

Analysis of Technology Education Development at Schools in Slovakia

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Abstract

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Between 2008 and 2013 Slovakia went through a curricular reform. The impact of the reform on technology education at lower level of secondary education was evaluated from 2013 to 2015. The need to reinforce some qualitative aspects of this analysis led in 2015 to a decision to carry out an additional research based on a personal inquiry, particularly on focus group interviews. The aim of the additional research was to find out how the teachers teaching the subject Technology (which before the curricular reform was known as Technical education), either as qualified or unqualified to teach it, evaluate impact of the curricular reform on teaching Technology as well as on technology education in general. The main intention of the research was to find out both positive and negative facts caused by the curricular reform in teaching Technology at the lower level of secondary schools and to evaluate whether the introduced changes supported quality assurance of technology education. The paper describes research methodology of the carried out focus groups interviews and the main results of the research.

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1. Introduction

In Slovakia Technology education has always been an integral part of general education being taught as freestanding subject in lower secondary education – ISCED 2. The learning outcomes of this subject have been to acquire basic knowledge of technology including the use of various devices and equipment, to form favourable attitudes towards technology and technology focused disciplines, eventually profession. However, despite of the importance of this subject (EU, 2001), for a long time we have been facing increasing space limitation offered to technology education at primary and secondary schools (Olsen, Prenzel, & Martin, 2012; Lukáčová, 2009).

Before 1995 in Slovakia, Work Education, a freestanding school subject taught within 2 lessons per week, delivered technology-related topics to students in grades six to nine (ISCED 2 – ages of 11-15). This policy was changed twice, in 1996 and in 2008. First, the name of the subject was changed from Work Education to Technical Education and the number of weekly lessons to each grade was reduced from twice to once. The next change was done within the curricular reform which came into operation through enactment of the new Law on Education in 2008 (Law No. 245/2008). The curricular reform changed the name of the subject from Technical Education to Technology and cut its instructional time to a half of a lesson per week taught only in 7th and 8th grades, or the school can determine the grade in which the subject is taught. However, at the same time an important change was introduced by the curricular reform and it became possible to use the so-called disposable lessons. Using these lessons, a school can enhance education in some areas according its mission, the conditions of its region, or its parents` demands. Technology can also “fit into” disposable lessons. The State Educational Programmes introduced in the Law on Education (ŠIOV ISCED 1, 2008; ŠIOV ISCED 2, 2008), prescribing 70 % of content of the compulsory subjects; the remaining 30 % is prerogative of individual schools in their School Educational Programmes.

Legislatively stated changes started to be introduced into the practice in the beginning of the academic year 2008/2009 and were completed in 2012/2013, when the teaching process in all grades 5th – 9th was already carried out in accordance with the new School Educational Programme. Consequently in years 2013 – 2015 a project Analysis of the Consequences of the Curricular Reform on Technology Education in Primary and Lower Secondary Schools was carried out to evaluate the impact of the curricular reform on technology education at the lower secondary education (Hašková, & Bánesz, 2015).

2. Problem Statement

The project, Analysis of the Consequences of the Curricular Reform on Technology Education in Primary and Lower Secondary Schools, had two goals. The first was to find out how the schools utilize the disposable lessons to support technology. The second goal was to identify the main obstacles to the successful implementation of curricular reform in technology education. Two questionnaires collected the necessary data: one was designed for head teachers and the other one for Technology teachers.

Although the questionnaires developed to collect the research data offered to respondents some space to express their own opinions, comments or critical remarks (additionally to the exactly formulated questions aimed at the inclusion of the subject Technology into the School Educational Programme, its time allocation, inclusion of disposable lessons and optional subjects related to Technology or technology education into the School Educational Programme, factors influencing inclusion or rejection of the increased scope of teaching Technology, numbers of qualified and unqualified teachers ensuring teaching Technology and to it related subjects, the factors influencing assignments of the particular unqualified teachers to teach Technology and to it related subjects, etc.), they could not create an appropriate space to express their personal professional experiences and on them based professional assessments of the previous and current situation. To further substantiate the

findings of this evaluation, qualitative research was conducted by way of personal interviews as well as focus group. Participants were all teachers of Technology (formerly Technical Education), whether they were qualified to teach the subject or not. The main objective of the research was to find out whether curricular reform in teaching Technology at secondary schools would have a positive or negative effect on the quality of education.

