment where thinking itself meets the standards of adequacy and precision (Bailin 2002)

> these are mental processes, strategies that people use to solve problems, make decisions and learn new concepts (Sternberg, 1986)

> a complex of thought operations beginning with information and ending with a decision. Its essence is an attempt to reach the truth with its own judgment (Krajčová, Daňková, 2001)

> critical thinking, or reasoning is an intellectual process that consists in conceptual grasp, analysis, synthesis, and evaluation of information (Scriven & Paul, 2009)

Critical thinking generally means the ability not to be affected by the first impression. It gives the person the capacity to create his own opinion on the basis of acquired knowledge and experience not only of his own but also the knowledge and experience of other people.

Scientific literature states that critical thinking can be described as a complex of thoughtful operations that begin with information and end with the adoption of one's own decision. It is independent thinking that is looking for arguments, that begins with raising problems, asking questions. On the other hand, uncritical thinking does not reveal, evaluate, assume, it is irrational and inconsistent, it is only a passive assumption. For

critical thinking, it is almost necessary to get a response from the environment and to confront other arguments, attitudes and opinions (https://eduworld.sk).

A teacher who applies critical thinking in teaching creates a safe, motivating and inclusive learning environment. Such a teacher has the ability to create critical thinking and thinking stimuli in the classroom, enough room for discussion, observes different opinions and formulates questions, has the ability to select and implement teaching methods, activities and forms of work that develop critical thinking in pupils, he supports active learning, whether indepently or in a team. He has the ability to develop pupils' communication skills, the ability to provide pupils with an active learning environment, supports positive relationships between pupils, creates well planned material environment for learning and all the required material and technical support.

Concrete application of critical thinking is also rooted in the innovatived state education program for technical education, where, in addition to work skills, emphasis is placed on developing critical and creative technical thinking of pupils. Educational strategies in pupil-centered education emphasize the use of activating, interactive, action methods that primarily create space for one's own thought and practical activity (Stebila, 2015).

3 Objective of partial research

The main objective of the partial research was to determine the degree of implementation of critical and creative thinking strategies in technically oriented subjects.

The intermediate goals were:
- to determine the importance and frequency of implementation of particular strategies by teachers;
- to determine the importance and frequency of implementation of particular strategies by students;
- to verify the reflection of the teacher's cooperation with the practice didactic;
- to find out the application of strategies by the teacher and the student's self-reflection;
- to verify the reflection of the student's cooperation with the teacher;
- verify the reflection of the student's cooperation with the trade didactic.

Research file / sample
The research sample consisted of separate sub-groups made up of primary and secondary school teachers, a total of 211 teachers, including 25 trainee teachers. Students of the Department of Technical Education and Information Technology (31 students) participated in the survey:
- students - future teachers of the subject Technical Education at primary schol,
- students of extended education.

The survey was preceded by the preparation of 2 questionnaires, the construction of which consisted of three parts (Scheme 1).
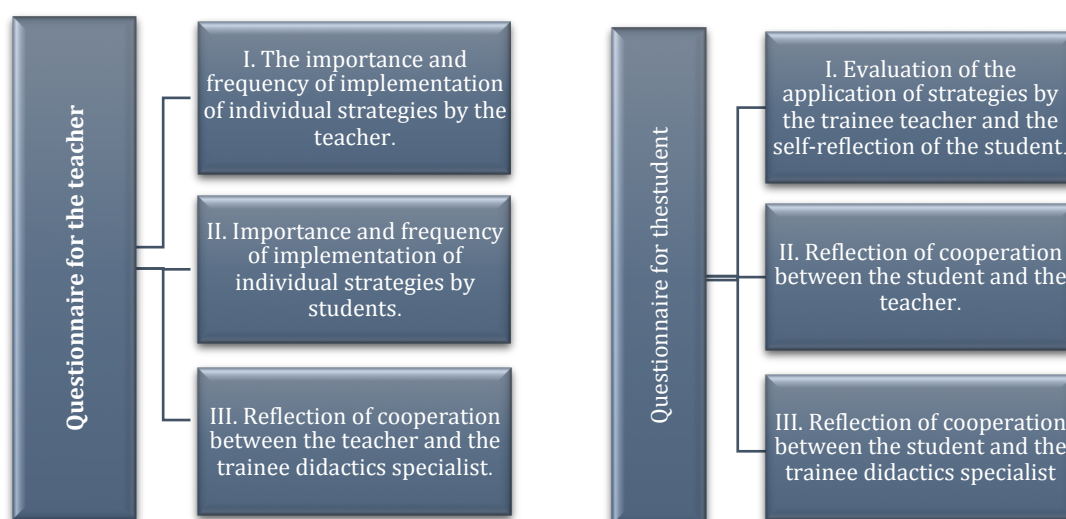
Scheme 1 Construction of the Critical and Creative Thinking Strategy Questionnaire for Teachers and Students (source: Duchovičová et al. 2017)

Questionnaire for students

I. the part consisted of 25 closed items with choice of answer in which we examined the students' views on the application of critical and creative thinking strategies of teachers in their teaching. At the same time, we also investigated the students' self-reflection on the application of the above mentioned strategies in practice.

