Difficulty Aspects of the Vocational Education and Training

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Abstract – **The paper presents results of a study the aim of which was to find out what causes difficulty in teaching technical subjects at upper secondary schools. For this purpose, a panel discussion was held with 20 selected staff members of two schools. The task of the panellists was to answer three questions: what are causes of difficulties in teaching technical subjects; what are the effective ways of motivating students to study technical subjects and how is it possible to maintain the motivation of students for a longer period of time; hence, what makes it possible to attract the attention of students more significantly in the teaching of technical subjects. The discussion was led by 3 moderators, university teachers from Slovakia, the Czech Republic and Poland.**

As it resulted from about 45-minute discussion of each of the stated questions, the main difficulty of technical subjects teaching is lack of students´ motivation what is partially caused by the way in which the students are assessed, and partially linked with the need to replace verbal teaching methods by other ones.

1. Introduction

To ensure sustainable effective vocational education and training means to fight with two challenges, interconnected within the sector of education, from which each is connected to different group of stakeholders.

One challenge is connected with the group of upper secondary vocational school teachers, who have to teach different vocational subjects to their students. The second challenge is connected to the group of employers for which the secondary vocational schools train their graduates. On the one hand, there are teachers who have to teach different vocational subjects to their students according to precisely specified curricula, i.e. those, who are fighting with the difficulty of technical subjects teaching. On the other hand, there are employers continuously coming with new requirements regarding knowledge and skills of the secondary vocational school graduates [1], [2], [3], [4], [5].

Most of the researches in this area emphasize either students´ points of view to these matters, for example, their understanding of the connection between specific learning experiences and successful performance in practice [6], [7] or to prove that in practice there is not a satisfactory cooperation between employers and vocational schools.

According to Gessler [8] majority of employers do not or only seldom cooperate with vocational schools relevant to them. What is very rare is a systematic survey of teachers' opinions on this issue, i.e. opinions of those involved in the vocational education and training.

2. Research Problem Statement

In 2015, the State Institute of Vocational Education (ŠIOV - Štátny inštitút odborného vzdelávania) carried out a national questionnaire survey in Slovakia, the aim of which was to assess a level to which competencies of upper secondary vocational school graduates are in compliance with requirements of their potential employers [9]. Employers were very critical in their statements. Almost half of the surveyed employers assessed attractiveness of secondary vocational schools with the grade 3 (using the traditional school classification - grades 1–5, where 5 is the worst grade having the meaning - insufficient). Totally, approximately 80 % of the surveyed employers assessed attractiveness of secondary vocational schools with this or even a worse grade (i.e., grades 3, 4 or 5, so the average grade was 3.2). It has to be stated that the attractiveness of upper secondary vocational schools was assessed as low in all regions of Slovakia. The only exception was the region of Trnava. In contrast to the other seven regions of Slovakia, in the Trnava region most employers perceive secondary vocational schools as equally or even more attractive than grammar schools. This is probably related to the already a long-term highly developed industrial environment of the region (focused primarily on the automotive industry). On the other hand, paradoxically, employers in the Bratislava and Nitra regions (which are as well regions with a high percentage of the automotive industry) perceive attractiveness of secondary vocational schools significantly lower. Secondary vocational schools in these regions were assessed as low attractive by 82.4 % and 70.0 % of employers from the regions. As the main reason of the low attractiveness of studying at a secondary vocational school (in comparison to grammar schools), employers stated students' disinclination for manual work and a vision or expectation of their easier future life by having a tertiary education (university degree). As many as a third of employers see the problem in the lack of cooperation between upper secondary vocational schools and the employer sector. According to the employers' opinion, this is even more significant problem than the low quality of education in these schools or problems with employment of graduates at the labour market [10], [11], [12].

At this point one comes back to the above stated issue of the difficulty aspects of the vocational education and training. The key problem has been, specifically according to the staff of the upper secondary vocational schools, how the requirements of employers could be transferred to upper secondary vocational schools in order to ensure sustainable quality of education of these schools graduates matching the demands of the labour market.

Therefore, based on cooperation of the Faculty of Education, Constantine the Philosopher University in Nitra with several secondary vocational schools, a case study dealing with the issue of difficulty aspects of the vocational education and training was developed. Here, the opinions of the staff of the upper secondary vocational schools, mainly the ones focused on information technologies, were taken into account.

3. Methodology

To collect the necessary research data the panel discussion with the staff of these schools was held. The panel discussion focused on exploring the issue of teaching vocational subjects and finding possible solutions of the most pressing issues related to the way the vocational subjects are taught.

