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APPLICATION OF INNOVATIONS AS AN IMPROVEMENT FACTOR OF TQM IN EDUCATION

Abstract: *One of the factors of improvement the quality of work in elementary schools is application of innovations. The teachers represent the key element, more exactly the basic driving force for innovations application cycle, but the teachers can also be the greatest obstacle for this matter. The pace with which the innovations will be introduced into schools depends on a teacher's understanding, acceptance and realization.*

The survey we are doing is started with an aim to investigate the connection and relation between the innovations application and the quality of educational work in order to improve it. The survey is carried out in elementary schools in the Municipality of Zaječar.

Keywords: *innovations, application, quality of educational work.*

1. INTRODUCTION

The teacher is the main factor in the management of innovation. He is in the heart of the teaching process. Whether an innovation will be accepted or not depends mostly of the participation of teachers.

Acceptance and implementation of pedagogical innovations is a long and slow process. It must be approached methodically, systematically and patiently in order to introduce innovations, for the best possible quality of education. None of the steps in this process yields quick results. On the contrary, each of the effects, especially those that are expected, are to be waited on.

Changes that occur in the environment lead to a change in the role of teachers. Teachers are required to respond to the needs of society in the best possible way. Teachers are required to have a more complete pedagogical education, ability to organize, to improve themselves professionally and to accept and implement new ideas (innovations). In earlier times, the teacher was the only source of information, however by introducing innovations, he has obtained new associates who in many ways have assumed his functions, and all the initiative originates from the teacher. The modern teacher is increasingly less a lecturer and far less involved in the process of knowledge transfer.

The question is: How to choose the most competent teachers? By the development of society, the criteria for selection have also increased. Besides the intellectual qualities, the modern teacher has to be a responsible, stable, humane, open, tolerant personality, etc.

The modern teacher must understand the educational needs of a society that is

changing and to adjust changes in school to the changes in society.

Faculties that educate teaching staff must be modernized. During his studies, a teacher must master the pedagogical technologies and to train for new functions in a new school.

In order to implement innovations in the best possible way, there must be good interpersonal relationship in schools between teachers and students, students and teachers, teachers and other teachers, and so on. In his work, a teacher must constantly improve himself and apply new and modern methods and procedures for the realisation of teaching, in order to improve the quality of his work.

Realisation and application of new modern methods (readiness to use innovations) depends on many factors, such as: the environment in which the school is located, years of service, age, gender of the teacher, the sphere of work and the like. The study was conducted for the previously mentioned elements.

2. METHODOLOGY OF SURVEY

2.1 Subject of survey

The main subject of survey concerns the readiness to use innovations by teachers who are employed in urban and rural schools.

2.2 Objectives of survey

Overall objective:

• determine whether there are differences with regard to the willingness to use innovations among respondents employed in rural and urban areas, as well as differences in the willingness to use innovations depending on the sphere of work.

Specific objectives:

• determine whether there is a difference in terms of readiness to use innovations among respondents employed in urban and rural areas;

• determine whether there is a difference in terms of readiness to use innovations depending on the sphere of work of respondents (surveyed groups);

• determine whether there is a difference in terms of readiness to use innovations depending on the gender of respondents;

• determine whether there is a connection between the readiness of respondents to use innovations and their age;

• determine whether there is a correlation between readiness to use innovations and years of service of respondents.

2.3 Variables, hypotheses and survey sample

Independent variables:

• sphere of work (natural sciences, social science, technical subjects and language);

• place of work (urban/rural area).

Dependent variable: readiness to use innovations.

Control variables:

• years of service;

• age;

• gender.

General hypothesis:

H_0 - There is a statistically significant difference regarding the readiness to use innovations among respondents employed in rural and urban areas, as well as difference in readiness to use innovations depending on the sphere of work.

Specific hypotheses:

H_1 – There is a statistically significant difference regarding the readiness to use innovations among respondents employed in urban and rural areas;

H_2 – There is a statistically significant difference regarding the readiness to use innovations depending on the sphere of work of respondents (surveyed groups);

H_3 – Statistically significant difference

with regard to readiness to use innovations depending on the gender of respondents;

H4 – There is a statistically significant correlation between readiness of the respondents to use innovations and their age;

H5 –There is a statistically significant correlation between readiness to use innovations and years of service of respondents.

The survey sample is random, and is made of 50 respondents – teachers (professors) namely: 27 teachers from urban schools and 23 teachers from rural schools of different gender structures and spheres of work.

The obtained data were collected by a questionnaire, where teachers indicated level of agreement with statements on the Likert five-point scale.

The following statistical analyses were used in the survey:

- descriptive statistics;
- correlative techniques;
- analysis of variance;

- t – test of the significance of differences.

The software suite SPSS 13.0 was used for processing of the data collected from questionnaires.

2.4 The importance of the survey

The theoretical significance of the survey is reflected in a better understanding and greater acceptance of technical achievements by teachers, as well as in optimizing the teaching process with the application of ICT, where both the teacher and the student play an active role.

The practical significance is reflected in improving the quality of the teaching process in specific schools at the territory of the city of Zaječar.

