

TEACHERS AND ICT TOOLS: TYPOLOGY OF TEACHERS IN TERMS OF THEIR APPROACHES TO AND VIEWS ON MODERN TECHNOLOGIES

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Abstract: Is it possible to categorize teachers by their approach to modern technology? Are there groups of teachers who use modern technology uncritically? These are some of the questions which the submitted paper attempts to find the answer.

The necessary research data were gathered through a research questionnaire, which was distributed to primary and secondary schools' teachers, and included both closed and open questions. On the basis of the assessment of the results it can be stated that according to their answers to the questionnaire items, it is possible to divide the teaching staff into five relatively separate groups, and there is neither a group that would accept ICT tools uncritically (adore) nor another one which would radically refuse (resist) them.

Keywords: ICT tools, teacher competencies, modernisation of education.

1 Introduction

The use of ICT¹ tools in training by the teachers is at present a very much discussed topic, which often oscillates between two 'extremes'. One refers to the uncritical acceptance and involvement of ICT tools in teaching, even in the areas where they could be avoided, while the other group comprises teachers who refuse to use these tools even in those activities and situations which explicitly require them. Uncritical reception or adoration refers to one 'extreme', and refusal or resistance refers to the opposite 'extreme'. A similar categorization can be found, for example, in more than 20 years' old works of E. Rogers, who calls the representatives of the first 'extreme' innovators or enthusiasts and refers to the members of the second "extreme" group as to skeptics or laggards (Rogers, 1995, 261-263). For the sake of completeness, Rogers's taxonomy has a total of 5 degrees (enthusiasts - innovators, early adopters - visionaries, early majority - pragmatists, late majority - conservatives and laggards - sceptics). Innovators share their enthusiasm for news especially with people of the same focus all over the world and their domain is communication. They are not afraid of the risks associated with the acquisition of innovation. They also dispose of considerable resources to cover potential losses from adopting unprofitable innovations. They enjoy trying new things, and they are not afraid of potential failure. As they are often not accepted by their environment, they establish relationships with other innovators. On the contrary, laggards are generally the last ones to adopt innovation and acquire it. They are focused on the past, and prefer traditional values and solutions. Since they are often isolated from their peers, they represent the opposite of the cosmopolitan focus of enthusiasts. Laggards are distrustful of innovation, often accepting innovation only when a new idea or innovation in the same area arises (Rogers, 1995, pp. 261-263).

The process of implementation of ICT tools into the educational process is very complex and complicated. This was the reason why there emerged an effort to make this issue easier to pedagogues and to help them define it as precisely as possible. An idea of how should the technological innovations be introduced in the teaching was presented in 2004 in a research by OECD in a framework of the ACOT (Apple Classrooms of Tomorrow) project. At that time, a so-called *diffusion model of a pedagogue* was published while it quite simply and comprehensibly defines individual stages of the process of development of ICT tools' acquisition for educational purposes from the stage of absolute non-employment to the stage of a

confident employment of the technology for a preparation of study materials, teaching and presentation of information within the teaching (Mandinach & Cline, 2004). This model contains four stages of diffusion in the work of a teacher, and it is a base of many theoretical and empirical treatises even today. *1st stage – Survival* - the first stage is closely connected to the introduction of new qualifying requirements for the performance of pedagogue's profession which, in most cases, requires the need of knowledge of the work with ICT tools (Brdička, 2010). *2nd stage – Mastery* - amidst the rising level of knowledge of the work with ICT tools, the pedagogue enters the stage of mastery in which they is able to control tools at a common user level (communication means, search of information) (Mandinach & Cline, 2004). *3rd stage – Impact* - at this stage, the ICT tools change from the aim of education to the means employed in the teaching process (Brdička, 2010). *4th stage – Innovation* - far from every pedagogue achieve this final stage of achievement of ICT tools. A pedagogue who achieved a stage of innovation is now able to independently restructure the curriculum, educational activities and work methods (Mandinach & Cline, 2004).

