

Mathematics in Perception of Pupils and Teachers¹

Isabella Pavelková¹, Vladimír Hrabal²

¹ Charles University in Prague, Faculty of Education,

² Universität Ulm, Medizinische Fakultät

Abstract: The presented study shows the possibilities of increasing the teacher's professional competencies using focused self-reflection on the basis of confrontation of his or her own ideas, expectations and observations with data obtained mostly from the statements of pupils. The study is based on the results of research carried out in the Czech Republic (sample: 3108 pupils from 25 elementary schools and 179 teachers of these pupils). The attitudes towards mathematics from the point of view of pupils were analyzed, as well as the teachers' perceptions of pupils' attitudes. The monitored variables are: popularity, difficulty, and importance of the subject, self-reflection of one's own talent for the subject, how interesting pupils find the subject, and their motivation and diligence in mathematics, complemented by the pupils grades and teachers' evaluation of each pupil's performance in mathematics. The study also provides examples of the trend of German pedagogical-psychological research and shows the parallels and possible directions of comparative research in the given area.

Keywords: pedagogical psychology, motivation, mathematics, pupils perceptions and attitudes to subjects, professional competencies of teacher, diagnostic competencies of teacher, effectiveness of instruction, criteria of effective teaching

1 Introduction

The objective of every educational system is to increase the effectiveness of teaching of all subjects. This is possible only on the basis of (a) accurately defining the appropriate criteria to ensure effective teaching, (b) determining the key factors influencing effective teaching (including the power of each factor and their effects on each other), (c) systematic appreciation of the changes in effectiveness depending on changes to the relevant factors.

Comparison of the educational system with other systems then allows for voluntary positive changes in the effectiveness of teaching, with the assumption of unified criteria for measuring the effectiveness of teaching.

The main focus of our research is the teacher and his or her professional competencies (Spilková, 2008). In our study, using a pedagogical-psychological approach, we will focus on the possibilities of increasing the teacher's competencies using controlled self-reflection by confronting one's own images, expectations and observations with the data gained mostly from pupils' own statements (Hrabal & Pavelková,

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120 2010). Another objective of our study is to present the current trends in German pedagogical-psychological research, and point out the parallels and possibilities for comparative research in this area.

2 Possibilities of Using the Pupils' Statements in Describing the Subjects of Instruction

The pupils' statements about a subject of instruction could be used for comparison of the character of chosen subjects and their differences in observed countries, based on the statistical processing of large samples. They could be also used to determine the efficiency of instruction of individual teachers in terms of creating positive attitudes towards the given subject.

Using a sample of Czech pupils from selected secondary schools and the semantic differential method, R. Pöschl (2005) identified differences in the importance assigned by pupils to mathematics and physics. The results of his research showed that the pupils in his survey associated the terms 'mathematics' and 'physics' with the terms 'school', 'theory', 'duty', 'formula', and 'truth'. By contrast, the pupils did not connect the terms 'mathematics', and 'physics' with terms such as 'science', 'nature', 'love', 'life', or 'future'. According to Pöschl's study, pupils find physics to be 'distant', 'boring', 'ugly', and 'complicated'. The pupils considered mathematics less distant and more useful. However, the point of view of those pupils that 'like it' is different; physics is, for these pupils, much more 'useful', 'varied', 'beautiful', 'active', 'entertaining', 'young' and less 'complicated'.

In a German study, the authors surveyed pupils' impressions of the importance of individual subjects to everyday life. The questionnaire they created included among others, questions about the difficulty of subjects and their significance. The results show that, similarly with the Czech Republic, German pupils consider mathematics to be difficult but significant. However, the importance to the everyday life is quite low compared to the German language (Haag & Götz, 2012).

The research of other German authors Kessels and Hannover (2006) demonstrated the importance of investigating the pupils' impressions of individual subjects. They discovered that a pupil's impression of a subject was reflected not only in his/her approach to the given subject, but it could also strongly influence the pupil's own self-conception. Their research was aimed at surveying German pupils' impressions of natural sciences and comparing and contrasting these with the impressions that pupils who preferred these subjects associated with them. The authors show on the example of physics that some subjects have a very distinctive image, and that pupils have the tendency to regulate their own identities by focusing their interests in subjects according to this image. As the authors of the study state, the pupils thus implicitly affect their own self-image.

