

Particular Results of a Research Aimed at Curricula Design of Teacher Training in the Area of Didactic Technological Competences

<https://doi.org/10.3991/ijep.v8i4.8184>

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Abstract—The paper presents particular results of the first phase of a research aimed at improving pre-graduate teacher training in the area of didactic technological competences. The main goal of the prepared research is to modernize and optimize relevant parts of study programs of teacher trainees at Slovak higher education institutions (inclusion and structure the relevant subjects in the study programs, their content and time assignment). The results are related to a questionnaire survey of the current state and perspectives of the continuing professional development of primary and secondary school teachers contributing to their didactic technological competences improvement and development. Main attention is paid to an analysis of the selected questionnaire items in which the respondents assessed significance of the use of various interactive educational activities and digital means in teaching process to increase efficiency of selected specific aspects of education. The presented analysis is based on the segmentation of the respondents on the factor of the category and sub-category of the teaching staff the respondents belong to.

Keywords—teacher training, teacher professional profile, didactic technological competences, interactive educational activities, digital didactic means

1 Context of the research and its goals

Didactic technological competences constitute increasingly important integral part of a teacher professional profile as they significantly influence teaching performance quality and efficiency of every teacher [1, 2, 3]. In principle all higher education institutions offering study programs in teacher training have incorporated in these programs some subjects or courses aimed at the didactic technological competence training. However in practice there are considerable differences in numbers of the relevant subjects included in the study programs, their position within the study program structure, in syllabi of these subjects as well as time allocation assigned to them [4].

A question is how an optimal model of the pre-gradual teacher training in the area of didactic technological competences should be designed, which aspects of the current requirements on the teacher competence profile and quality teaching assurance should be met and how these should be incorporated into the appropriate optimal training model [5]. To find out answers to these questions has become a task of a research, financially supported by the Ministry of Education, Science, Research and Sport of the Slovak Republic, main goal of which is to support modernization and optimization of the pre-gradual teacher training related to formation and development of teacher trainee professional didactic technological competences.

In the first phase of the research, the current state and perspectives of the continuing professional development of primary and secondary school teachers in Slovak Republic relating to the development and improvement of their didactic technological competences were surveyed. The survey was based on the screening of the in-service teachers' opinions and attitudes about this issue.

In the second phase of the research, an analysis of the inclusion of different subject and courses focused on the use of modern digital technologies in primary and secondary education (ISCED 1, ISCED 2 and ISCED 3) in teacher training study programs at various Slovak higher education institutions will be done. Assessment of the observed subjects (courses) content (syllabi) will be done from the students – teacher trainees' point of view.

Results of the analyses processed within the first two phases of the research will be used to design a proposal of a draft of measures to innovate and modernize the corresponding parts of the pre-graduate teacher training.

2 Screening of the in-service teachers' opinions on the needs of their didactic technological competences improvement

Methodology of the analysis of the current state of the continuing professional development of primary and secondary school teachers in Slovak Republic aimed at identification of the needs of further development and improvement of teachers' didactic technological competences has been based on screening opinions of these teachers.

For the purpose of the screening a questionnaire involving 41 items was designed. The questionnaire items were structured into four parts:

- part A consisting of 4 nominal items (A1 – A4) focused on the respondents' identification data (gender, length of service, category and sub-category of the teaching staff they belong to);
- part B consisting of 7 nominal items (B1 – B7) focused on the use of interactive educational activities and digital means in respondents' teaching practice (how they use them);
- part C consisting of 13 ordinary items (C1 – C13) focused on the assessment of the significance of the use of various interactive educational activities and digital means in teaching process for selected specific aspects of education;

- part D consisting of 17 ordinary items (D1 – D17) focused on the respondents' self-assessment of their knowledge and skills, i.e. in principle competences, to work with software applications and digital means within the scope of their own teaching practice.

Specification of the given parts resulted from an extensive search work of available sources describing relevant research done in Slovakia and abroad, too [6, 7, 8], on consultations with experts dealing with these or similar issues and not least on personal discussions led in community of experts having extensive professional and educational experiences in tertiary education practice as well as in continuing education of primary and secondary school teachers aimed at topics relevant to our research interest area [9, 10]. The above-mentioned parts of the questionnaire were proposed with the intention to enable a transformation of the qualitative features of education (training) in the field of selected computer applications, digital teaching tools and objects into the quantitative characteristics, what opens broader possibilities to final evaluation using a wide scale of methods of quantitative based research.