II. the part contained 9 closed and 2 open items in which we verified the reflection of the cooperation of the student with the trainee teacher, the intensity given to particular activities by the trainee teachers and the benefits of these activities for the student.

III. the part contained 9 closed and 2 open items, through which we verified the cooperation of the student with the pedagogical staff member – specialist in the field of Didactics.

The analysis of information obtained from the teachers was focused on the frequency of application of individual levels of Bloom taxonomy (memorization, comprehension, integrating knowledge, analysis, synthesis, evaluation) by teachers. We also focused on assessing the importance of each level from the teacher's point of view.

4 Research results in selected items

In individual items we examined the frequency of application of the levels of Bloom taxonomy by teachers and the subsequent finding of the frequency of implementation of individual strategies. In the context of importance which the teachers attribute to particular strategies, we can state that they consider very important - 6 and 5 on the scale – the use of different sources of teaching equipment (82%) and practical work with technical materials and tools (Valentová, Brečka, Depešová, 2017).
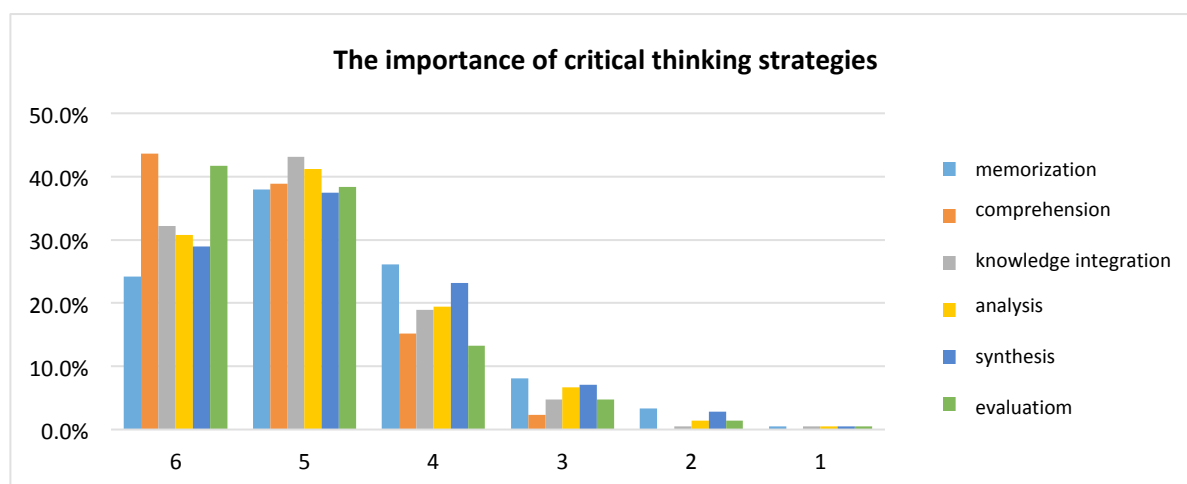
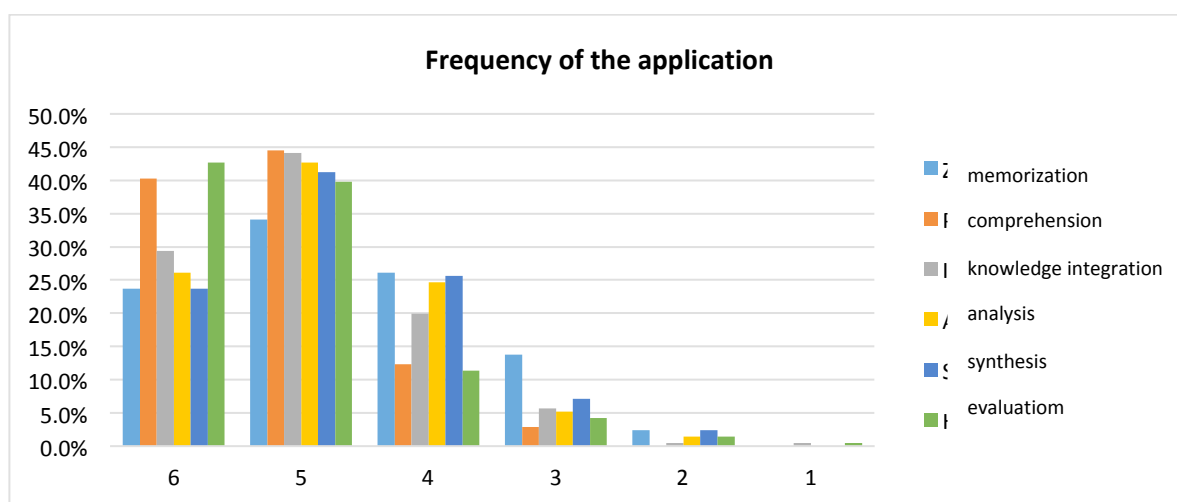**Chart 1** The importance of critical thinking strategies in education