3. RESULTS OF THE SURVEY

H1 – There is a statistically significant difference regarding the readiness to use innovations among respondents employed in urban and rural schools.

Table 1: t – test of the significance of differences in readiness to use innovations, depending on the place of work.

Place of work	No	AM	SD	t	Significance
Town	27	58.04	15.228	2.859	**.006**
Village	23	46.57	12.742		

The following abbreviations are used in Table 1: No. – number of respondents, AM – arithmetic median, SD – standard deviation and t – test.

Results of t – test, are shown in Table 1, which indicates the existence of a statistically significant difference in the readiness to use innovations among respondents employed in city schools and those who are employed in village schools. t – test was 2.859 with the significance level of 0.006. Based on the results of arithmetic median, shown in the same table, it can be seen that the respondents employed in urban schools are more ready to use innovations than those employed in

rural schools.

In this way, specific hypothesis H1 has been confirmed.

H2 –There is a statistically significant difference regarding the readiness to use innovations depending on the sphere of work of respondents (surveyed groups).

Table 2: Analysis of the variance of the readiness to use innovations according to the variable "sphere of work".

Variable	Df	F	Significance
Readiness to use innovations	3	8.777	**.000**

The following abbreviations are used in

Table 2: df – degrees of freedom and F – results of the F-test (analysis of the variance).

Table 3: Multiple comparison for the subgroup variable "sphere of work" (LSD test).

Sphere of work		Diff. arith. median	Signif.
Natural	Social	17.717	**.001**
Natural	Tech. sub.	-5.761	.325
Natural	Language	12.506	**.016**
Social	Tech. sub.	-23.478	**.000**
Social	Language	-5.210	.253
Tech. sub.	Language	18.268	**.002**

The results of the analysis of variance are shown in Table 2. The results show that between these two subgroups there is at least one statistically significant difference in the readiness to use innovations. In order to determine among which subgroups there is a difference, an LSD test was done, whose results are presented in Table 3. LSD test shows the following significant results:

• a statistically significant difference was established between respondents who teach in the field of natural sciences and those in the field of social sciences. Based on differences of arithmetic medians it can be seen that the respondents who teach natural sciences are more willing to use innovations as compared to respondents who teach social sciences;

• a statistically significant difference was established in the readiness to use innovations among those respondents who teach natural sciences and those who teach languages. Based on the difference of arithmetic medians, it can be concluded that the respondents belonging to the sphere of natural sciences are more ready to use innovations;

• there is a statistically significant difference in the readiness to use innovations among those respondents who teach natural sciences and those who teach technical subjects. The latter are more ready to use innovations;

• there is a statistically significant difference among those respondents who teach technical subjects and those who teach languages. The former are more ready to use innovations. This difference is particularly tested on the subsample of respondents employed in the urban areas as well as the subsample of respondents employed in rural areas.

Table 4: Analysis of the variance – rural area.

Variable	df	F	Signific.
Readiness to use innovations	3	8.574	.001

Table 5: LSD – rural area.

Sphere of work		Diff. arith. median	Signif.
Natural	Social	14.733	**.022**
Natural	Tech. sub.	-11.167	.118
Natural	Language	5.000	.439
Social	Tech. sub.	-25.900	**.000**
Social	Language	-9.733	**.048**
Tech. sub.	Language	16.167	**.011**

Tables 4 and 5 are showing the results of the analysis of variance in rural areas (Table 4) and statistically significant differences that occurred between different subgroups in terms of the readiness to use innovations (Table 5).

From the results obtained, it can be seen that the teachers who teach natural sciences are more ready to use innovations in their work than teachers of social sciences. Teachers of technical subjects are more susceptible to innovations than language teachers and teachers of social sciences and, ultimately, language teachers are more ready to use innovations than teachers of social sciences in rural schools.

Tables 6 and 7 are showing results only in urban schools. It can be seen from Table 6 that there is a statistically significant difference among certain subgroups in urban schools, while Table 7 gives a detailed account of these differences.

Table 6: Analysis of the variance – urban area.

Variable	df	F	Signific.
Readiness to use innovations	3	3.149	.044

Table 7: LSD – urban area.

Sphere of work		Diff. arith. median	Signif.
Natural	Social	12.464	.091
Natural	Tech. sub.	-6.000	.480
Natural	Language	14.750	**.041**
Social	Tech. sub.	-18.464	**.041**
Social	Language	2.286	.749
Tech. sub.	Language	20.750	**.021**

Statistically significant differences in urban schools occur between teachers of natural sciences and language teachers, where the former are more ready to use innovations in teaching. Teachers of technical subjects are more ready to use innovations than teachers of social sciences and language teachers.

Hypothesis H₂ was confirmed.

H₃ – statistically significant difference in terms of the readiness to use innovations depending on the gender of respondents.

Table 8: t – test of significance of differences in the readiness to use innovations depending on gender

Gender	N	AS	SD	t	Signif
M	21	57.67	12.749	2.009	**.050**
F	29	49.21	15.938		

Table 9: t – test – rural school.