At the nominal items B1 – B7 the respondents chose from the offered alternatives the one which corresponded with their opinion best. Besides that, the items B1 – B6 offered the respondents also the possibility to give other, their own response. Because all these items were of nominal character, they were not included in the process of the questionnaire reliability/item analysis.

At the ordinary items C1 – C13 the respondents expressed their opinions and assessments to the use of various interactive educational activities and digital means in teaching processes taking into consideration different aspects of the teaching process. The assessment was done through a four-point scale, i.e. by assessments from 1 to 4 point value (1 – *insignificant, unimportant, without influence*, 2 – *rather insignificant, rather unimportant, rather without influence*; 3 – *rather significant, rather important, rather with influence*, 4 – *significant, important, with influence*). A choice of the neutral, emotionally indifferent attitude towards the given questions/statements was not included because we wanted to force the respondents to express themselves clearly and exactly. Each respondent's response to the particular ordinary items were recorded, i.e. we re-corded the scale values by which the respondent evaluated impact of the interactive educational activities and digital means on the selected aspects of the teaching process (see list of aspects in the Fig. 1` Note).

Analogically in the questionnaire part D the respondents were asked to assess a level of their knowledge and skills to work with various selected software applications and digital means and to use them in frame of their teaching practice. Also here the assessment was done through a four-point Likert scale (1 – *my knowledge and skills are insufficient*, 2 – *my knowledge and skills are rather insufficient*, 3 – *my knowledge and skills are rather sufficient*, 4 – *my knowledge and skills are sufficient*).

As it has been above-mentioned, for a further use of the designed questionnaire as a tool for a broader research data collection we considered to be very important to verify its reliability. This was done in a pilot test.

3 Assessment of the reliability of the data collection tool

A basis of each measuring process is data collection. If the measurement is to be of an appropriate quality, the measuring procedure has to be objective, valid and reliable. In our case the reliability of the data collection tool was confirmed based on the identification of the suspicious items through the reliability/item analysis.

The reliability/item analysis belongs to multidimensional survey techniques and is used for quality assessment purposes. It can be used to assess reliability of the measuring process, in particular for example just to assess the questionnaire scale and to identify its suspicious items.

One of the direct estimations is Cronbach coefficient alpha – Cronbach's alpha

$$\hat{\alpha} = \frac{m}{m-1} \cdot \left(1 - \frac{\sum s_j^2}{s^2} \right), \quad (1)$$

where m refers to the number of questionnaire items, s^2 refers to the variance of the questionnaire scale (variance associated with the observed total scores) and s_j^2 refers to the variance associated with the item j scale.

Reliability estimation can be calculated also from the average correlation coefficient \bar{r} of the particular items, according the formula

$$\bar{\alpha} = \frac{m\bar{r}}{1 + (m-1)\bar{r}}, \quad (2)$$

where m is the number of items.

Standardized Cronbach's alpha can be calculated also through the previous formula (1), if all measurements were standardized in advance, what means each value of the variable to count off its mean and to divide it by its standard deviation.

If the two estimations differ, it indicates that the particular items have not the same variability [11].

4 Results of the questionnaire reliability assessment

Validation of the questionnaire was carried out at the beginning of the year 2017. The research sample of the pilot test consisted of 37 primary and secondary school teachers.

As it is above-indicated (see the part 2 *Design of the methodology of the CPD current state evaluation*), only 30 from the total number of 41 questionnaire items (13 ordinary items of the part C and 17 ordinary items of the part D) were included in the data collection tool evaluation and its suspicious items identification. The total reliabilities of the two relevant parts (questionnaire parts C and D) were assessed through Cronbach's alpha, Standardized alpha and the correlation. The calculated

values of Cronbach's alpha for the part C $\alpha_C = 0.8678$ and part D $\alpha_D = 0.9268$ indicate a high internal consistency of the designed research data collection tool [12].