However, based on our experience and on the outcomes of the research conducted, the situation among current pedagogical staff is not as clear as claimed by the above mentioned theories. Teachers are frequently rather 'pushed' to the use of innovations, that is to say modern ICT tools, by many external conditions and stimuli. The first stimulus are the pupils themselves, such as the concept of digital natives (Prensky, 2009), who are constantly increasing their interest in ICT tools and thus influencing their teacher's work. As an another external influence we can regard the pressure of firms, which often present new technologies and thus attract teachers' interest in them without the former being constantly prepared or at least informed about the possibilities of a meaningful use of such technologies in education. More external influences could certainly be identified, however, it is necessary to consider internal obstacles and barriers, which are of no less importance, too.

2 ICT tools and teacher competencies

All the presented facts place new demands on teachers who have to be prepared to work with modern ICT tools and create appropriate educational materials for such tuition. This need stems not only from the practice but also from the necessity to accept modern paradigms of teaching and it perceives the importance of student's inner conditions of learning as well as their contact or interaction with the environment. That is why in this modern teaching paradigm new demands are made on a teacher and even though the teachers do not necessarily need to be ICT experts they should be able to make use of them in tuition where their role should be, above all, students' advisor (Jonassen et al., 2003). We can define these demands from the TPCK model (Technological Pedagogical Content Knowledge) by L. Shulman (1986), in Czech – technological-didactic knowledge of content, according to Zounek and Šedřová (2009) or Janík (2005) who was further elaborated by P. Mishra and M. Koehler (Mishra, Koehler, 2006). This model uses three dimensions: (1) pedagogical dimension; (2) content dimension; (3) and technological dimension that all accept the fact that teaching is a complex activity requiring various types of knowledge (understanding, skills and attitudes), "and understanding its principle means to penetrate into the complex net of their inter-relationships" (Šimonová et al., 2010).

According to Brdička (B. Brdička, in Sojka, Rambousek eds., 2009), integration of ICT in the tuition is possible only based on a real modification of teaching processes. Newly outlined content that educates teachers is composed of, according to above given TPCK, four parts. The first one being the earlier mentioned didactic knowledge of content (Pedagogical Content Knowledge – PCK) that stems from the original Schulman's

¹ By ICT tools technical devices such as interactive whiteboards, tablets, computers, etc., but also software such as tutorials, learning websites, e-learning portals, electronic learning materials and e-books are meant.

concept. This concept, according to Mishra and Koehler, contains knowledge how to approach the educational content and organise it in order to be transmitted as effectively as possible. The second part deals with the interconnection of teaching and technologies (Mishra, Koehler, 2006). As a result, technological knowledge of the content is formed there (Technological Content Knowledge – TCK), to be more specific, this knowledge describes which technologies are appropriate for the particular educational content. This means that the principle is not only in the knowledge of the taught subject or issue, but also in the way the subject is adjusted using the ICT. The next part connects the field of didactic knowledge with the technological knowledge (Mishra, Koehler, 2006), which results in a new educational field, so called technical-didactic knowledge (Technological Pedagogical Knowledge – TPK). This field represents not only the knowledge of the existence of various technologies usable in education, but also the knowledge of the fact that these technologies have various tools and possibilities applicable in tuition. This means that it is necessary for the teacher not only to know of the various technologies, but also be familiar with their possibilities and limits that can be brought in the tuition. The last part is an intersection of the three above mentioned fields. Mishra and Koehler (2008) talk about so called technological-didactic knowledge of the content (Technological Pedagogical Content Knowledge – TPACK) made by a new form extending significantly further than its three parts. Technological-didactic knowledge of the content is according to earlier mentioned authors (Mishra, Koehler, 2006, 2008) the foundation of effective education that requires from the teacher, above all, understanding the usage of technologies. *“Only the combination of all necessary knowledge (technological-didactic-subject) makes the teacher a unique and irreplaceable master of their field who is able to help transfer learning towards higher forms in the current world conditions”* (Brdička, 2009).

Once again, we have to state here that the required technical-didactic knowledge is far from being achieved by all teachers, as some teachers do not dispose of various key competencies necessary for a meaningful involvement of ICT tools into training. The reasons for this shall be sought not only in the lack of these tools, but also in some of the internal influences which prevent the necessary competences of teachers in this field from further development.