Panel discussion is a type of session used mainly during academic conferences to explore specific topics [13], [14], [15]. It is based on the idea of bringing together a group of experts (panellists) who are given a topic to discuss from different perspectives and to share their viewpoints on the discussed issue, while the discussion is witnessed by an audience of conference attendees. The discussion generates interesting dialogues that are thought-provoking and educational for both the panellists as well as the attendees (observers) as the panellists present different perspectives on the given topic which neither the observers, nor the panellists, may have never considered previously and support meaningful conversations that can spark ideas for new solutions of the discussed matters. A very important element of the panel discussion is its moderator, as they play a significant role in the success of the discussion. It is on them to guide the discussion (among the panellists as well as between the group of the panellists and the audience, too), making it a dynamic and interactive form of learning. The moderator manages the time and keeps the conversation moving forward, prevents any of the panellists to become dominating in the discussion, steers the panellists to be on-topic and refocuses them, if needed, clarifies terminology and concepts that any of the participants (either the panellists or the audience) may not be familiar with, highlights the takeaways [16], [17].

The panel discussion can be done in different forms. As to the presented study, the discussion was carried out in a question-and-answer form. The participants were a group of 20 teachers, staff from a secondary vocational school, from which 7 were teachers of information and communication technologies, 5 teachers of electrical engineering, 3 teachers of economics and 5 masters of professional training.

Thematic areas discussed during the panel discussion were related to the solution of three research questions, which were the following ones:

1. *What are causes of difficulty in teaching technical subjects?*
2. *What are the effective ways of motivating students to study technical subjects and how is it possible to maintain the motivation of students for a longer period of time?*
3. *What makes it possible to attract students´ attention more significantly in the teaching of technical subjects?*

Moderators of the panel discussion were representatives of three closely co-operating higher education institutions - Constantine the Philosopher University in Nitra (SK), Prague University of Economics and Business (CZ) and Casimir Pulaski Radom University (PL). Due to similarities of their mother tongues, there was no need to translate the discussion, which was with respect to the panellists led in the Slovak language.

4. Findings

The main finding from the panel discussion was the fact that teachers of the technical subjects perceive lack of students´ motivation as the most serious problem in teaching those subjects. This problem they frequently related to the way the students are assessed.

Hereinafter, the main findings from the panel discussion related to each of the stated research questions are presented.

What are causes of the difficulty in teaching technical subjects?

The panel discussion pointed out at complexity of teaching technical subjects which is significantly related to the fact that most technical subjects (disciplines) have an interdisciplinary nature, i.e., they require knowledge from various fields of study and other subjects. These are mainly interdisciplinary and cross-curricular relationships with science subjects, i.e. mathematics, physics, chemistry, but also with history.

Moreover, knowledge acquisition stated in the curriculum for professional technical subjects, and especially the application of this knowledge, requires ability to use such thinking processes as logical reasoning, deduction, and complex and creative combination of heterogeneous knowledge.

What are the effective ways of motivating students to study technical subjects and how is it possible to maintain the motivation of students for a longer period of time?

Comprehensive mastery of a certain technical area requires a large amount of different knowledge from different areas, which usually does not encourage students at the beginning of their learning activities, but, on the contrary, it can have a significant demotivating effect. Moreover, even if this knowledge ultimately brings students the satisfaction they sought, a lack of motivation focusing students on a particular area(s) may have an overall negative consequence. Therefore, it is a great challenge for teachers to be able to motivate students to become well-disciplined already in achieving partial goals, which can help them to get an insight into the mediated issues which subsequently can elicit their interest in the subject matter. However, many students are unable to establish this inner motivation because the seemingly heterogeneous requirements on their knowledge and skills discourage them so much that they start to get lost in the presented issues. The worst outcome for students would be realising the fact that they have chosen the wrong school and the field of their study, that the subject is too demanding for them, hence, they cannot manage either the subject or the school.

The answer to the question of how it is possible, or how students should be motivated to study the subject matter of the required technical subjects, and how it is possible to maintain the motivation of students for a longer period of time, was quite skeptical. The panellists stated that the issue addressed in the question was unsolvable. However, when continuing the discussion, their skepticism became weaker, as they started to associate the answer to this question with the system of students` evaluation. Many teachers believe that the only effective way to evaluate students is to assess them in a standard, traditional way by means of grades from 1 (excellent) to 5 (insufficient/failed). Of course, it would not be easy to replace this way of assessment and switch to a different way of assessing students, as assessing students by grades has a long tradition in schools, and most parents cannot even imagine any innovative ways of assessment. On the other hand, the established assessment by means of grades undoubtedly brings with it several negatives.

One of them is, for example, the fact that using this way of assessment, the teacher is primarily forced to look for and point out the student's mistakes and, based on their number, worsen the student's grade. Assessing students by pointing out at their negatives and inability to achieve better study results is demotivating for many students and it strengthens their belief that they are not able to learn the required study material. During the panel discussion, some of the panellists pointed out, within their experience, that when they decided to cancel grading students in some subjects, the motivation and study results of students improved.