At this point we would like to notice some attributes of the pilot research sample of the primary and secondary school teachers. Actually the respondents were only primary and lower secondary education teachers (ISCED 1 and ISCED 2), mostly females, with different length of their teaching practice. All respondents have already passed some continuing professional development courses, focused on enhancing their didactic technological competences (provided by different education institutions), i.e. the courses were devoted to improvement of teachers' skills to use computer applications and digital tools in their teaching practice and professional development. That is why the respondents' statements to the observed issues can be taken as relevant ones and creating a platform for the improvement of the pre-graduate teacher training study programs.

The main goal of the pilot validation of the questionnaire tool was to find out from the respondents' point of view, which components were causing problems, to be able to relieve eventual shortages, whether of the formal, technical, contentual or methodological character. From the statistical point of view, the size of the pilot research sample was large enough to use the statistic methods to assess the questionnaire reliability and to identify its suspicious items. Following the obtained results the questionnaire was modified into its final version.

Thereinafter, we present a deeper analysis of the results of the questionnaire part C verification.

4.1 Analysis of the suspicious items of the questionnaire part C

In the questionnaire part C the respondents, primary and secondary school teachers, were asked to express their opinion on incorporation interactive education activities into the teaching process. They were asked to evaluate a level of significance of their use in the teaching process from the point of view of different aspects of education (list of the aspects see in the note at Fig. 1).

On the basis of the reliability/item analysis, the suspicious items, which decrease the total questionnaire reliability and have the most serious influence on the mean value and variability of the total score, were identified.

The value of the correlation coefficient 0.86 expresses a ratio of the sum of the particular questionnaire item variability and the questionnaire total variability. Both estimations (Cronbach's alpha and standardized alpha) do not differ very much, what means that the particular items of the questionnaire part C are of the same variability (Table 1).

From the point of view of the given item group, the questionnaire shows to be reliable, however the low value of the average correlation between the items (0.3377) indicates that some items elimination (their removing) could even increase the questionnaire reliability.

Table 1. Overall questionnaire statistics

Number of the questionnaire items	13		
Number of valid responses	37		
Mean	42.1081		
Standard deviation	5.6852	Cronbach's alpha	0.8613
Average correlation between the items	0.3377	Standardized alpha	0.8613

The graph in Fig. 1 shows how the elimination of each particular item decreases the given Cronbach's alpha (0.8613). The only exception is the item C13, limitation of which causes an increase of the given Cronbach's alpha (to the value 0.8787). This means that the item C13 decreases the total reliability of the designed questionnaire.

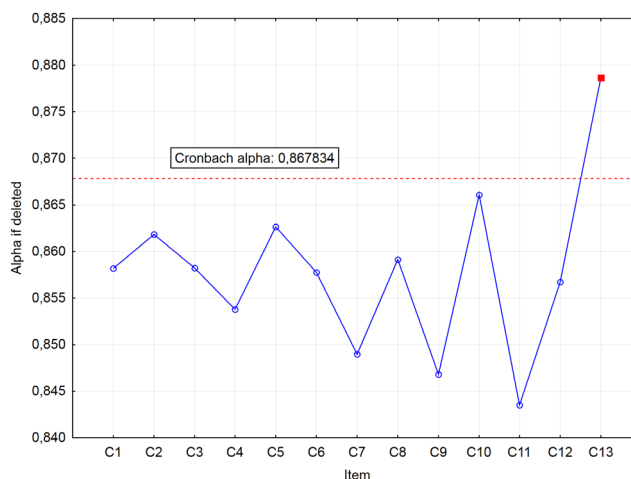


Fig. 1. Changes of the questionnaire reliability coefficient value after elimination of the relevant questionnaire item

Note to Fig. 1:

C1 – increase of pupils` motivation; C2 – increase of pupils` interest in the taught subject; C3 – increase of pupils` activity during the lesson; C4 – development of pupils` creativity; C5 – pupils` easier understanding of the presented new subject matter; C6 – longer-term retention of the presented subject matter; C7 – increase of the pupils` skills to apply the acquired knowledge in practical task solving; C8 – increase of the taught subject popularity (favour); C9 – increase of pupils` mutual co-operation; C10 – increase of pupils` “spirit of competitiveness”; C11 – positive influence on pupils` disciplined behaviour; C12 – increase of the positive classroom climate; C13 – development of pupils` digital literacy

The graph in Fig. 2 shows values of the coefficient of determination after elimination of each relevant item. The value of this coefficient indicates to how many percentages the other questionnaire items explain the relevant item (e.g. the questionnaire item C13 is explained by the other C items approximately only on 20 %).