Therefore, we will try to find an answer to the question mentioned in the title of this article, and to find out how teachers perceive the positive or negative aspects of the use of ICT tools in their teaching. Undoubtedly, it is not possible to expect that all teachers and pedagogues accept and use ICT tools totally uncritically, and, on the other hand, it is certain that the latter are not totally rejected by all teachers either. There may exist barriers which prevent educators from using or involving ICT tools in their teaching. These barriers may be internal (for example fear and unwillingness to use ICT tools, and so on) as well as external (for example little support from school management, lack of ICT tools, and so on).

3 Aim and methodology of the research carried out

The aim of the research carried out by means of quantitative research methods was to find the response to the established research problem of how teachers of primary and secondary schools deal with the rapid development of ICT tools and the need to implement them in education. We also looked at the extent to which teachers are able to transfer this development to teaching, and at the related offer of training which would enable teachers to implement this transfer. Moreover, we tried to identify the main causes which prevent teachers from using ICT in teaching. Finally, we compiled this set of sub-questions into an overall summary of the essence of the research problem, which is: *how do teachers respond to the rapid development of ICT tools, how do they reflect it in their teaching and do they lack support and help for this reflection?*

We also focused on determining whether it would be possible to classify teaching staff according to their answers into separate

groups, which would correspond to their interest or lack of interest in using ICT tools in teaching. In this respect, we followed the above-mentioned taxonomy of E. Rogers (Rogers, 1995, pp. 261-263) operating with five categories, differentiated by the degree of interest and the level of use of ICT tools by a particular teacher in the process of teaching. Our aim was to verify whether this more than 20-year-old taxonomy still reflects the current situation (in terms of number of categories) and whether or not the extremes (innovator versus laggard) have remained in existence. Based on these considerations, we defined the following research assumptions: *is there a group of pedagogical workers who uncritically accept (adore) the use of ICT tools in the teaching which they implement, and/or, on the other hand, a group which fundamentally rejects (resists) such use?*

Our aim was therefore to identify within the framework of the research sample individual groups of respondents who showed the same or similar level of evaluation of the particular questionnaire items, to describe their characteristics, and possibly to correct the negative impact of some groups of respondents on the results of the research survey. The aim was achieved using the method of cluster analysis, which in this case analyzed clusters within the set of respondents to determine whether there were groups of pedagogical staff who showed a similar way of evaluating individual questionnaire items.

4 Methods of the research data collection and processing

As the main means for the data collection (necessary for the realization of the research), the questionnaire was used. The questionnaire belongs among indirect – investigational methods – in the structure of research methods classification. The questionnaire can be characterized as a measuring means which we can research *the people’s opinions on individual phenomena* (Chráška & Kočvarová, 2015). The research phenomena might be (from the point of an individual – respondent) related to either external processes or internal processes. For the needs of the research, the structured questionnaire (Gavora, 2010) was constructed based on the research questions and hypotheses delimited above.

The questionnaire contained closed-end questions while possible responses were offered, semi-closed-end questions with a scale of possible responses (a four-step scale was used), and open-ended questions which enabled the respondents to describe the variant state of observed phenomena. In order to ensure the understandability of individual questions of the questionnaire, the questionnaire itself was provided with an explaining text which delimited individual terms used. In order to discover the size of individual groups of respondents (who responded in the same way), basic descriptive statistics were used as well as their visualization via graphs. Additionally, these results were subjected to an analysis while the level of significance of the responses of the individual groups of respondents was studied. These groups of respondents were divided according to their significant characteristics (sex, age, length of professional experience, etc.). In order to perform this verification, we used parametric Student’s t-test which compares the means of one variable in two groups (Chráška & Kočvarová, 2015).

Eventually, the method of cluster and factor analysis was applied, which ranks among methods aimed at exploring similarities of multidimensional objects, that is to say objects with a larger number of variables, and their classification into groups, or clusters. It is particularly applicable where objects show a natural tendency to group (as it originated as a taxonomic method), but can be applied in other areas, too (Meloun & Miltky, 2006, p. 341). The above mentioned facts were used in the analysis of the obtained research sample, which was consequently divided into groups according to the similarity of answers to individual questionnaire items. Based on this division, it was possible to identify individual groups of respondents, responding to the questions asked similarly or identically. We used statistical system Statistica 11 for all calculations and visualizations (Klímeck, Stříž & Kasal, 2009).