3 Pupils' Approach to School Subjects and Their Self-Assessment in the Area of Qualifications for Learning

3.1 Example of the research orientation in Germany

H. Ditton (2002) highlighted the potential of using pupils' statements to increase the effectiveness of teaching. On the basis of the analysis of many research works, Ditton came to the conclusion that how pupils perceive the teaching is an important factor when determining the professional qualities of the teacher. He carried out large scale research in which he used a sample of 4316 pupils in 186 ninth grade classes, who assessed their mathematics teachers both on their behaviour during the instruction and the characteristics of the instruction. Ditton found that a positive attitude towards mathematics teachers statistically significantly correlated with the values of importance the pupils give mathematics ($r = 0.31$), their fear of mathematics ($r = 0.32$), how fair they consider the marks from oral examination ($r = 0.46$), how interesting they find the instruction ($r = 0.64$), how they assess the teacher's diagnostic competencies ($r = 0.73$) and how clear they find the instruction ($r = 0.65$). On a partial sample of 172 pupils, the author further investigated how the assessment of pupils corresponds to the expectations of the teacher. The correlation between how interesting and how well structured the teaching was, was between $r = 0.39$ and $r = 0.44$, and the correlation between the effectiveness of the teacher's classroom management and the positivity of the teacher-pupil relationship was $r = 0.48$. The author concludes: "How the pupils perceive instruction could be an important base for improving the quality of the instruction, if data from such surveys aren't used only for research purposes, but also made available to the teachers." As part of the study, the results were given to each of the teachers and they could compare their results with the results of the whole sample. The feedback showed that many of the teachers used such obtained information to improve the quality of their teaching. Our concept of the self-diagnostic possibilities of the teacher (Hrabal & Pavelková, 2010) (see also part 5 of this study) is of a similar vein, but it is further developed in the area of diagnostic methods.

3.2 Our research study

Research sample

Our research was conducted between 2005 and 2008 in two distinct phases. Pupils at the lower secondary school (grades 6 to 9) participated in both phases. Only the pupils were surveyed during the first phase in 2005 and 2006. During the second phase in 2007 and 2008 their teachers also participated. A total of 2071 pupils from 101 classes in 18 schools were investigated in the first phase, with an additional 1037 pupils, and 179 teachers, from 50 classes in 7 schools in the second phase. The schools were carefully selected to ensure that they fairly represented the full spec-

122 trum of schools nationwide in the Czech Republic. We therefore had a total sample size of 3108 pupils from 151 elementary school classes.

Table 1 Numbers of monitored pupils

Year	1st phase			2nd phase			Total		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
6	282	259	541	102	80	182	384	339	723
7	280	250	530	130	104	234	410	354	764
8	262	242	504	152	131	283	414	373	787
9	282	214	496	169	169	338	451	383	834
Total	1106	965	2071	553	484	1037	1659	1449	3108

The research method and chosen variables

The research method used on the pupils in our study was *Questionnaire about attitudes to subjects* (Hrabal & Pavelková 2010). The questionnaire included the questions regarding the character of the subject of instruction, one's own preconditions for success in the subject, and information about the pupils' marks on their last school report. The questionnaire used always a 5-level scale:

- *subject popularity* (1 – very popular subject ... 5 – very unpopular subject);
- *subject difficulty* (1 – very difficult subject ... 5 – very easy subject);
- *subject importance* (1 – very important subject ... 5 – not an important subject);
- *mark on the latest school report*;
- *talent for the subject* (1 – very talented ... 5 – not talented);
- *motivation in the subject* (1 – very motivated ... 5 – unmotivated);
- *diligence in the subject* – (1 – very diligent ... 5 not working/lazy).

Characteristics of the monitored variables

- Subject popularity – emotional experience of the subject (both as a precondition and as a result of the motivation to learn).
- Perceived difficulty of the subject – and the relation to many motivational processes (feeling of powerlessness, self-image, success or failure, etc.).
- Subject importance – ascribed subjective value of studying the subject. Source of motivation – internalisation of the social representation of the subject via its application in society.
- Self-perception of one's own talent – the competence component affecting motivation to learn.
- Diligence – realised motivation in lessons and home preparation.

Teachers of individual subjects assessed their pupils using the same characteristics as the pupils used to grade themselves. They also assessed the performance of the pupils on the 5-level scale (1 – very good performance ... 5 – very poor performance). The teachers therefore tried to assess their pupils' attitudes towards individual school subjects.