Chart 2 Frequency of the application of critical thinking strategies in education

The results shown in Chart 1 show that teachers give the greatest importance to (in the following order): comprehension (43%), evaluation (42%), knowledge integration (32%), analysis (31%), synthesis (29%)) and memorization (24%).

An analysis of the results shown in Chart 2 shows that there is only a small percentage difference between the importance and frequency of application of these levels in teaching. We can see this difference by comparing the percentage of the results of verifying the application of critical thinking strategies: comprehension (40%), evaluation (43%), knowledge integration (29%), analysis (26%), synthesis (24%) and memorization (24%) . Nevertheless, research has identified some differences that have resulted from the comparison of the importance that teachers attribute to a given strategy and a comparison of its implementation rate.

This implies that teachers attribute great importance to the development of cognitive processes, and to a great extent also try to include them in teaching, as well as further develop them. A positive finding is the fact that teachers try to lead pupils to understanding of the knowledge and the ability to apply the acquired knowledge in practice, problem solving, etc. They emphasize the development of evaluation, which is essential in developing critical thinking. In the area of basic (general) strategies of critical and creative thinking, teachers prefer especially situations in which pupils can freely discuss and formulate questions that support the development of thinking. In the field of technically oriented strategies of critical and creative thinking, teachers attribute the greatest importance to strategies: using various sources of teaching equipment, encouraging

pupils to accountability and quality of their work, acquiring user skills, experimenting, working with technical materials and tools and related design and construction activities.

5 Reflection of cooperation between the trainer and the union didactic

In the third part of the questionnaire for trainers we focused on the evaluation of their cooperation with the trade didactic. Specifically, we wanted to find out the quality of collaborative union didactic and assessment of the pedagogical practice of students. We verified this area through 9 items, in which the training teachers evaluated the quality of the cooperation.

Table 2 Reflection of the cooperation of the trainer with the trade didactic

KS	A.	B.	C.	D.	E.	F.	G.	H.	I.
V	0,0 %	0,0 %	57,1 %	0,0 %	0,0 %	28,6 %	0,0 %	0,0 %	28,6 %
D	71,4 %	85,7 %	42,9 %	57,1 %	100,0 %	57,1 %	71,4 %	85,7 %	71,4 %
N	28,6 %	14,3 %	0,0 %	42,9 %	0,0 %	14,3 %	28,6 %	14,3 %	0,0 %
Ž	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %

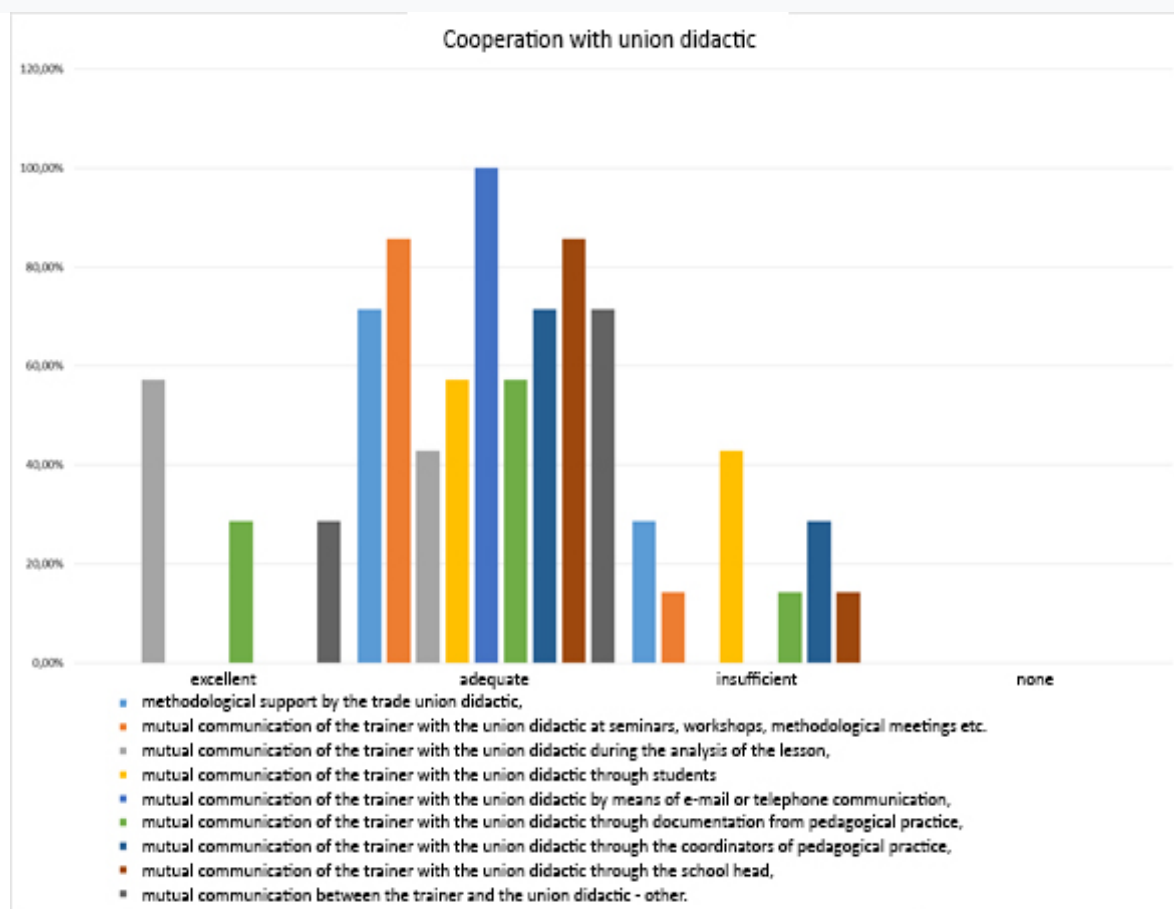|						
KS:	quality of cooperation		*V:*	excellent	*D:*	sufficient
N:	insufficient		*Ž:*	no		