The constructed research questionnaire was distributed among 850 pedagogical workers of basic and secondary schools. In total, 260 pedagogical workers filled-in the constructed questionnaire, therefore, the response rate was 30.6 per cent which might be a proof that the solved issue is topical and contributing. The research sample consisted of members of teaching staff of 35 schools in total while these schools are based in three regions of the Czech Republic (Olomouc region, Moravian-Silesian region and Zlín region) while 8 of them were respondents from pre-primary schools, 165 respondents were from basic schools, and 81 were based in secondary schools, the rest of 6 respondents expressed their affiliation to "other" type of school. The research sample is described in Table 1.

Table 1. Research sample structure

Characteristic	Group	Frequency in %	Overall frequency
Sex	Male	25.4%	260
	Female	74.6%	
Length of professional experience	less than 5 years	13.5%	260
	5-10 years	12.7%	
	10-15 years	13.8%	
	15-20 years	18.1%	
	more than 20 years	41.9%	
Type of school	pre-primary school	3.1%	260
	basic school	63.5%	
	secondary school	33.5%	
	less than 100 pupils	5.4%	
Size of school	100-200 pupils	21.9%	260
	200-500 pupils	46.2%	
	500-1000 pupils	26.5%	

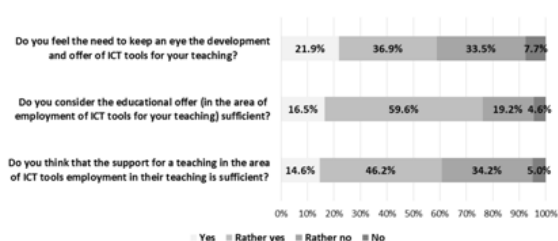
5 Selected results of the research

Hereinafter, some partial results of the research conducted to find out how primary and secondary school teachers deal with the rapid development of ICT tools and the need to implement them in education are stated. The aim of the partial outputs summary is not to provide an exhaustive description of all the results achieved but to familiarize the reader with the overall context of the research conducted. Main focus of the presented research is therefore to be seen in the overall analysis of the teachers' answers processed by cluster and factor analyses, which we applied in order to attempt to extract individual groups of teachers.

5.1 Determination of the perception of ICT by teachers

The first area of study focused on teachers' perception of ICT. Questionnaire items, such as: "Do you feel the need to keep an eye on the development and the offer of ICT tools for your teaching?", "Do you consider the educational offer in the area of ICT tools for your teaching sufficient?" and "Do you think that the support for teaching in the area of ICT tools employment is sufficient?" The purpose of the aforementioned questionnaire items was to find out whether the teachers of the monitored schools are following the current offer of ICT tools designed to support their teaching and are thus aware of current trends in the development and related supply of the former.

We believe that monitoring the development and the supply of ICT tools available for teaching is an important prerequisite for their adequate and meaningful use in the educational process, although this development is sometimes conditioned by the business interests of particular companies rather than by the practical applicability and benefits of these innovations for teaching itself. Nevertheless, the knowledge of the current offer is an important factor which can help teachers to assess the benefits and the necessity of deploying the ICT tools offered for teaching. An overview of the answers to these questions is summarized in graph 1 below.



Graph 1 The level of monitoring the development and supply of ICT tools by the teachers

As shown in Graph 1 above, more than 50% of teachers do monitor the current offer and development of ICT tools available and applicable in their teaching (see the Yes and Rather Yes answers), and only 7.7% of them do not feel such need (see the No answers). Furthermore, it can be observed that an overwhelming majority of teachers - 76.1% in total, consider the educational offer pertaining to ICT usage in teaching to be sufficient (see the Yes and Rather yes answers). Only 4.6% of teachers perceive this offer as being totally inadequate and 19.2% as rather inadequate. Finally, only 14.6% of teachers regard the support which teachers are provided with in the use of ICT tools as sufficient, and another 46.2% claimed that they considered it rather sufficient. Surprisingly, only 5.0% of teachers stated that they perceived the support provided in this area as totally inadequate, and 34.2% characterized it as rather inadequate.