These variables were measured for the following school subjects in the given year: Czech language (Čj), mathematics (M), English language (Aj), German language (Nj), physics (F), chemistry (Ch), biology (Př), geography (Z), history (D), citizenship (Ov), Family education (Rv), arts (Vv), music (Hv), sports (Tv), work education (Pv), informatics (I). Abbreviations in parentheses are taken from the Czech names of the subjects. A summary of results follows. We have specifically selected the data that demonstrate the implicit concept of teaching mathematics. Mutual relationships between the variables were identified on the basis of correlation coefficients with the significance border $p < 0.05$.

Results of the study – relationship between popularity, difficulty and importance of the subject

As set out above, and detailed further in our research (Hrabal & Pavelková, 2010), the popularity, difficulty and importance of the subject to the pupils are all important components in their motivation to learn, and by influencing one or more of these components it is possible to increase the efficiency of the instruction. They are also important indicators characterising the subject and feedback given by the pupils, which can then be used by the teachers for their self-reflection.

Relationship between popularity and difficulty. Generally, it is possible to say that the more difficult a subject is, the less popular it is with the pupils. Typically, if a subject is perceived to be particularly difficult, it tends to be particularly unpopular, and vice versa. If we consider extreme groups from this point of view (a popular and very popular subject versus an unpopular and very unpopular subject), there is a strong relationship between popularity and difficulty. However, we have found that for another group of pupils this tendency does not exist and, indeed, the contrary appears to be true. Up to a quarter of pupils that liked a given subject a lot, considered it to be difficult or very difficult. This phenomenon was found to be present in subjects such as the Czech language and mathematics. Forty percent of those who liked mathematics, considered it to be easy or very easy, but 25% of pupils that considered it to be difficult or very difficult, also liked it very much. Mathematics and the Czech language generally belong to the rather unpopular and difficult group of subjects.

Relationship between popularity and importance of the subject. In terms of the relationship between popularity and importance of the subjects, we again noticed positive, although less pronounced trends; typically the more popular a subject is among the pupils, the more important they find it. Conversely, the more important a given subject is for the pupils, the more they like it. (Causal relationships between popularity and importance were not a subject of our study.) What is significant is that the relationship between popularity and importance exists, is of moderate strength, and is true for both the subjects generally considered to be popular (arts, music, sports, citizenship, family education, etc.) and for the subjects considered to be less popular (mathematics, physics, etc.).

Relationship between difficulty and importance of the subject. The relationship between difficulty and importance was found to be less pronounced and less stable

124 than either of those described above. For mathematics and most other subjects, there was only a relatively weak mutual connection between these factors. For Czech language, arts, music, etc., there was no discernible relationship between difficulty and importance shown in the results.

Relationship between popularity of the subject and mark. Teachers frequently believe that if a pupil is successful in a subject, he/she will like it. But the results of our study do not entirely support this claim. There was only a weak correlation between the popularity and results for most subjects; in particular, there was only a medium-strength connection between mathematics, geography, history, English, and German language.

Relationship between difficulty of the subject and mark. A medium-strength relationship was established between perceived difficulty and results in the subjects of mathematics, Czech language, geography, history, English language, German language and citizenship. For the rest of the monitored subjects, the research found only a weak relationship between these factors. Thus, it is not possible to state with any degree of certainty that pupils with bad results in a given subject must therefore consider it to be particularly difficult, or vice versa, that pupils with good results consider the subject to be easy.

Relationship between importance of the subject and mark. A weak relationship was found to exist for most of the subjects between the importance of the subject and marks.

Results of the study in terms of homogeneity and heterogeneity of pupils' attitudes towards subjects

The level of homogeneity or heterogeneity in pupils' attitudes towards certain subjects may be a better indicator of the real level of agreement or disagreement in the attitudes, and thus may more clearly demonstrate the social standing of individual subjects. From the point of view of the teachers, there is a great difference between teaching a subject where the attitudes are similar (for example, where almost all pupils like it or almost all consider it difficult) and a subject where the attitudes of pupils are differentiated. It is important to note the results with regard to the levels of homogeneity with a degree of caution given that they could, of course, be influenced by a number of subliminal and/or external factors. These could include the difficulty pupils may have in reflecting on or differentiating their particular attitudes towards a subject, and/or the product of their indecisiveness, lack of clarity of their opinions, and/or stronger tendency to choose middle values.