3. Research Method

To obtain teachers' opinions on the curricular reform in teaching Technology and the development and current state of technology education at schools there was used one of the kinds of personal inquiry, particularly focus group interview (panelling). Focus group interview is an interview where a group of people have been working together for some time or common purpose, or where it is seen as important that everyone concerned is aware of what others in the group are saying (Watts, & Ebbutt, 1987). It is a form of group interview, where the discussion is led less between the interviewer and a group, but it is led rather in form of interactions within the group, among the members of the group who discuss a topic supplied by the researcher (Morgan, 1988). So the data necessary for the research as well as the outcomes emerge from the interaction of the group participants. The reason of choosing this alternative of the personal inquiry was the fact, that a group interview can generate a wider range of responses than it is generated in individual interviews (Lewis, 1992) and can be useful for gaining an insight into what might be pursued in subsequent individual interviews (Bogdan, & Biklen, 1992). Moreover the group interview does not demand such a lot of time as individual interviews with all members of the group.

In our case there was used panelling with four focus groups. It means the group of the members of the panel discussion was divided into four subgroups and each subgroup solved the same problems (questions). Consequently each of the subgroups presented its conclusions to the given problems (questions) they discussed and solved. At the end the four subgroups, based on a mutual discussion, were to come to a common consensus to each of the solved questions.

Beside the curricular reform the scope of the questions to be solved during the panelling was significantly influenced by two very serious facts. One of them was innovation of the State Educational Programme introduced in 2008, which arose out of the general criticism of the introduced curricular reform as well as of the preliminary results of the analyses of the curricular reform impact on practice. Following the innovated State Educational Programme from September 2015 the lesson allocation of the subject Technology has been 1 lesson per week at each grade of the lower secondary education (grades 6th – 9th).

The second fact, which influenced the scope of the panelling questions, was the national project Support for Professional Orientation of Pupils of Primary and Lower Secondary School to Vocational Education and Training Through the Development of Polytechnic Education Aimed at Developing Work Skills and Work With Talents (ŠIOV, 2013), by teachers and the professional community called in short as the project *Workrooms*. Development and implementation of this project, financed by the EU structural funds, was a consequence mainly of the obstacles which occurred in the context of the curricular reform of Technology and natural science subjects. Realisation of the project started in 2013,

i.e. 5 years after the curricular reform had started. Within this project a total of 48 schools were selected for the pilot research and they were fully equipped with newly established workrooms, teaching aids, tools, instruments, apparatus and educational facilities for teaching Technology and natural science subjects. The main goal of the project was to enhance pupils' interest in vocational education and training. This was to be achieved just by the means of the newly established specialized classrooms for teaching chemistry, physics, biology and also Technology. The established classrooms (workrooms) should create at schools a platform for development of pupils' working skills through so-called polytechnic education, based on the use of modern forms and methods of education.

The two above-mentioned phenomena, having a great impact on teaching Technology at schools, were taken into consideration during designing the panelling frame. The main components (topical areas) of the panelling frame are presented in Figure 1.