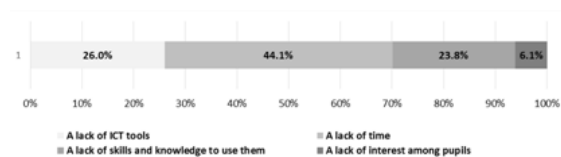
Additionally, we can state that on the basis of the analysis carried out by means of Student's T-Test, the level of significance $p > 0.05$ was reached for only two significant signs (gender and school size) out of four. It is possible to deduce from this result that the group of secondary school teachers with more than 200 pupils shows a higher interest in monitoring the development and the supply of ICT tools. Therefore, it can be stated that *the level of teachers' monitoring the development and the supply of ICT tools is statistically significantly higher with women with a shorter working experience who teach at secondary schools with more than 200 pupils.*

5.2 Determination of the interest in the use of ICT tools by teachers

Further area of study focused on identifying how teachers monitor ICT development, as well as major obstacles to their use. This area was explored using the following questionnaire items: "How do you monitor the development of ICT tools convenient for your teaching?", "How often do you participate in ICT training courses / tutorials / workshops?", and "What do you consider the biggest obstacle to a wider usage of ICT in your teaching?"

The aim of the aforementioned questionnaire items was to find out whether teachers have enough opportunities for further training in the use of ICT tools in their teaching, how they respond to this offer, and whether they use it. Furthermore, we attempted to identify most frequently used information channels and resources aimed at monitoring innovation and development in the field of ICT teaching tools. Finally, several questionnaire items aimed at formulating the overall attitude of teachers to the use of ICT tools in their teaching, including the identification of the main obstacles determining such teaching. Based on the assessment of the data obtained, it can be stated that the most widely used sources with respect to the monitoring of the development and the offer of ICT tools convenient for teaching are the Internet (48.8%) and educational events (25.9%). Only 19.8% of teachers stated that they did not use any information source to monitor the development and supply of ICT tools, which corresponds to the above declared need to monitor such development, as outlined in Figure 1, where more than 40% of respondents stated that they did not feel or rather did not feel such need.

Furthermore, it was possible to conclude that as regards educational events, teachers attend them usually only once a year (50%), while a significant proportion (38.1%) of teachers do not participate in educational events at all. Only a small proportion of teachers, a total of 12.0%, attend educational events focused on the use of ICT in education two or more times per year, a result which is rather surprising. However, with respect to the incoherent concept of Continuing education of pedagogical staff, and the absence of a finalized and binding career system of teachers, such result becomes more understandable.



Graph 2 Identification of obstacles preventing a wider use of ICT tools in teaching

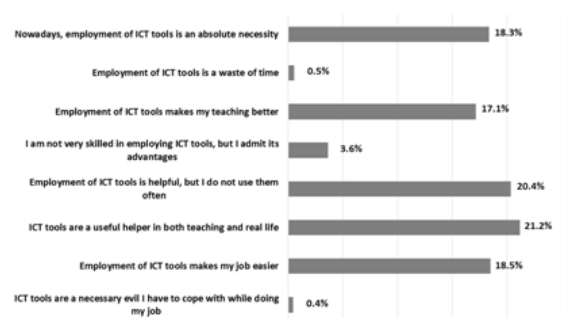
Based on the analysis of the data acquired in the field of identifying the obstacles preventing a wider use of ICT tools in teaching (see graph 2 above), it can be said that the most frequently mentioned obstacle is a lack of time (44.1% of respondents), a lack of suitable ICT tools (26.0% of respondents), and a lack of relevant knowledge and skills (23.8% of respondents). Only 6.1% of respondents claimed that it was also a lack of interest on the side of pupils which prevented a wider use of ICT tools, which, however, can be due to the type or the content of the teaching of the latter.

The aforementioned results were again subjected to an analysis aimed at detecting the possible dependence of the results on the significant signs, i. e. gender, length of practice, type and size of the school, etc., realized via Student's t-test. Since the observed value of $p < 0.05$ was reached in three of the four monitored signs (with the exception of gender), we can state with a relatively high probability with respect to the probability limit that *the frequency of teachers' opinions on the obstacles preventing the use of ICT tools in their teaching is relatively higher for women with a shorter period of practice, who work at pre-schools and primary schools with fewer than 200 pupils.*

5.3 Determination of the attitude of teachers to ICT tools

Final area of study focused on identifying the overall attitude of teachers to ICT tools. The questionnaire item used for this purpose was formulated as it follows, that is to say "How would you characterize your relationship / attitude to ICT tools?"