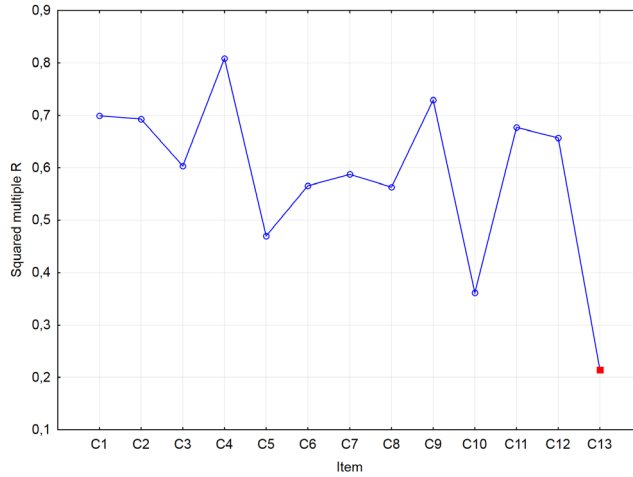


Fig. 2. Values of the coefficient of determination after elimination of the relevant item

From the graph presented in Fig. 3 it is clear that the total values of the standard deviation of the responses after the elimination of the relevant items are not changed significantly. This statistical indicator points out the most homogeneous responses recorded in case of the questionnaire item C13 (5.5615) at which the respondents stated their opinions on the influence of the use of interactive education tasks in teaching process on the pupils' digital literacy development. After this item elimination the variability of the total questionnaire score (5.5615) was increased most significantly.

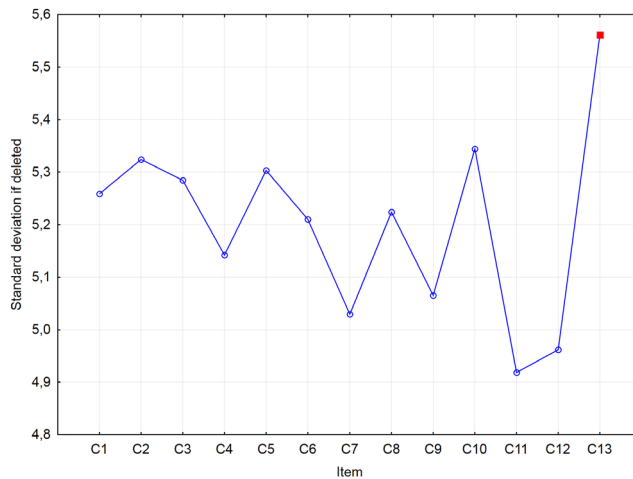


Fig. 3. Values of the total score standard deviation after the relevant item elimination

The graph in Fig. 4 presents correlations of the particular items with the total questionnaire score. A positive correlation, linear direct proportion, with the total ques-

tionnaire score was identified in case of all of the items with the exception of the item C13. This item does not correlate with the total score (0.014), what means that its values change independently. From this reason the item was identified as a suspicious one.

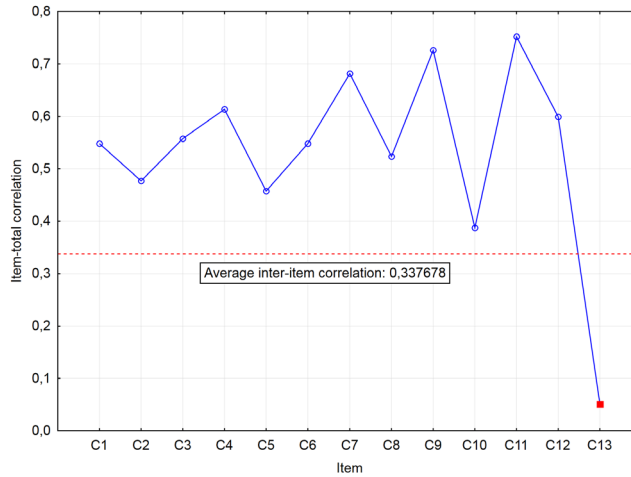


Fig. 4. Correlations of the particular items with the total questionnaire score

Based on the graphical visualization of the average value of the questionnaire total score after the relevant item elimination (the graph in Fig. 5) we state that just the item C13 was evaluated by the respondents very positively and after its elimination the decrease of the average questionnaire score was most marked.