To assess the homogeneity of individual attitudinal characteristics, we first sorted them according to the standard variation. In the second stage, we divided the 112 characteristics (16 subject \times 7 characteristics) into quartiles (Table 2). The subjects in the first quartile have a high level of homogeneity, whereas the subjects in the fourth quartile have a low level of homogeneity or a high level of heterogeneity of pupils' attitudes towards them.

Table 2 Homogeneity and heterogeneity of pupils' attitudes towards subjects

Characteristic	Subject	Subject Characteristics
High level of homogeneity		
Marks	Vv, Hv, Ov, Tv, I	very good
	Př, Ch, Z	good
	Čj	bad
Importance	Aj, M, Čj	high
Talent	Tv, Rv, I	good
	Př, Ov, Z	middle
	Čj	low
Popularity	Tv, I	high
	Čj	low
Low level of homogeneity		
Interest	M, F, D, Ch, Vv, Hv, Ov, Tv	nothing typical
Diligence	all subjects	nothing typical
Motivation	all subjects	nothing typical
Popularity	D, Ch, M	nothing typical

The abbreviations are taken from the Czech names of the subjects as follows: Vv – arts, Hv – music, Ov – citizenship, Tv – sports, I – informatics, Př – biology, Ch – chemistry, Z – geography, Čj – Czech language, Aj – English language, M – mathematics, Rv – family education.

Mathematics – summary. Pupils' attitudes towards mathematics are quite differentiated; the pupils agree on the high level of importance of mathematics, but their attitudes differ in the popularity and interest of mathematics as a subject, as well as in their motivation and diligence in mathematics.

Results of the study in the area of pupils' approaches to mathematics

Mathematics as a subject is perceived as one of the least popular – it was the third most unpopular subject, ahead of only German language and Physics. Mathematics was also viewed as the most difficult subject of all those investigated, and at the same time, the pupils perceived it as a very important subject (third place behind English language and Czech language). The average results in mathematics were the worst of all the monitored subjects, with pupils considering themselves less talented at mathematics (third worst of the subjects, in front of only Czech language and physics). Pupils' motivation was found to be only average – in comparison with other subjects, mathematics came in fourth place behind informatics, English and

126 sports). With regard to diligence, pupils considered themselves to be only averagely hard-working in mathematics (sixth least diligent subject). More detailed information about all the subjects in the lower secondary schools are summarized in the book by Hrabal and Pavelková (2010).

Gender differences

We also looked at the differences between boys and girls in their respective attitudes towards mathematics. The results are shown in Table 3. Due to the large sample size, statistical significance could be also found by small differences. On average, the difference between boys and girls was not greater than ± 0.20 , approximately a quarter of a grade. The differences between boys and girls in their attitudes towards mathematics were not therefore generally statistically significant. The greatest differences were found to exist in the perceived talent that boys and girls consider themselves as having for mathematics, where the boys felt more talented than the girls (difference 0.27), and in the motivation that each has to learn mathematics – where once again the boys felt more motivated (difference 0.23). It is interesting that there was no significant difference in diligence (diligence as real motivation). Other differences included that mathematics was more popular with boys than girls (difference of averages 0.13), that boys also consider it easier (difference 0.18), and that boys as a whole have better marks (difference 0.19). Differences between the approach of boys and girls to other subjects can be found in the study by Pavelková (2005).

Table 3 Differences in approach to mathematics between boys and girls

		N	Average	Difference in averages	Importance
Popularity	Boys	1658	2.84	-0.13	**
	Girls	1448	2.97		
Difficulty	Boys	1659	2.73	0.18	**
	Girls	1446	2.55		
Importance	Boys	1658	1.75	-0.08	*
	Girls	1447	1.83		
Mark	Boys	1646	2.55	0.19	**
	Girls	1441	2.36		
Talent	Boys	852	2.71	-0.27	**
	Girls	760	2.98		
Motivation	Boys	851	2.47	-0.23	**
	Girls	762	2.70		
Diligence	Boys	850	2.71	0.09	
	Girls	759	2.62		

* = $p < 0.05$, ** = $p < 0.01$

4 Diagnostic Competencies of Teachers in Respect of Pupils' Approaches to Mathematics

4.1 Research of diagnostic competencies of teachers in Germany

Research activity aimed at the diagnostic competencies of teachers in Germany was provoked by disappointment in the results in the PISA study (2002), and also by the conclusions of the Conference of Ministers of Culture of the German States (2004) that stated low diagnostic competencies of the teachers as one of the reasons for the PISA study results. In this regard we make reference to two studies on this theme. The first study (Praetorius et al., 2011) looked at precisely how teachers know to evaluate the self-image of pupils in the area of competencies in individual subjects, i.e. what is their diagnostic competence in this area. It compared the *level* – average value of the self-image and teacher's estimation, *differentiation* – tendency of the teachers to overestimate or underestimate the self-image of pupils and *ranking* – the difference in the order of pupils in class created on the basis of teacher's estimations and the pupils' self-assessment. The research was based on a sample of 663 pupils of the first year of elementary school, and 37 of their teachers from 20 schools. The results show that there is no difference between subjects and length of experience of the teachers. Only differences between pupils and teachers were found in the area of ranking.