The use of ICT tools in education is, according to some authors, a significant impulse for the development of both pedagogical practice and theory (eg Zounek, 2015, Brdička, 2012, Jonnasen, 2003, Mishra & Koehler, 2006). However, the question is whether this need is perceived in practice at all, whether teachers feel this need equally, and whether ICT are perceived by teachers positively as a helper to their difficult work. A summary of respondents' answers is apparent from Graph 3 below.



Graph 3 Overall attitude of teachers to ICT tools

Based on the results presented in the graph, it can be stated that only 0.9% of teachers declared rejection of the use of ICT tools in teaching (0.5% of respondents described the use of ICT tools as an unnecessary waste of time, and 0.4% of respondents characterized ICT tools as necessary evil). Majority of teachers, 56.8%, hold the opposite view, and they welcome the use of ICT tools in their teaching (18.5% of respondents said that ICT tools make it easier for them to work, 21.2% of respondents claimed that ICT tools are a suitable tool for teaching, and 17.1% of respondents believe that the use of ICT tools improves teaching). Obviously, only a small part of teachers utterly refuse the use of ICT tools in teaching, and the question remains what exactly discourages these teachers from using the latter.

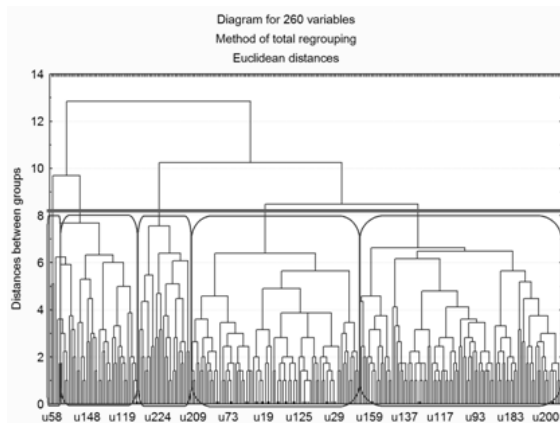
These results were also subjected to an analysis aimed at detecting the possible dependence of the results on the significant signs (gender, length of practice, type and size of the school). Student's t-test was applied. Since the observed value of $p > 0.05$ is reached for all four signs monitored, it is possible to say with high probability that *the relationship and attitude of teachers to the use of ICT tools in teaching is identical for men and women, including the length of practice, and type and size of the school.*

Overall, it is possible to summarize the results of the aforementioned analyzes and their outcomes by concluding that ICT tools are not neglected or on a large scale refused by teachers. However, for the sake of objectivity, it is necessary to emphasize that it is not to be expected that all teachers and educators accept and use ICT tools uncritically, and, on the other hand, it is equally impossible to expect total rejection of ICT tools by all teachers either. For this reason, a further analysis was carried out using multidimensional statistical methods, which aimed to identify and describe individual groups of respondents, responding to the questions asked similarly or identically.

6 Adoration or resistance – what is reality?

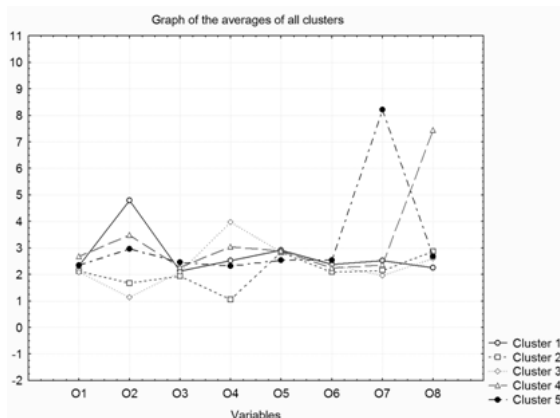
To be able to answer the question raised in the title of the chapter, another statistical evaluation was carried out, using the statistical method of cluster analysis (Pošík, 2008, p. 17). This method is applicable where a set of objects (affirmations, respondents, etc.) can be divided into several relatively homogeneous groups, which would, for example, facilitate further analysis. Based on the aforementioned facts and on the outputs of the research, there was a presumption that there was practically no group of teachers who would deliberately refuse to use ICT tools in education and who thus responded to all questionnaire items with a low score rate.