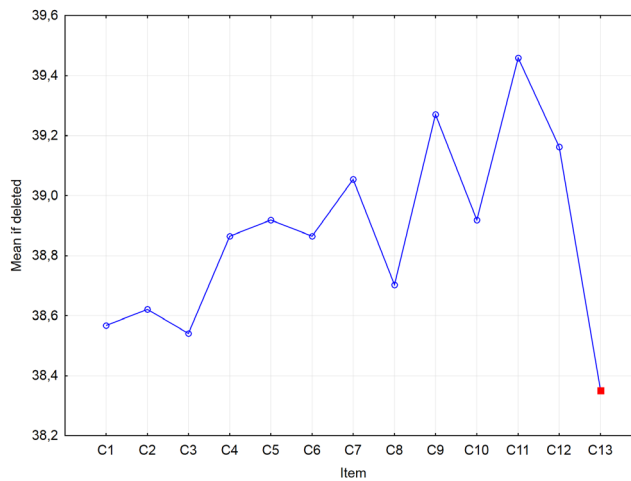


Fig. 5. Average values of the questionnaire total score after the relevant item elimination

4.2 Discussion of the achieved outcomes

Through the items included in the questionnaire part C, i.e. through the statements given in them, we want to find out teachers' opinions about how significant is to include interactive education activities into the teaching process to influence particular selected aspects of this process (list of the aspects see in the note to Fig. 1; 4 – *significant*, 3 – *rather significant*, 2 – *rather insignificant*, 1 – *insignificant*).

By the means of the reliability/item analysis the questionnaire item C13, in which the respondents assessed influence of the inclusion of interactive education activities into the teaching process on pupils' digital literacy, was identified as a suspicious one. As suggested by results from the recorded average value of the C13 score, this item belonged to those at which the respondents stated positive assessments, i.e. in the respondents' opinion inclusion of the interactive education activities into the teaching process is rather or even significant for the pupils' digital literacy development. From the C items (C1 – C13) this was the one with the most homogeneous responses of the respondents. At the other C items the standard deviations indicated a greater variability of the respondents' responses to them. This means that the influence of the inclusion of the interactive education activities into the teaching process on e.g. the pupils' behaviour (item C11) or increase of pupils' mutual co-operation (item C9) was assessed by the respondents not so exactly as it was in case of the development of the pupils' digital literacy (item C13).

Another reason why the respondents responded to the C13 item independently on the other items could be the fact that a conceptual inclusion of the interactive education activities into the teaching of the particular subjects has not so significant direct impact on the development of the pupils' digital literacy as it is in case of its influence on pupils' subjective attitudes to the taught subjects (e.g. C1 – increase of pupils' motivation; C2 – increase of pupils' interest in the taught subject; C6 – longer-term retention of the presented subject matter; C7 – increase of the pupils' skills to apply the acquired knowledge in solving practical tasks; C8 – increase of the taught subject popularity (favour)) or particular aspects of the teaching process realization (C3 – increase of pupils' activity during the lesson; C5 – pupils' easier understanding of the presented new subject matter; C9 – increase of pupils' mutual co-operation; C12 – increase of the positive classroom climate).

Untrustworthiness of the item C13 could result also from the used formulation, in meaning of unclearness of the used term digital literacy. On the one hand this term is used very frequently but on the other hand its content is continually changing, shifted further, and so it is difficult to state how the term was taken by the respondents.

Following the presented discussion of the result achieved by the item C13 in the reliability/item analysis, a decision was made to keep this item among the others, although it was identified as a suspicious one and its elimination increased the questionnaire reliability from the value 0.8678 to the value 0.8787. But on the other hand there is an intention to reformulate it, to make it in its meaning more exact for the target group of the respondents of the further questionnaire survey.