Chart 3 Reflection of cooperation of a training teacher with and specialist in the field of Didactics
The excellent quality of cooperation was stated by 38% of trainers in the following items:
 • mutual communication between the trainer and the union didactic during the analysis of the lesson.

- mutual communication of the trainer with the union didactic through documentation from pedagogical practice,
- mutual communication between the trainer and the union didactic.

On average, 80% of trainee teachers consider the quality of cooperation to be sufficient in all the items in the questionnaire.

Insufficient cooperation was reported by 16% of trainers in the following areas:
- methodological support by the trade union didactic,
- mutual communication of the trainer with the union didactic at seminars, workshops, methodological meetings etc.
- mutual communication of the trainer with the union didactic through students,
- mutual communication of the trainer with the union didactic through documentation from pedagogical practice,
- mutual communication of the trainer with the union didactic through the coordinators of pedagogical practice,
- mutual communication between the trainer and the union didactic through the school head.

None of the interviewed teachers in the questionnaire stated any cooperation of the trade didactic during the reflection and evaluation of students' pedagogical practice.

A part of the verification was to find out what forms of cooperation with a trade didactic were considered by teachers to be the most effective. In their replies they stated the following:
- cooperation with the university;
- analysis of lesson work,
- mail, telephone, personal communication,
- project cooperation.

From the results of the evaluation of the training teachers we can conclude that they, like the students, are satisfied with the cooperation with the trade didactic. They evaluated most positively the mutual communication during the lesson analysis. All teachers agreed on the evaluation of their communication via e-mail or telephone, which they found sufficient. Practical teachers would appreciate more opportunities for personal communication and cooperation through joint workshops or projects.

6 Conclusion

The results of the research project will be used to increase teachers' professional competencies in the implementation of teaching strategies developing critical thinking of pupils, for the creation of legislative documents (descriptions of fields of study etc.), where the definition of practical training standards for the fresh graduates of pedagogical studies are missing. An important result is the interrelation of the theoretical training of future teachers with the everyday educational reality and teaching of the subjects of the particular specialization (Duchovičová a kol. 2017).

The project is currently still running, but it has already produced results applicable to the teaching practice. It offers methodological material in the form of visually captured implementation of psychodidactic strategies in practice with methodical introduction to the situation and subsequent didactic and pedagogical-psychological analysis and setting tasks for reflection of the practical situation of the student. The methodological procedure will include the definition of a didactic strategy suited to the particularities of the proposed didactic situation. The created situations will become the basis for creating the database of the Center for Practical Training.

Today's society expects the school to respect and reflect its needs and respond to the challenge of educating pupils in a prosperous society. The school provides education, acquires knowledge and skills important for lifelong learning and for full life in a changing socio-cultural environment. The school mediates

the knowledge produced by science and technology, while maintaining the cultural and national heritage. The school reflects on the current and prospective needs of the knowledge society and prepares elementary school pupils as the next productive generation to carry out qualified work in the economy in the fields required by the labor market and where the pupil finds employment.

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