Gender	N	AS	SD	t	Signif
M	8	55.88	10.412	2.983	.007
F	15	41.60	11.179		

In order to verify this hypothesis t - test has been carried out, whose results are presented in Table 8. Based on these results, it can be concluded that there is a statistically significant difference in terms of the readiness to use innovations depending on the gender. t - test amounts to 2.009, with a significance level of 0.05.

Based on results of arithmetic median, shown in the same table, it can be seen that men are more ready to use innovations in comparison to women.

This difference was tested separately on the subsample of respondents employed in urban areas, as well as on the subsample of respondents employed rural areas.

Table 9 shows that there is a difference between median values on t – test with men and women (men 55.88, women 41.60) who are employed in rural schools. t – test is 2.983 with the significance level

of 0.007. Based on results of the arithmetic median, shown in the same table, it can be seen that men are more ready to use innovations in comparison to women.

Results of t – test on the urban subsample are shown in Table 10. It can be seen that there is a difference in arithmetic medians (male 58.77, female 57.36); t – test amounts to 0.236, with the level of significance of 0.815, meaning that this difference is not statistically significant.

Table 10: t – test – urban school.

Gender	N	AS	SD	t	Signif.
M	13	58.77	14.290	.236	.815
F	14	57.36	16.560		

It can be seen that this hypothesis is partially confirmed and only in the subsample of teachers in rural schools. Therefore, there is a statistically significant difference in terms of readiness to use innovations depending on the gender of respondents, but only in rural schools, and this difference is in favour of men. Men who work in rural schools are more ready to use innovations in teaching than their female colleagues.

Hypothesis H₃ was partially confirmed.

H₄ – there is statistically significant correlation between the readiness of respondents to use innovations and their age.

Table 11: Connection between the readiness to use innovations and age.

		Innovations
Age	R-Pearson	-.528
	Significance	**.000**

Table 11 presents the correlation between the age and readiness to use innovations. A negative correlation (-0.528) has been obtained, with the level of significance of 0.01. Based on this correlation it can be concluded that the readiness to use

innovations declines with age. Older teachers less often use innovations in teaching.

Hypothesis H₄ was confirmed.

H₅ – there is statistically significant correlation between the readiness to use innovations and years of service of respondents.

Table 12: Connection between the readiness to use innovations and the years of service.

		Innovations
Age	R-Pearson	-.419
	Significance	**.002**

A statistically significant correlation between the years of service and readiness to use the innovations was obtained. The correlation is negative (-0.419, significant at 0.01). The readiness to use innovations declines with age and vice versa, which is given in Table 12.

The connection between the readiness to use innovations and years of service, i.e. age, was surveyed in particular in the subsample of respondents employed in rural areas, as well as in the subsample of respondents employed in urban areas,

which is shown in Table 13.

Table 13: Correlation of age and the years of service for urban and rural areas.

Variable		Ready to use innovations	
		Rural area	Urban area
Years of service	R-Pearson	-.406	**-.445**
	Sig. (2-tailed)	.055	**.020**
	N	23	27
Age	R-Pearson	**-.532**	**-.498**
	Sig. (2-tailed)	**.009**	**.008**
	N	23	27

Table 13 provides an overview of these data and here it can be seen that the readiness to use innovations in rural schools is in negative correlation with age; teachers who are older are less ready to use innovations, and vice versa. The correlation between the years of service and readiness to use innovations in rural areas was not established. In urban schools, a negative correlation appeared between different ages, as well as between the years of service and the readiness to use innovations. The readiness to use innovations decreases with the age and years of service in urban schools.

Hypothesis H₅ was confirmed.

4. CONCLUSION

When the survey procedure was started, the intention was to examine the readiness to use innovations by teachers who are employed in urban and rural schools. In addition to the tasks that were set and the presumed conclusions, i.e. hypotheses, many other issues were opened during the survey process, which deserve special processing.

Conclusions of the survey have been drawn based on the analysis of questionnaires filled out by teachers who are covered by the survey, which was aimed to determine the importance innovations with teachers in schools, for the purpose of improving TQM in education.

By analysing the results based on the survey procedure, the following conclusions can be drawn:

- there is a statistically significant difference in terms of readiness to use innovation among respondents employed in urban and rural schools;
- there is a statistically significant difference in terms of readiness to use innovation depending on the spheres of work of respondents (surveyed groups);
- there is a statistically significant correlation between the readiness of respondents to use innovations and their age;
- there is a statistically significant correlation between the readiness to use innovations and years of service of respondents.

There is no great difference between rural and urban schools in terms of the survey. The time is coming when innovations will be increasingly used in the teaching process. Schools are poorly equipped, but are mostly using their resources well. The upcoming generations of young people are all increasingly technically literate, regardless of profession, and thus the way to the more frequent use of innovations is opened. Innovations are not here to make things difficult, but rather to make the teaching process easier, and as with every

novelty, we should grow accustomed to them and accept them as a challenge and as an aid. The time for the application of new technologies is coming.

Just a decade ago, only a few schools had computers and it was a rare phenomenon, while today there are computers at most classrooms and each school has its own computer centre. Students themselves are showing an increasing need to expand their knowledge also through the Internet, which was once a luxury, but is now an urgent need that leads to the reform of the teaching into the new future and improvement of TQM in education.

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