In another study (Karing, 2009) aimed at the diagnostic competencies of elementary school and grammar school teachers, the accuracy of the estimation of performance and subject motivation of pupils was investigated. The research was conducted in Germany on the sample of 1984 pupils from the 4th year of elementary school with 142 of their teachers, and 914 pupils of 5th year of grammar school with 111 of their teachers. Performance tests were made in the areas of vocabulary, understanding of texts and calculations. Also surveyed were interests of pupils in German language and mathematics. The results showed that the teachers at the elementary school estimated the pupils' performances more accurately than the grammar school teachers. In the evaluation of interest in mathematics, both groups of teachers had similar results.

4.2 Results of our study for teachers of mathematics

As we have already shown, pupils have typical attitudes to individual school subjects. The subjects in pupils' self perception differ in all monitored indicators. We will now focus on the teachers' perceptions of pupils' attitudes. In this sense, we do not consider the comparison of teacher's impressions of pupils' self-image with the pupils' self-image. We for now only present a general comparison of the views of the pupils and the views of their teachers. Table 4 shows the results for mathematics only, for the results in other subjects see (Hrabal & Pavelková, 2010; Pavelková & Škaloudová, 2008).

128 Table 4 Teacher's perception of pupils' attitudes towards mathematics

	Pupils (6th to 9th year)	Teachers (6th to 9th year)
Popularity	2.7; 3; 2.9; 3.0	2.2; 2.7; 2.9; 2.9
Difficultness	3.0; 2.7; 2.5; 2.4	3.2; 2.7. 2.7. 2.6
Importance	1.8; 1.9; 1.7; 1.7	Performance 2.1; 2.6; 2.5; 2.2
Mark	2.2; 2.5; 2.6; 2.5	2.5; 2.8; 2.8; 2.7
Talent	2.7; 2.9; 2.9; 2.9	2.6; 2.8; 2.8; 2.8
Motivation	2.6; 2.6; 2.5; 2.6	2.4; 2.8; 2.7; 2.5
Diligence	2.5; 2.8; 2.6; 2.7	2.4; 2.7; 2.7; 2.6

The development of pupils' attitudes towards mathematics could be summarised by saying that the popularity of mathematics decreases after the sixth year, coinciding with worsening marks after this year. Meanwhile the perceived level of difficulty of mathematics is constantly rising and the importance of mathematics is slowly rising. Talent for mathematics is perceived as the highest by pupils in the 6th year, after which it falls before plateauing and remaining largely constant. Motivation to learn in mathematics doesn't change although diligence falls in the 7th year.

In summary of the teachers' views of pupils' attitudes, we can see similar trends as with the results of the pupils' self-evaluation. There are some notable differences, for example in the overestimation of pupils' enjoyment of mathematics in the sixth year, underestimation of the difficulty of the subject (pupils consider mathematics to be more difficult) and particularly in the underestimation by teachers of the level of importance of mathematics that is perceived by the pupils.

Interestingly, the research found that when comparing the results of the teachers' estimations of pupils' performances – the teachers consistently tended to assess the performance as worse than the marks they themselves gave the pupils. They slightly overestimated the motivation of the pupils and underestimated their diligence.

5 Possibilities of Teacher's Self-Diagnosis on the Basis of the Pupils Classification Analysis

5.1 Mark and teachers' estimation of the performance in mathematics

As the above mentioned results show, the marks given by the teachers are not in clear accord with their evaluation of the pupils' performance, contrary to what one might expect. The marks were on average better than the estimated performance with the individual differences shown in Table 5.