Consequently, our aim was to identify individual groups of respondents in the research sample who showed the same or similar level of evaluation of the individual questionnaire items, to describe their characteristics, and possibly to correct the negative impact of some groups of respondents on the results of the research survey. This was achieved using cluster analysis, which in this case analyzed clusters in the set of respondents to determine whether there were groups of teachers who showed similar way of evaluating individual questionnaire items. The result of this analysis is represented by Graph 4.



Graph 4 Cluster analysis of evaluation of individual questionnaire questions by teachers

As illustrates Graph 4, it was possible to classify teachers according to the similarity of their evaluation of the individual questionnaire items into 5 relatively independent groups, differentiated according to the distance of the connection at the level around the value of 8. However, none of these groups showed neither higher nor lower rate of evaluation of individual questionnaire items. Therefore it was not possible to identify a cluster of possible "opponents" of using ICT tools in education. To prove with certainty that there is no teacher group that clearly rejects all activities related to the implementation of ICT tools in education, we used the k-diameter method, which aimed to identify and describe the characteristics of individual groups of respondents. For this reason, we performed a further k-diameter cluster analysis, which divided the surveyed sample into 5 groups, as shown in Graph 5.



Graph 5 Classification of the respondents based on similar rating of questionnaire items

As is evident from Chart 5, our assumption was confirmed that the group of respondents is subdivided into five relatively separate groups according to the assessment of individual questionnaire items. Furthermore, it is noticeable from the graph that none of the respondents' groups showed a significantly higher or lower rating in all questionnaire items than other groups. Although there does exist one group (indicated in the graph as Cluster 2), which has lower scores in most items, however, in some items (Q2 - "Do you feel the need to follow the development and supply of ICT tools for your teaching?" and/or Q5 - "What are the most common obstacles to the use of ICT tools in your teaching?"), this group provides higher rating than another group. More obvious are significant differences in the evaluation of the items between different groups of respondents. The biggest differences are in the approach to these facts: Q2 - "Do you need to monitor the development and supply of ICT tools for your teaching?"; Q4 - "How often do you attend courses / tutorials / workshops which focus on innovation in ICT field for your teaching?"; Q7 - "What do you consider the

biggest obstacle to the wider use of ICT tools in your teaching"? On the basis of the aforementioned facts, it is possible to specify the determined research assumption and to state that according to the rating of the questionnaire items, it is possible to classify the teachers into five relatively separate groups, where there is no such group which would uncritically accept (adore) ICT tools or, on the other hand, a group which would totally reject (resist) such use.

To ultimately confirm the research assumption, the method of factor analysis (Blahuš, 1985, p. 172) was applied, with the following parameters: main components, rotation - Varimax normalized, high load factor > 0.7. The method was used to validate or refute the research assumption that it is possible, according to the rating of the questionnaire items, to classify the teachers into five relatively separate groups. Table 2 shows the percentage of variance explained by each extraction factor.

Table 2 Factor analysis of individual questionnaire items rating; Eigenvalues and variance percentage explained by factors

Factor	Eigenvalues: Number of variables – 260 Extraction: Main components; Rotation: Varimax normal			
	Eigenvalue	Total percentage variance	Cumulative eigenvalue	Cumulative variance percentage
1	1.837290	22.96613	1.837290	22.96613
2	1.205841	15.07301	3.043131	38.03914
3	1.098699	13.73374	4.141831	51.77288
4	1.062508	12.04385	5.204339	63.81673
5	1.001260	11.45325	6.205599	75.26999

In total, 5 factors (factors representing 5 identified groups of teachers) explained 75.27% of the variance. By number of eigenvalues greater than 1, it was possible to extract 5 factors again and calculate the factor charge values of the individual criteria, as shown in Table 3.