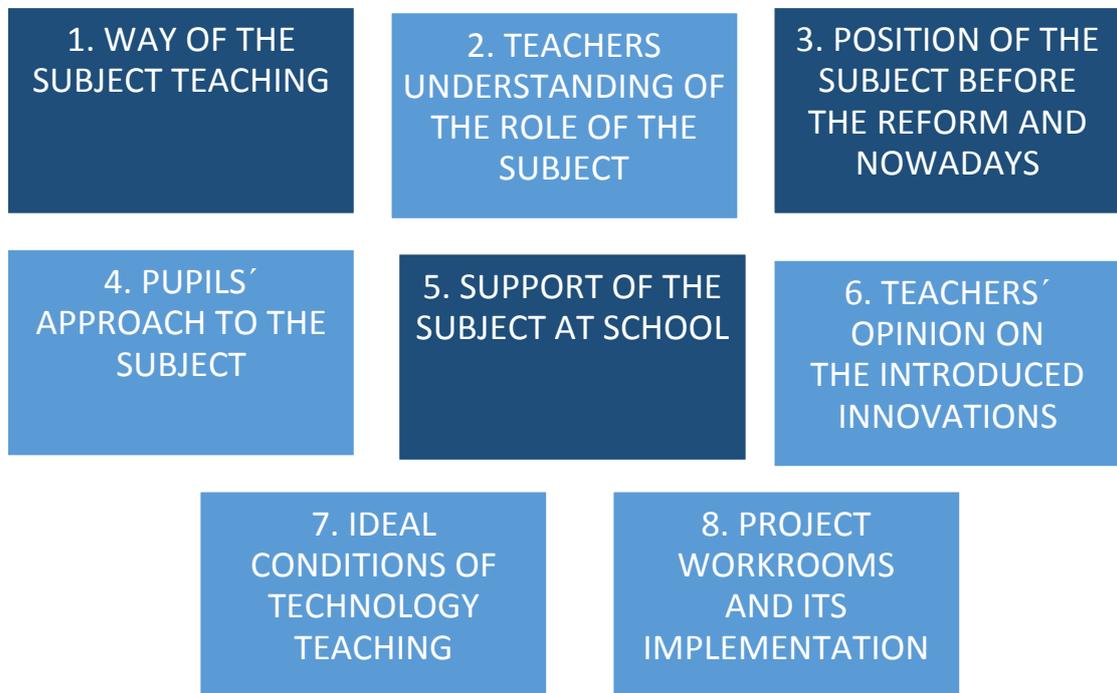


Fig. 1. Topical areas of the focus groups interview (panelling).

The topics of the focus groups interview were reflected in eight basic interview questions:

1. What is the mostly used way of Technology teaching (how, in which way are the teachers teaching subject Technology)?
2. What is the spirit of Technology teaching in your opinion (what is the teachers' point of view on teaching the subject Technology at schools, its mission, goal, objective, purpose)?
3. Are there any differences in the position of the subject Technology before and after the curricular reform (what was the subject position before the reform and what is it nowadays?)
4. How do the pupils perceive the subject Technology (pupils' attitude towards this subject, to its content)?
5. Is there any support given to the subject Technology at school? Is the subject Technology supported by the school management (in which way)?
6. What is your opinion on the carried out changes in relation to teaching Technology? In your opinion, how did the curricular reform influence teaching Technology?
7. In your opinion, what would be the ideal state of teaching Technology (how would teaching Technology in a "perfect case/way" look like)?
8. How do you assess the conception of the national project *Workrooms* (its strengths and weaknesses)?

The panelling was done in two cycles.

The first time we used the opportunity that in April 2015 the administrators of the national project *Workrooms* (ŠIOV, 2013) organized a workshop to this project. Participants of the workshop were representatives of 12 schools from Žilina region, one of the eight territorial districts of the Slovak Republic, which were engaged in the project. We asked the workshop organizers to incorporate into the programme of the workshop, as one of its items, also the activity of the focus groups interview led by our researcher.

The second time we used the methodological seminar organised for teachers of physics organized by the Methodology and Pedagogy Centre (Institution for in Service Teachers' Education and Training in Žilina) in Dolný Kubín in June 2015.

The group of the members of the first panel discussion consisted of 12 teachers (consequently divided into the four sub-groups), with one exception all qualified Technology teachers. The one exception was a teacher with qualification in teaching pupils with special needs. Most of the concerned teachers had teaching practice more than 15 years and undertook also a leading position at their schools (head teachers or deputy head teachers). Only two of the participants taught less than 2 years and one of them only 6 months.

The group of the members of the second panel discussion consisted also of 12 teachers (consequently as well divided into the four sub-groups), from which 11 were qualified and 1 unqualified to teach Physics (as it was above-mentioned the seminar in frame of which the focus groups interview was carried out was organised for Physics teachers). Most of them were qualified to teach also the subject Technology, as the combination of the majors physics – Technology (Technology Education) belongs to the most often ones. All of the participants had teaching practice more than 15 years and 4 undertook also a leading position at their schools (head teachers or deputy head teachers).

4. Findings

The process of both discussions, the discussion led within the subgroups as well as the mutual discussion led among the subgroups, was very interesting. In the first case the teachers with the short length of their teaching practice more or less did not enter into the discussions, as they did not know the situation before the curricular reform. But on the other hand they would like very much to be engaged in these discussions, but they felt that they are not competent to assess the weaknesses or strengths of the reform. The teacher with 6 month teaching practice (but qualified for Technology teaching) was out of the discussed issues, she did not understand most of the discussed problems. Moreover also the issues of the *Workrooms* project were strange for her. She expressed that for her a very useful would be an intensive cooperation with a mentor teacher and some additional training (Gadušová, & Vítečková, 2014; Dovalová, 2014; PISOŇOVÁ, TÓBLOVÁ, & NAGYOVÁ, 2011). On the contrary a very useful for the discussion development was just the unqualified teacher. This teacher appreciated the possibility to express her opinions and encouraged very much the other to express, too.