What makes it possible to attract students´ attention more significantly in the technical subjects teaching?

The most common traditional way of teaching at primary and secondary schools in Slovakia is frontal teaching which includes all kinds and ways of presenting the subject matter determined in the curriculum, when the learners sit passively and do not perform any activity except seemingly active listening. Therefore, it often happens that the learners stop paying their attention after a short period of time and, when refocusing on their teachers, they are unable to follow up on the parts of the presented subject matter they have missed in the meantime, especially in the case of technical subjects teaching.

According to the opinions of the panellists, these circumstances often lead to negative consequences, such as forbidding the use of mobile phones or disciplinary problems such as having fun or chatting with classmates.

For this reason, the verbal frontal way of teaching the subject matter is often ineffective, and according to the panellists opinions it would be appropriate, especially in vocational education and training, to consider replacing them with methods that support students' active involvement in teaching/learning process.

5. Discussion of the Results

What are causes of the difficulty in teaching technical subjects?

The panel discussion pointed out at the complexity of the technical subjects (disciplines) and the complexity of their teaching. The results of the discussion also showed that teachers of technical subjects (represented by the panellists) consider lack of students' motivation to be the biggest problem (Figure 1). To a large extent, this is perceived as a very surprising result, because there is a high presumption that students should be interested in the subject matter for most of the technical subjects taught in their field of study, as they have chosen a technical vocational school by themselves. This choice forms the basis of their professional orientation. The graphs in Figure 1 prove students' motivation to be the main problem connected with teaching technical subjects at secondary vocational schools.
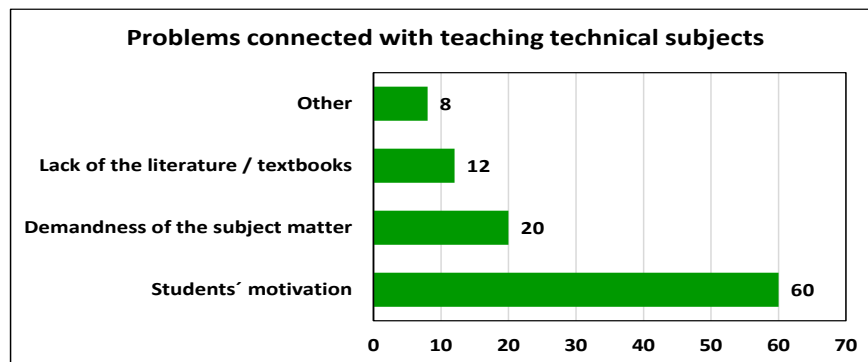

Problems connected with teaching technical subjects

Other	8
Lack of the literature / textbooks	12
Demandness of the subject matter	20
Students´ motivation	60

Figure 1. Problems connected with teaching technical subjects

Consequently, from the achieved findings logically results that if students are not motivated in learning technical subjects, they a priori consider these subjects to be difficult and demanding for them and they are unable to master them. Besides the students' motivation, two other issues, with considerable impact on students' perception of technical subjects as the difficult ones, were identified.

These two other issues are the "real" difficulty of the subject matter resulted from the above mentioned interdisciplinarity of the explained topics, and a lack of the relevant professional literature (including textbooks). However, these two issues are much less significant than the problem of the lack of students'

motivation (Figure 1), the relative frequencies of the given problems: 60 – 20 – 12. The other issues are even less significant than these two are.

What are the effective ways of motivating students to study technical subjects and how is it possible to maintain the motivation of students for a longer period of time?

Additionally, to the above stated findings, a very serious issue in the context of professional orientation (in the panellists opinion) is the fact that learners finishing the last year of compulsory education do not know which field of study to choose, to which field of study they have predispositions for or which of the offered study options will suit them best.

Therefore, some learners leave the final decision to their parents, who choose the field of study for their child preferably with respect to, either their wishes and expected future financial prosperity rather than taking into consideration the real interests and predispositions of their child. Unfortunately, even if teenagers choose the field of their study on their own, without the direct intervention of their parents, they often find that the field doesn´t match their expectations.

What makes it possible to attract students´ attention more significantly in the technical subjects teaching?

The panellists agreed on the fact that the verbal frontal way of teaching the subject matter is not very effective and it should be replaced by other techniques and procedures that support student active involvement in teaching/learning process, such as presented by Čapek [18]. Based on the discussed good practices and experiences of the participants in the panel discussion, the following three teaching methods were identified as well acquitted and contributing to attract and activate students in technical subjects teaching:

- Story as a part of frontal teaching (story assisted frontal teaching),
- Problem solving teaching [19],
- Information (knowledge) gap activities (theory of gaps) [20].