Table 5 Frequency table: results in mathematics and estimated performance in mathematics

		Estimated performance of the pupil					Total
		1	2	3	4	5	
Mark	1	54	34	5	1	0	94
	2	21	111	69	7	0	208
	3	4	31	124	38	1	198
	4	1	4	20	53	32	110
	5	0	0	0	1	5	6
Total		80	180	218	100	38	616

Marks and teachers' estimation of the pupils' performance in mathematics:

- Performance assessment corresponds to the mark = 47%.
- The performance is assessed better than the mark = 33%.
- The performance is assessed worse than the mark = 20%.

The difference between the marks and the estimated performance can be explained by the fact that the marks contain both performance and non-performance components. The non-performance components include the motivational potential of the marks, but may also incorporate the relationship between teacher and pupil, a degree of sympathy or antipathy towards the pupil. The teachers may also be under a degree of external or internal pressure in certain subjects to award good marks.

5.2 Diligence and talent as perceived by both by pupils and mathematics teachers

Share of talent and diligence in mathematics

In our research we were also interested in further comparative analysis to consider the relationship between the diligence and talent of the pupils in the opinion of their teachers, compared with the diligence and talent of the pupils in their own opinion. Once again we only used data related to mathematics in the following comparison.

View of teachers:

The level of diligence is the same as the level of talent = 53%.

The level of diligence is higher than the level of talent = 16%.

The level of diligence is lower than the level of talent = 31%.

In more than half of the cases, the teachers of mathematics ascribe the same level of diligence and talent to the pupils. This opens the question whether the teachers are able to differentiate between these two indicators. Low differentiation suggests lower diagnostic competencies of the teacher and could lead to little sensitivity to the motivation of pupils. Our research also highlights that teachers of mathematics consider almost one third of their pupils to have more talent than

130 diligence, a view not shared, for example, by teachers of music who typically have the opposite point of view.

View of pupils

The level of diligence is the same as the level of talent = 47%.

The level of diligence is higher than the level of talent = 19%.

The level of diligence is lower than the level of talent = 34%.

Also from the point of view of pupils are the diligence and talent in many cases balanced, but if we compare these data with the perception of teacher, we could see that they distinguish more between diligence and talent.

Marks and performance in relation to diligence and talent, as estimated by the teachers of mathematics

If we compare the teachers' perception of the pupils' performance and the marks which they awarded, with how they assessed the diligence and talent of the pupils, we obtain valuable information about how performance, marks, diligence and talent correspond with each other. The results of our research in this regard are as follows:

The performance corresponds to the assessment of both diligence and talent = 45%.

The performance corresponds to the assessment of diligence and not talent = 15%.

The performance corresponds to the assessment of talent and not diligence = 27%.

The performance doesn't correspond to the assessment of either diligence or talent = 14%.

The mark corresponds to the assessment of both diligence and talent = 32%.

The mark corresponds to the assessment of diligence and not talent = 17%.

The mark corresponds to the assessment of talent and not diligence = 22%.

The mark doesn't correspond to the assessment of either diligence or talent = 8%.

The mark is better than the assessment of both diligence and talent = 18%.

Teachers of mathematics most often assess the performance of their pupils according to how they perceive the respective diligence and talent of their pupils. Similarly, the marks awarded most often correspond with their assessment of these factors. However, our research confirms that the marks ultimately awarded must also take into account other factors, most likely educational and school policy.

6 Conclusions

The conclusions to be drawn from our study suggest that there is a possibility of increasing the effectiveness of instruction via the enhancement of the professional competencies of the teachers by working with pedagogical-psychological data from

the pupils. On the basis of a cursory comparison of research results in the Czech Republic and Germany, we can say that it is possible to use the data from the pupils not only for comparing the effectiveness of education systems, but also for comparing the professional competencies of the teachers in individual countries, especially their diagnostic and assessment competencies. The study also shows possibilities for the use of pupils' own feedback for systematic self-diagnostic analysis of teachers' performance, which is one of the preconditions of focused self-reflection. By such focused self-reflection, teachers can systematically increase their individual professional competencies in the mentioned areas.

Our results are also interesting from the point of view of assessment activities of the teachers and identification of their components (for example the comparison of marks and estimated performance with diligence and talent). In individual cases they could be a source of information for the teacher for comparing their own scheme of assessment with the schemes of other teachers – i.e., self-diagnostic data in this area.

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Doc. Dr. Isabella Pavelková, CSc.
Department of Psychology, Faculty of Education,
Charles University in Prague
isabella.pavelkova@pedf.cuni.cz

Prof. Dr. Vladimír Hrabal
Medizinische Fakultät, Universität Ulm
vladimir.hrabal@uni-ulm.de