Based on the content analysis of the transcription of the discussions led within both cycles of the panel discussion to the eight stated questions the overview of the findings related to technology education development at schools in Slovakia is summarized in following items.

- The ways of teaching Technology do not depend on the length of the teachers' teaching practice. The methodology of Technology teaching strongly depends on the school facilities, technical equipment, material possibilities and conditions of the school. If the teachers have at disposal a workroom or a special classroom, they prefer to teach Technology based on practical activities and work in the workroom. Unfortunately, in the past there were better conditions for technology education at schools (premises, workrooms, tools and material equipment) as they are at schools today. This is a reason why Technology is taught at schools at a ratio 20 – 30 % to 80 – 70 % in favour of the theory (i.e. nowadays highly prevailing theoretical way of teaching Technology at schools), although the teachers are aware of the fact that this subject should be taught mainly practically (it should develop pupils' practical manual skills and in a matter of fact also the teachers prefer practical ways of Technology teaching).
- There are great barriers also as to the scope of the pupils' skills which are developed in frame of the practical way of teaching Technology. The main barrier is the material the schools have at disposal (mostly only paper plus wood and plastic) and the second one is the fact that currently the classes (pupils) are not divided into groups neither for the practical teaching (as it used to be before).
- In general the teachers evaluate teaching Technology at schools before the curricular reform as more on the practice oriented while nowadays as more on theory oriented (i.e. more theoretical). Mainly the teachers with teaching practice over 20 years expressed their opinion that nowadays the subject has no seriousness and acceptance (neither at parents).
- Another highly criticised fact was a low quality of current text-books. The teachers evaluate the text-books used before the reform as better ones, mainly from the point of view of the methodological aspects. Because of the insufficient quality of the text-books teachers are forced to prepare most of the teaching materials, tasks and teaching aids by themselves. Another

weakness of the current state of technology education at schools is a low interconnection of curricula of such subjects as Technology, Math, Physics, Chemistry are.

- On the other hand the teachers evaluate the subject Technology as an important one for pupils (which should develop their manual skills through practical training and practical activities). At the same time in opinion of some of the teachers the subject Technology should be taught only in special “technical classes” (classes of pupils with instruction with enhanced Technology teaching).
- Very interesting finding is that the reform has reinforced the feeling of teachers that the state has not any great regard for the work of teachers, and specially the work of Technology teachers, and absolutely does not accept teachers` opinions. Moreover the state creates and introduces worthless obstacles acting against their meaningful teaching practice (high level of bureaucracy, requirements to proceed and elaborate useless reports, tables and other different materials of a great extent, etc.).
- As to the attitude of the pupils towards the subject Technology, in the opinion of the teachers with teaching practice 15 - 20 years the pupils are not interested in it, or even they are bored by it as they do not like the theory oriented teaching of this subject. In the opinion of the teachers with teaching practice over 20 years, the pupils join in the discussions, they ask questions related the taught topics but they lack practical activities and handling with different kinds of materials, tools and devices. And just the work with different materials (mainly with wood and also plastics, as the work with iron is too arduous for the pupils of this age), own construction of different products and their presentations are the things which are most attractive for pupils. In general nowadays pupils do not already prefer the work with computers, they like more the practical manual activities. In case of practical activities supported by computers, these activities must not take the whole lesson not to lose the interest of the pupils. What the pupils like very much is computer supported technical drawing.
- The highest variability was characteristic for responses to the question on the support given to teaching Technology. The responses to this question were within the range from no support given, through the support gained from the side of the pupils` parents or given by the school leaders, up to the support given to this subject also by the teachers of other majors (who consider this subject to be an important one for pupils). But most of the responses stressed the role of the school leaders in supporting the subject, mainly the head teacher`s approach to this subject, how s/he perceives Technology, its meaning for pupils and importance of its teaching.
- A very negative finding is that it is not a rare case, that the school management does not solve the unqualified teaching of the subject Technology at their school, i.e. school leaders do not try to recruit a teacher qualified to teach just this subject and prefer to spread this duty among the teachers they have at disposal (because of the financial aspects and the fact that Technology has a low lesson allocation, so mainly for small schools it is difficult or even impossible to ensure for Technology teacher to have assigned to teach only his/her majors).
- From the point of view of Technology teachers the innovations in technology education at schools are proposed people who do not know school practice and school operation. Having bad

experience with the innovations introduced to schools after 2008 the teachers are afraid “where teaching Technology is going”. In their opinion the changes are introduced to schools very often (and very often from political reasons) and the current state is evaluated by them as “chaos and mess in the system”.

