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Teaching climate of a technical subject in the process of applying ict tools

Introduction

A teacher is the creator of positive school climate without the atmosphere of suspense, fear, anxiety by applying creativity, flexibility, cooperation, tolerance, encouraging students to mutual trust and to constructive criticism. To maintain the quality of a teaching process it is important for the teacher of Technology to create a positive climate so that the students are not afraid or stressed out, bored, so that they do not do stereotypical activities, they can be active, independent and so that the education is the closest possible to their interests. To achieve a favorable climate while teaching a vocational subject is in many areas dependent on the teacher's attitude to students [Hanuliaková 2010: 26].

From a psychological point of view a class creates a social group with many participants, elements and tools, therefore changing the climate during classes is considered a demanding, long-term but also an achievable process.

1. Teaching climate in the subject Technology while applying MTA

The term climate has different definitions depending on the authors and their points of view, survey focus whether pedagogical, psycho-pedagogical or another ones. Conrad a Sydov [according to Grecmanová 2008: 18) claim that the climate is a theoretical reflection of relationships between the organization and the person from his partner's point of view. From the TQM point of view it is primarily important how the partners (internal – students, teachers) feel in the school environment [Miklošíková 2009: 126].

Sackney [Mareš 2003: 38] defines climate as a relatively stable quantity of the internal school atmosphere characterized by the following features: a) it is experienced by those who belong to the school, b) it affects their behavior, c) it could be described in value terms, norms and convictions about a collection of characteristics, which a school should have.

Dresman [Grecmanová 2008: 35] defines teaching climate as a relatively persistent quality of a teaching environment, which is affected by a group

of features, which could students experience and its size influences their behavior.

Technology and Industrial Arts are primary school subjects which are focused on obtaining knowledge and skills in the field of technology. These are the subjects which give teachers space for the students to obtain and develop these skills in a creative school atmosphere. These stimuli have an integrating character. During correct education they lead students and teach them understand relations between theoretical subjects and technological products which they come across in their real lives. They are typical for their strong inter – subjectual connection [Kozík et al. 2013].

None of the other subjects of the framed teaching plan (part of the State educational program ISCED 2) within the lower secondary education and 8-year-gymnazia does not create, i.e. does not lay foundations or develops in students:

- Technical and 3D skills of conception,
- technical, constructive, technological and technical creative thinking,
- understanding applications of the natural science knowledge,
- orientation, commercial and user thinking,
- manual practice and skills,
- ability to implement cooperative and team teaching with the acceptance of experimental activities and realization of projects in the field of creating technical products.

The above mentioned fundamental dispositions of the subjects with technical focus have irreplaceable importance for an overall and specific development of a child in the early-school time (6/7 – 10–11 years old) and followed by the adolescent time (11/12 – 15 years old), from the point of view of their personal physiological, cognitive and emotional development [Pašková, Salbot 2013: 56].

2. Empiric pedagogical research – defining teaching climate in the subject Technology

In this part of the article we describe what we wanted to find out, why it was necessary and how individual pieces of information of the pedagogical research were acquired and processed. To maintain clearness and because of a limited number of pages, we report only a partial selection from the statistical elaboration of the results.

Research subject

The research subject are students of the school framework ISCED 2A, who are a part of the teaching process in the subject Technology in the chosen topic of Graphic communication. The process is based on the use of an MTA tool which we suggested with an optimal support of information and communication technologies.

Our interest was caught by such pedagogical and psychological phenomena to which the theory attributes the highest priorities in the relation to creative – humanistic teaching and which we have already described in this article.

The research questions, which arose from the research target, were the following:

Research target

The target was to confirm the success of using an MTA in real conditions on the selected Slovak schools in the subject Technology, where computer work was used as well. We also analyzed the cognitive area, active learning and teaching climate of the students of Technology.

To reach the main target of the pedagogical research we defined the following partial tasks:

- Implement ICT elements to the teaching process of the subject Technology with the use of MTA and continuously analyze its cognitive side.
- Suggest MTA focused on the development of graphical communication of the students in the 7th year in the subject Technology.
- Find out what differences in the cognitive area, in the state of social climate and active learning were created during classes between the experimental and the control class.

Research problem

In our environment there still frequently occurs a public discussion about the suitability of using computers in the process of teaching technical subjects. We are aware of its extensiveness and complexity, which is possible and necessary to analyze in details. We are interested whether students taught by the help of MTA will achieve better results in cognitive area and whether they will learn more actively during the teaching process which uses MTA, than during such a teaching process which uses traditional teaching methods.

Research hypotheses

Based on the above mentioned research questions we formulated the following main, underlying hypothesis:

H: Implementing and using MTA elements during the classes in the experimental class in the subject Technology statistically significantly influence the level of cognitive area and improve the class climate during the lessons when compared to the control class.