Table 3 Factor analysis of individual questionnaire items rating

Area	Factor charges Rotation: Varimax Standardized; Extraction: Main Components, (Labeled loads are > 0.700000)				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
	O1	-0.02364	0.33895	-0.42576	0.55138
O2	0.03619	0.04291	0.01679	0.01996	0.99617
O3	0.75984	0.21091	-0.02492	0.16806	-0.03088
O4	0.28057	-0.19671	-0.01446	0.76436	0.00696
O5	-0.60603	0.10984	0.31247	0.46668	0.01494
O6	0.81940	0.02648	0.14447	0.15152	0.08857
O7	0.14184	0.90948	0.05295	-0.05584	0.04210
O8	-0.02006	-0.06644	-0.88797	0.04444	-0.02351

It can be seen from Table 3 that the extracted factors follow from the responses to the questionnaire items for every particular group of teachers. Based on this finding, we can say that the variance of the questionnaire scores can be explained by 5 factors which represent the 5 groups of teachers having been set by us. As this classification corresponds to the established research assumption, the latter can thus be accepted. It turned out that more than 20 years old taxonomy of E. Rogers, which operated with five categories, differentiated by the level of interest and level of use of ICT tools by teachers in teaching, can still be considered valid even today.

7 Summary and discussion of the results

However, in connection with the presented results, one interesting fact has to be pointed out concerning a group of pedagogical staff with practical experience of up to 10 years. This group has surprisingly lower usage rates for some analyzes than the group comprising pedagogical staff with more than 10 years of experience. Although these results were not statistically significant, it is necessary to reflect on this fact. One explanation could lie in the assumption that this group of workers perceives the use of ICT tools as self-evident and natural in their teaching and therefore ICT tools use is not regarded as something "new". This conclusion is supported by the fact that these members of pedagogical staff underwent their undergraduate training at a time when ICT tools and their use in the educational process had already become and were an integral part of their education. That

is why the use of such tools is natural to them. However, the whole issue can be seen from a different point of view related to the length of teaching experience. From this perspective, it can be stated that pedagogues with shorter work experience will spend more time and energy on dealing with discipline and organization matters. Consequently, they will not have left enough time and/or energy to incorporate ICT tools to a larger extent. Of course, this is just an assumption which would have to be supported by relevant statistical analysis.

This problem relates to the "new" role of the teacher in the educational process, based on the consistent use of modern ICT tools in the educational process. The aforementioned results clearly point to the fact that teachers regard teaching supported by modern ICT tools as necessary, beneficial, effective, more motivating, developing more components of the pupil's personality, all in a more attractive form. The question is whether this applies to all schools where these tools are used. It is impossible to take a clear, unequivocal stance toward this issue, as a significant group of schools, the teachers of which had undergone extensive training and many workshops focused not only on the operation of ICT tools, but also on the creation of suitable didactic materials in the form of electronic teaching materials (see the project Modern Teacher, www.moderni-ucitel.upol.cz), was involved. Our effort was to develop the so-called "digital wisdom" in the context of the above-mentioned facts for a group of teachers, who could then better understand the thinking of pupils - "digital natives" (Prensky, 2009). Such massive and targeted teacher training is not common at schools. That is why there might exist schools where ICT tools serve "only" for a static projection of non-didactic content. Teachers who implement such teaching do not have the necessary competencies to prepare and implement the lessons, where modern ICT would represent an integral part of interaction between teacher, subject matter, and student.

8 Conclusion

The research carried out in the form of quantitative research methods *did not prove the existence of a clearly identifiable group of pedagogical staff who would uncritically accept and use modern ICT tools in teaching. At the same time, the existence of a group which would clearly reject ICT tools was not proved either.* Based on the results, it is possible to distinguish relatively separate groups of members of pedagogical staff according to the degree of their evaluation and usability of ICT tools in teaching. However, this distinction or classification is not supported by the overall approach to these tools, but only by some aspects of it. The identification of these aspects shall be the subject of further research realized by us.

Last but not least, the above-described research pointed to additional interesting facts. First of all, we can say that over 50% of the teaching staff monitor the current supply and development of ICT tools for their teaching and only 7.7% of them do not feel the need. Furthermore, it emerged that the most frequently used source of information necessary for monitoring the development and the offer of new ICT tools is the Internet (48.8% of respondents) followed by educational events (25.9% of respondents). The vast majority of teaching staff - 76.1% in total, perceive the current offer of ICT tools as sufficient whereas only 4.6% of pedagogical staff perceive this offer as being totally inadequate, and 19.2% as rather inadequate. It can also be noted that 0.9% of pedagogues claimed that they totally reject the use of ICT tools in teaching, while a much larger proportion of teaching staff, a total of 56.8%, hold the opposite view and welcome the use of ICT tools in their teaching.

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