- Another very interesting finding resulted from the teachers’ responses to the question what would be the ideal state of teaching Technology, what should be improved. The teachers did not mention any improvements of the methodology Technology teaching, improvements related to its content, material and technical equipment, but what they called for was direct communication with professionals, methodologists, offer of possibilities to participate at methodological workshops and trainings, organized events given them possibilities of mutual meetings, discussions, consultations, experience exchanges (including visits in other schools), etc. The teachers would appreciate also a web portal through which they could share their opinions, experiences, teaching materials etc., but they would like to have this portal chats and discussions with ensured responses from the side of adequate experts (Bánesz, 2012). In the panelling there occurred also a radical point of view to the current state of Technology teaching according which it is necessary to change, i.e. to improve everything. To very frequently mentioned suggestions these following belonged: to establish regional centres for delivery of relevant tools and materials to schools, to create text-books, technical sheets (manuals of working processes to constructing different products) and working sheets (teaching materials) of appropriate high quality, to absolve teachers from administrative bureaucracy and the necessity to prepare everything by themselves, i.e. let them to teach and do not force them to prepare and develop everything by themselves.
- As regards the national project *Workrooms*, there was a total agreement of teachers in perceiving this project as very beneficial for both particular Technology teaching as well as general technical education. Teachers teaching at schools which participated in the national project *Workrooms* [23] appreciated this project very much, mainly the supply of teaching aids to schools. They considered the delivered teaching aids to be very attractive for both, not only for pupils but for teachers, too. On the other hand not only positive notes occurred in relation to this project. The most serious remarks were related to the small number of schools involved in the project and to delays or even omitance of teacher training for the work in the newly, in frame of the project, established workrooms.

5. Conclusions

The findings of our research completely correspond to the problems connected with the realisation of general technical education at schools listed by Pavelka (2013) as well as with cardinal changes required by Kozík (Kozík, Kuzma, Kožuchová, Vargová, Pavelka, Lukáčová, & Ďuriš, 2013) to promote positive changes of technical education at schools.

As the most significant problems Pavelka (2013) lists:

- insufficient number of teaching lessons prescribed to Technology,
- high number of unqualified teachers covering Technology teaching (2011 – almost 40 %),
- out-of-date hence unattractive equipment and facilities (lack of textbooks, out-of-date teaching aids, out-of-date tools and appliances, lack of technical equipment, lack of technical materials to create any products, lack of special classrooms/workrooms),
- almost no systemic support given to technology and facility infrastructure development,
- more or less disrespect and negative status of handicrafts and manual work in the society.

The changes which should be done to promote technical education at schools Kozík (Kozík et al., 2013) calls for are regarding mainly two areas:

1. Premises and technical and material conditions ensuring Technology teaching

- by means of legislative proceedings from the side of the Ministry of Education to oblige the school founders to establish, support and develop workrooms at school assigned to Technology teaching,
- in cooperation with the relevant state bodies and production practice authorities to elaborate and implement into the practice a new prescription defining for schools basic facilities (teaching premises) including their obligatory equipment and material supplies for theoretical education and practical training in technology education,
- in cooperation with boards of education to ensure establishment of the regional centres of school services and to broaden the scope of their activities also by systematic and complex activities focused on delivery the needed technical materials, tools and devices to schools,
- by means of legislative proceedings from the side of the Ministry of Education to oblige the school leaderships to allocate a part of the school budget for development of the technology education carried out at schools,
- based on the cooperation among the faculties preparing Technology teacher trainees, and their cooperation with the practice, to create conditions for development, research and distribution of the specific teaching aids,
- to ensure efficient revisions of the premises and technical and material equipment of schools carried out by the State School Inspection as well as by the Safety Inspectorates,
- to design a proposal of the system of the general technology education at the lower secondary education and implement it into the practice.

2. Time allocation, content and specific goals of the general technology education at primary and lower level of secondary education

- to make changes in the State Educational Programmes for ISCED 1 and ISCED 2 to increase the time allocation of the subjects ensuring development of the general technology education at schools (was done in 2015),
- to change content and specific goals of the subject Technology (its education standard), i.e. repeatedly introduce education content and performance standard of the previous technology education and regularly to innovate them.

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