To be able to confirm or invalidate our hypothesis and unambiguously, quantifiably and qualitatively verify the main underlying hypothesis, we formulated the following working, partial hypotheses:

Partial Hypotheses:

H1: In a class in which a teacher uses MTA while teaching, the social climate will be better than in a class where this method is not applied.

H2: Pupils in the experimental class which uses MTA will be learning more actively during their classes than pupils in the control class, where that MTA is not used.

Independent variable:

MTA – independent variable describing the use of multimedia teaching aid.

Main dependent variables:

EFI – dependent variable describing student efficiency in the cognitive area.

ACT – dependent variable describing active learning of the students.

SOC – dependent variable describing social climate in the classroom.

Additional dependent variables:

Success – stimuli connected with motivation subject to an experience with success.

Communication – stimuli connected with fulfilling social needs of the student.

Thinking – stimuli connected with developing higher levels of thinking.

To verify these hypotheses it was necessary to carry out the following working tasks according to a time schedule:

- Prepare the experiment (divide pupils into groups, define the experimental and control group, prepare the measuring tools, manage the whole experiment);
- Carry out the experiment (according to the defined rules carry out the teaching process in the control and experimental group, manage the testing of students);
- Statistically process and analyze the data (using the methods of descriptive statistics);
- On the basis of the analysis evaluate the success and justification of applying multimedia teaching aids during the classes.

Research sample

The basic body, suitable for our research, were students of the 7th year of the school framework ISCED 2A in Slovakia. Results of the students of the 7th year can be considered as normally divided within the Slovak republic. This is the reason why we can process the data in the research as a selection from a normal division. From the point of view of research external validity we carried out the sample selection by a stratified choice.

Table 1

Chart of dependent pair choice in particular elementary schools

	Block 1	**Block 2**	**Block 3**	**Block 4**
Classes 7.A (52 pupils)	The highest arithmetic mean 7.A	Ascending arrangement	Pupils with penultimate lowest arithmetic mean 7.A	Pupils with the lowest arithmetic mean 7.A
Classes 7.B (52 pupils)	The highest arithmetic mean 7.B	Ascending arrangement	Pupils with penultimate lowest arithmetic mean 7.B	Pupils with the lowest arithmetic mean 7.B

The selected body represented 104 pupils from the 7th year of five different elementary schools on Slovakia. To be able to objectively define whether our suggested MTA (independent variable) influences the level of graphic communication knowledge of pupils of the 7th year of elementary schools in the subject Technology, two groups of respondents were involved in the research: the control one and the experimental one. Both of them were always formed by a whole class. The control class comprised 152 pupils and so did the experimental one. In the Table 1 we list the numbers in all bodies of the individual schools. For the needs of the experiment all control subgroups were expediently marked as one control group KON and all experimental subgroups were marked as one experimental group EXP.

Table 2

The Overall Summary of the Selection of Pupils into Groups in the Educational Research

Number of selected classes of the 7th year of the 2nd level of primary schools	6	104 pupils
Number of groups taking part in the educational research	2	CONTROL and EXPERIMENTAL
Number of experimental subgroups	5	a given number of pupils in every subgroup
Number of control subgroups	3	a given number of pupils in every subgroup
Experimental group EXP – experimental subgroup A1 – experimental subgroup A2 – experimental subgroup A3	**52 pupils** pupils21 pupils20 pupils11	
Control group CON – control subgroup B1 – control subgroup B2 – control subgroup B3	**52 pupils** pupils21 pupils23 pupils8	

Measuring tools:

For the H1 hypothesis: a **standardized questionnaire CES** – Classroom Environment Scale [Blaško 2008].

For the H2 hypothesis: a **standardized questionnaire AUS –** [Rotling, Sihelský 2001].

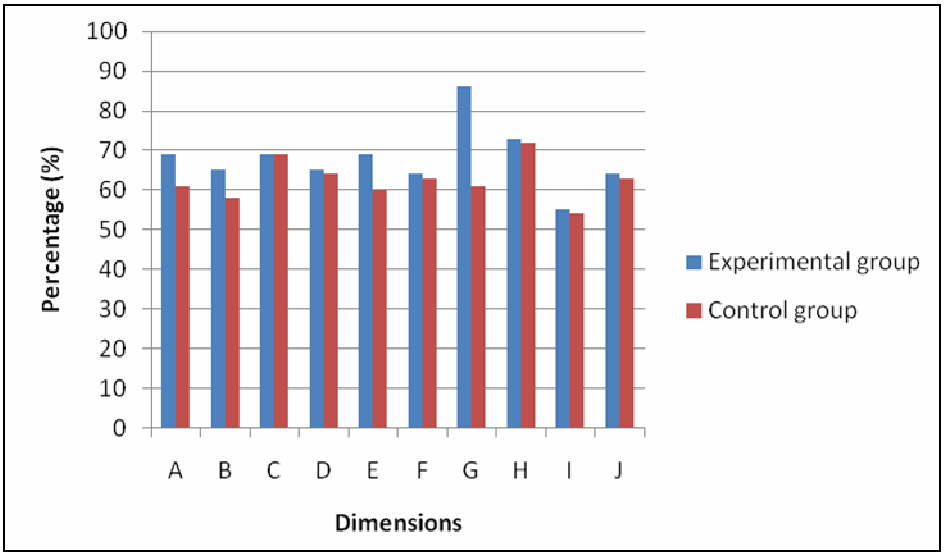
3. Statistical processing and analysis of the accumulated data

Verification of the working hypothesis H1

Proportion of the class climate was acquired by a standardized questionnaire CES. The dependent variable measurement results of SOC were analyzed by the methods of descriptive statistics, whose results are summarized in the following tables and graphs.