Findings from discussion of the three questions raised in the panel discussion which characterize the situation of technical subjects teaching in vocational education and training, the moderators raised a question of comparing these findings with situation related to economical subjects teaching. The main points of this comparison are summarized below.

Are there any similarities between the teaching of technical and economic subjects in secondary vocational schools?

The current approach to teaching economic subjects emphasizes personalized learning that adapts to individual needs, the incorporation of gamification and esports to increase student engagement, and the use of microlearning and nano-learning techniques allows for concise and brief learning experiences that are easily comprehensible and have a big impact. Augmented and virtual reality, along with artificial intelligence, are being increasingly popularised and integrated within classrooms to provide more active educational experiences. Recent trends in teaching economic subjects have a stronger focus on personalized learning that matches individual student needs.

A detailed discussion and the latest trends, one can refer to the literature cited in the article *5 of the biggest education trends in 2023* available at *eSchool News* [21].

In the current era marked by an explosion of information and shifts in the global economy and geopolitical arrangements, there are also different changes in teaching such subjects that need to be reconsidered.

One of the foremost challenges is the need to update the curriculum regularly. Due to the rapid evolution of economic theories and practices, it is the imperative that the teaching content is kept current and up-to-dated. This involves integrating the latest theories and models, as well as including recent case studies. Educators must be proactive in revising their course materials and assuring themselves that they accurately reflect recent economic environment.

Incorporating technology into education is another crucial aspect. Modern economic fields increasingly rely on digital tools and software, such as advanced accounting systems and analytical platforms. Bringing these technologies into the curriculum means preparing students for real-world professional environments. This not only enhances their learning experience, but also provides them with practical skills that will be factually applicable for their future careers.

Fostering critical thinking is another goal that should be met. In an age where information overload is common, students must be taught how to critically analyse and evaluate information. They need to be trained to identify biases and distinguish between reliable and less dependable sources. This skill is particularly crucial in fields where information is frequently updated and where analytical acumen is required to navigate through vast amounts of data.

It is also important for the educational approach to incorporate both global and local perspectives. Students should understand both the dynamics of global markets and how local economic conditions affect businesses and economies.

This dual focus helps them appreciate the interplay between international and domestic economic forces and prepares them for diverse professional scenarios.

Lastly, embracing interdisciplinary approaches enhances economic subjects teaching. Economics often intersects with political science, law, sociology, and other fields. Connecting these disciplines in the economic curriculum can provide students with a more comprehensive understanding of the complex and multidimensional challenges of today's world. This approach encourages them to think beyond traditional boundaries and develop innovative solutions to contemporary problems.

6. Conclusion

The main intention of the presented study was to analyse which aspects of vocational education and training can be identified as causes of its difficulty. With respect to this intention three research questions were formulated. The answers to the research questions were obtained by means of a panel discussion with a group of selected secondary vocational school teachers. The discussion proved that the most serious problem of teaching technical subjects, and which technical subjects teachers perceive is the lack of students´ motivation. According to the teachers, students´ motivation to learn technical subjects could be increased through changed ways of the assessment of students´ learning achievements in technical subjects. As to the increased attracting and maintaining of students´ attention in the technical subjects teaching, according to the opinions of the technical subject teachers, the verbal frontal method of the subject matter teaching and interpretation should be replaced by other approaches and methods which support students´ activity. As the most appropriate ones, they suggest using story assisted frontal teaching, problem solving teaching, and teaching based on the theory of gaps.

Dissemination of the findings from the panel discussion could elicit and support implementation of some relevant changes into the ways the teachers are conducting their teaching activities. For them, it should be a source of new ideas to inspire them to use new approaches in teaching to eliminate the lack of students´ motivation in learning technical subjects, which are the key for their professional profile and successful career.

The key to effective teaching of technical subjects is the continuous adaptation of methods and teaching techniques to the changing world of technology and the individual needs and capabilities of students, as well as requirements of employers.

To enhance the appeal of technical subjects, it is necessary to show students their practical application.

Demonstrating how technology connects with everyday life and innovations can increase interest and engagement of students. Moreover, in the era of digitization, it is important that the teaching of technical subjects is supported by modern technologies, such as computer simulations, interactive educational platforms, or virtual reality. The use of such tools can not only increase motivation but also aid in a better understanding of complex issues of technology. Students should be given tasks that require them to solve problems independently or engage in designing, and to develop critical thinking and creativity skills.

Process of teaching technical subjects presents a whole range of challenges and brings a lot of complicated puzzles, to which an adequate answer cannot always be found and offered. With respect to the correctly chosen teaching approach of the teacher, even in the search for answers, teaching of professional technical subjects can become a source of a lot of experience and valuable knowledge for students, which will not remain only in the level of strict and inanimate facts. The application and use of various teaching methods, techniques and procedures gives a chance to enrich the teaching process so that it brings joy not only to students but also to teachers.

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