5 Particular results of the identification of the requirements put on the designed curricula

In the questionnaire part C the respondents were asked to assess significance of the use of various interactive educational activities and digital teaching facilities in teaching process for selected specific aspects of education (questionnaire items C1 – C13). Processing of the respondents' responses to these questionnaire items indicates some requirements on the curricula of the teacher training in the area of didactic technological competences, which should be designed as the final output of the carried out research. Thereinafter the particular results of an analysis of the respondents' responses to these questionnaire items in dependence on the segmentation factor SUB-CATEGORY OF THE TEACHING STAFF are presented. In this analysis attention is not paid to the level of the significance of the use of various interactive educational activities and digital means in teaching process for the given specific aspects of education (and the differences among the identified significance levels for each of the given aspects). Attention is paid to the potential differences among the assessments of these significances stated by different sub-categories of teachers. These results reflect how important the teaching activities (staying behind the particular C items) are for the relevant age category of pupils and whether there are or there are not differences in the contributions of these activities applications into the teaching process in dependency on the age category of the pupils as recipients.

According Slovak legislation [13] teachers are classified in one of three teaching staff sub-categories: primary education teacher, lower secondary education teacher, upper secondary education teacher. The carried out analysis was carried out in dependence on this segmentation factor of the respondents. It means the divergence of the means – average values of the scores of the respondents' responses to the part C questionnaire items (focused on the assessment of the significance of the use of various interactive educational activities and digital teaching facilities to increase efficiency of the specified aspects of teaching) in dependency on the respondents' teaching staff sub-category (item A4).

In frame of the statistical processing of the results following null hypothesis, de facto presenting 13 particular null hypotheses (connected with the particular questionnaire items C1 – C13), was tested:

H0: Respondents' answers to the questionnaire item C do not depend on the level of the factor SUB-CATEGORY OF THE TEACHING STAFF.

Null hypotheses were tested on the 5% significance level. In the partial null hypotheses independence on the given factor was tested through both parametric and nonparametric tests.

Following results of on-way ANOVA as well as its nonparametric alternative Kruskal-Wallis ANOVA null hypotheses are not rejected in case of the variables C1 (increase of pupils' motivation), C2 (increase of pupils' interest in the taught subject), C3 (increase of pupils' activity during the lesson), C4 (development of pupils' creativity), C7 (increase of the pupils' skills to apply the acquired knowledge in practical task solving), C8 (increase of the taught subject popularity / favour), C9 (increase of pupils' mutual co-operation) C10 (increase of pupils' "spirit of competitiveness") and

C13 (*development of pupils` digital literacy*), i.e. these variables do not depend on the factor SUB-CATEGORY OF THE TEACHING STAFF.

Within the questionnaire items C1 – C13 statistical dependence on the observed factor SUB-CATEGORY OF THE TEACHING STAFF was proved only for four of them and these are the items C5 (*pupils` easier understanding of the presented new subject matter*), C6 (*longer-term retention of the presented subject matter*), C11 (*positive influence on pupils` disciplined behaviour*) and C12 (*increase of the positive classroom climate*).

Descriptive statistics of the final score of the responses to the items C5, C6, C11 and C12, i.e. items by which the statistical dependence on the observed factor SUB-CATEGORY OF THE TEACHING STAFF (TS-Cat) was proved, are presented in Table 2. The table comprises more detailed statistical view on the examined issues in dependency on the segmentation of the respondents – teachers into one of the four possible categories, which as it was already above-mentioned can be *primary education teacher* (a), *lower secondary education teacher* (b), *upper secondary education teacher* (c). Apart from the already mentioned in the table there are presented also descriptive statistics of the final score of the given items overall, i.e. for the whole research sample, without any segmentation of the respondents on the factor SUB-CATEGORY OF THE TEACHING STAFF (TS-Cat). There are presented values of the mean, standard deviation, standard error of the mean estimate and 95% confidence interval for the average value of the scale.