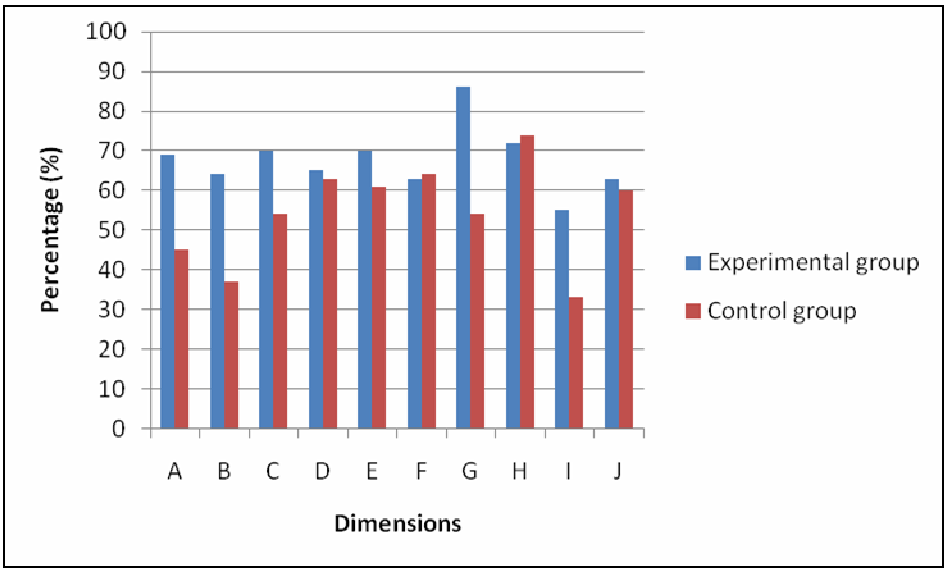
Values of the dependent variable SOC were changing during the whole experiment and they also influenced the dependent variables EFI and AKT.

From the graph 1, which describes the results of social climate of teaching the subject Technology in the experimental class before and after the end of experimental teaching, it shows that we achieved a higher success percentage in all dimensions. We elicited the smallest difference in the J dimension – teacher's enthusiasm and insight, and that only in a few hundredths of per cent. We can claim that in this dimension the teaching social climate neither improved nor deteriorated. The biggest difference we discovered was in the G dimension – rules clarity for the class, where there was a significant difference of 9,28% on the improvement side.



Graph 1. Results of the climate development in the Technology classes in the experimental class

From the Graph 2, which describes the discovery concerning the teaching climate in the experimental and control class at the end of the experiment, it is obvious that in 8 out of 10 dimensions we acquired significantly better results in the social climate of teaching. The biggest difference was discovered in dimensions (C – cooperation between students during education, E – focus on learning, G – rules clarity for the class), where the difference between the classes was significant.



Graph 2. Results of the climate development in the Technology classes in the experimental class and in the control one after the end of the experiment

Conclusion

According to the statistical analyses and conclusions of testing the partial hypotheses it is possible to claim that on the chosen level of importance and by the given conditions the hypothesis is confirmed and true.

Experimental classes with the use of MTA lead to better learning results and higher social climate. We discovered statistically important differences in all the chosen fields.

From the teachers' point of view we discovered that the standardized questionnaires of the CES type are a valuable asset for the classes, as they diagnose actual problems of the students, which often remain unknown to the teacher due to lack of time or communication barriers during the communication with students. Anonymity of the questionnaires enabled students to comment on and openly express their opinions on the teacher's work in the given subject. Evaluations from the questionnaires were mostly not positive. Despite that we

take all opinions of the students seriously and they will form a basis for self-reflection.

It was very important to read the questionnaires continuously and discuss with the students about the suggested improvements and integrate individual improvements into the classes. Values of the dependent variable SOC were at the end of the experimental classes of the subject Technology higher than in the beginning of the experiment and so we claim that the hypothesis was confirmed.

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Abstract

In the article we deal with summarizing the fundamental characteristics of the social climate in the primary school environment in the lower secondary education. The aim is to analyze the results of the conducted pedagogical experiment in the subject Technology and to refer to the function of implementing multimedia teaching aids as tools which help to improve social climate and develop knowledge, skills and creativity of students.

Key words: technology, social climate, teacher, pupil, multimedia.