Results of the dot estimation of the average scores of the assessments of the particular factors show that the group of the respondents – *primary education teachers* (a) in comparison to other two group of the respondents, *lower secondary education teachers* (b) and *upper secondary education teachers* (c), responded to all of the four tested ordinary items (C5, C6, C11 a C12) more positively. Average values of the scores of the respondents` responses to the items C5, C6, C11 and C12 are from the scale range 2 (rather insignificant) – 4 (definitely significant) from the maximal scale value 4, while majoritarian part of these items was evaluated by the respondents on the level rather significant (scale value 3). The tabulation (Table 2) of the results of the respondents` assessments of the level of the influence of the use of interactive educational activities and digital means on the specific aspects of education (C5 – *pupils` easier understanding of the presented new subject matter*; C6 – *longer-term retention of the presented subject matter*; C11 – *positive influence on pupils` disciplined behaviour*; C12 – *increase of the positive classroom climate*) shows the lowest average score was recorded in case of the item C11 (2.42) at which the respondents expressed their opinions on the positive influence of the use of interactive educational activities and digital means on pupils` disciplined behaviour. According to the group of the respondents – *upper secondary education teachers* (c) the intervention of the interactive educational activities and digital means into the education process has not any adequate influence on the positive behaviour affecting at teaching time (item C11). The achieved results have been quite surprising as there were expected more positive opinions of the respondents in the context of the observed means influence on this aspect of education. A possible explanation of the achieved result may be the age category of the pupils and to this category more relevant other by the teachers used

methodological processes of the knowledge acquisition. We suppose that these „others“ ways of the new subject matter presentation/explanation have a proper positive impact on influencing pupils' behaviour within the teaching lessons.

On the contrary, the highest average score was recorded at the items C5 (3.45) and C6 (6.38) in case of the group of the respondents – *primary education teachers*. At these items the respondents assessed significance of the intervention of the didactically elaborated interactive educational activities in teaching process for *pupils' easier understanding of the presented new subject matter (C5)* and *longer-term retention of the presented subject matter* which is a part of the school curriculum (C6). The achieved more positive assessment of the tested items given by the primary education teachers (a) can be taken as a signing of the possibility to further applications of a broad scope of the interactive educational facilities into teaching (ISCED 1). The results indicate that the teaching has an object-lesson and attractive character for the pupils of the respective age category (based on the given possibility to enter actively into the object lesson teaching to both the teacher and the pupils).

In general quite satisfactory finding is the fact that the average score values achieved by the particular groups of the respondents for all the items did not occur below the scale value 2.

The final standard deviation values of the respondents' responses to the particular items C5, C6, C11 and C12 are not much different. Taking into consideration the confidence interval estimate for the mean score values of the particular items ranged from the value 1.99 even to the value 3.59. In frame of the used scale this means evaluation of the significance of the intervention of the interactive educational activities and digital didactic means in the teaching process in range from *rather insignificant* up to *definitely significant*.

The most heterogeneous responses were recorded at the item C12 in case of the group of the respondents – *upper secondary education teachers* (variability index 0.99). In case of this sub-group of the respondents, the highest heterogeneity of the stated assessments regarding the significance of the implementation of the interactive educational activities and attractive electronic teaching materials into the upper secondary education (ISCED 3) to increase the positive classroom climate during the lesson was found out. All the same a higher heterogeneity of the responses occurred also in case of the assessment of the items C12 (variability index 0.93) and C11 (variability index 0.92) by the *lower secondary education teachers*. Based on the interval estimate of the means, the score average values of the responses to these items ranged from the value 2.56 even to the value 3.21 (questionnaire item C12 assessed by the respondents – *upper secondary education teachers*), from 2.40 to 2.85 (item C12 assessed by the *lower secondary education teachers*), from 2.23 to 2.67 (item C11 assessed by *lower secondary education teachers*).

The lowest value of the standard deviation (0.52) was found out at the items C6 (range 3.26 – 3.52) and C5 (range 3.35 – 3.57) at the group of the respondents – *primary education teachers*. This means the lowest variability of the given statements given by the sub-category of the teaching staff *primary education teachers* to the specified teaching aspects. At the same time, at the items C5 and C6 assessments

done by the *primary education teachers* also the lowest value of the average score of the responses was recorded (C5 – 3.46; C6 – 3.39).

Table 2. Descriptive statistics of the items C5, C6, C11 and C12 of the questionnaire part C

Item C5	TS-Cat factor value	N	Mean	Standard deviation	Standard error	Confidence Interval for the Mean	
						-95.00%	+95.00%
Total		173	3.329480	0.611040	0.046457	3.237781	3.421178
"A4"	a	85	3.458824	0.524471	0.056887	3.345698	3.571949
"A4"	b	69	3.202899	0.631984	0.076082	3.051080	3.354718
"A4"	c	19	3.210526	0.787327	0.180625	2.831047	3.590006

Item C6	TS-Cat factor value	N	Mean	Standard deviation	Standard error	Confidence Interval for the Mean	
						-95.00%	+95.00%
Total		173	3.225434	0.674313	0.051267	3.124240	3.326627
"A4"	a	85	3.388235	0.599486	0.065023	3.258929	3.517541
"A4"	b	69	3.072464	0.648955	0.078125	2.916568	3.228360
"A4"	c	19	3.052632	0.911268	0.209059	2.613414	3.491849

Item C11	TS-Cat factor value	N	Mean	Standard deviation	Standard error	Confidence Interval for the Mean	
						-95.00%	+95.00%
Total		173	2.699422	0.909798	0.069171	2.562889	2.835955
"A4"	a	85	2.964706	0.837329	0.090821	2.784098	3.145314
"A4"	b	69	2.449275	0.916134	0.110290	2.229196	2.669355
"A4"	c	19	2.421053	0.901591	0.206839	1.986500	2.855605

Item C12	TS-Cat factor value	N	Mean	Standard deviation	Standard error	Confidence Interval for the Mean	
						-9.00%	+95.00%
Total		173	2.820809	0.919571	0.069914	2.682810	2.958809
"A4"	a	85	3.00	0.872872	0.094676	2.811726	3.188274
"A4"	b	69	2.623188	0.925162	0.111376	2.400940	2.845437
"A4"	c	19	2.736842	0.991189	0.227394	2.259104	3.214580

6 Conclusion

The achieved particular results indicate us some of the needs and requirements on the design of the curricula of the optimal model of the pre-gradual teacher training in the area of didactic technological competences which should be the main output of the solved research project. The needs and requirements of the teaching practice, level of their intensity, are reflected in the achieved scores of the observed questionnaire items (their average values). These scores show us primarily in connection to which aspects of the teaching process the use of the digital didactic means and interactive educational activities should be incorporated into the prepared curriculum. And secondarily the

identified significant differences between the responses of the sub-groups of the respondents to the particular observed questionnaire items (results of the analysis of the respondents' responses to the questionnaire items in dependence on the segmentation factor SUB-CATEGORY OF THE TEACHING STAFF, i.e. on the respondents' affiliation to one of the three teaching staff sub-categories: primary education teachers, lower secondary education teachers or upper secondary education teachers) point at some cases of the use of the digital didactic means and interactive educational activities in which the age category of the pupils (in teaching of which these means and activities are used) proved to be very important (different perception of the used means and activities by the younger and elder learners).

Currently the research continues in preparation of an analysis of the inclusion of different subject and courses focussed on the use of modern digital technologies in primary and secondary education (ISCED 1, ISCED 2 and ISCED 3) in teacher training study programs at various Slovak higher education institutions. Assessment of the observed subjects (courses) content (syllabi) will be done from the students – teacher trainees' point of view. Results of the presented first phase of the research together with the results of this second phase of the research will be used to design a proposal of a draft of measures to innovate and modernize the corresponding parts of the pre-graduate teacher training.

7 Acknowledgment

This work has been supported by the Cultural and Educational Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic under the project No. KEGA 041UK-4/2017 and by the Slovak Research and Development Agency under the contract No. APVV-14-0446 and No. APVV-15-0387.

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This article is a revised version of a paper presented at the International Conference on Interactive Collaborative Learning (ICL2017), held September 2017, in Budapest, Hungary. Article submitted 29 December 2017. Resubmitted 07 January 2018. Final acceptance 10 January 2018. Final version published as submitted by the authors.