QUALITY OF INTERNAL ENVIRONMENT IN SCHOOL CLASSROOM AS FACTOR OF THE EFFECTIVENESS OF PRIMARY SCHOOL PUPIL´S EDUCATION

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Abstract

In 1995 the Global School Health Initiative by World Health Organization (WHO) was created, its aim was to mobilize a strengthen activities supporting health and education at national, regional and global level. The initiative is intended not only to support health of pupils/students, but also school personnel, family and all members of community through the school. According to WHO the issue of supporting pupils’ health very topical, because during the learning period also the physical and psychical development of pupils occurs. School and school environment should support pupils’ health and contribute to their development, but also their education.

Our goal is to show the relationship between healthy school environment of classroom and the level of knowledge obtained by primary school pupils. Workers of KTIT PF UKF are members of research team of the VEGA research project focused on evaluation of the quality of educational environment as special kind of work environment. In our project we focused on definition of basic terms, which are related to our researched topic and on evaluation of work environment effect in which are pupils educated.

Educational process is based mostly on optical and acoustical information sharing. Pedagogical communication is effective if there is no communication noise between communication partners. In the paper we are showing the fact that the quality internal school environment of classroom, significantly eliminates negative factors directly related with information sharing in educational process and therefore make whole educational process more effective.

Keywords: pupils education, the quality of educational environment, school classroom, educational process.

1 INTRODUCTION

In 1995 the World Health Organization (WHO) introduced an initiative in the health department called Global School Health Initiative, which aimed to mobilize various activities to promote health and education at national, regional and global level [1]. The project was designed to support the health of the pupils, students, school staff, family, and other community members working in the school environment. The issue of supporting the pupils’ health is still a very live matter according to WHO. The educational process is in parallel with the physical and mental development of the pupils and is the responsibility of the school to promote a healthy lifestyle and protect the health of its pupils. Many schools abroad responded to the challenge by joining the Healthy Schools campaign and expected improved learning results. The basis for expectations was the fact that a healthy school environment is an environment that positively affects the health and well-being of pupils, which creates conditions for building a strong foundation for learning [2].

During assessment of healthy school environment, the WHO organization described the following parameters as crucial: school environment, physical activity options, proper nutrition, basic safety measures, air and water cleanliness, access to health care and education of pupils about nutrition and physical prosperity. The influence of these parameters was the subject of several pedagogical researches. In most cases, the environmental influence on the pupils’/students’ health was the point of investigation [3].

The aim of this paper is to highlight the fact that the quality of working environment affects not only health of the youth, but also has impact on the effectiveness of primary school education.
2 THEORETICAL BACKGROUND

The psychological effect of space on a person is a significant factor that affects his work performance. It can also be argued that the effect of space affects the educational process as well [4].

The space itself is seen as a workplace that can generally be defined as the Encyclopaedic set of safety and protection of health during work time [5]. It is a type of workplace, where the work equipment and objects with which the worker or workers come in contact with during their work duties. It is a summary of material and spiritual values creating the conditions in which the work is performed ([4], [6], [7], [8]). Working conditions are all physical, chemical, biological, physiological, psychological factors affecting human health and work performance during work time; they are influenced by the regime of work, rest and the technical condition of the working environment [9].

In the context of education we are talking about so-called educational (learning) environment. The educational environment is defined as any environment in which a controlled learning process takes place [6]. It is further specified that the educational environment is a set of physical and psychosocial factors. It has physical parameters (size of space, architecture, microclimate, lighting, noise, dust, etc.), ergonomic (equipment, aids, arrangement, and more) and psychosocial (type of relationships, communication between participants and others) and is also influenced by national culture, politics of education, educational system, etc. [10, 11]. In practice, this means that the educational environment they understand classes, corridors (if the teacher supervises or moves with pupils), study cabinets, warehouses, gyms, school yard, school playground, school dining room, facilities for swimming courses and those areas where school in nature takes place as well as other educational activities.

As stated by Brad [9], area is capable of influencing individual behaviour. The pupil's behaviour at school and the results achieved in education are influenced by the signals of the environment in which they are located. This confirms that the school classroom environment with its size, equipment, lighting, technical aids and organizational structure predetermines to some extent the educational outcome. When assessing the influence of the working environment on the performance of pupils, it is necessary to pay attention also to the state of the working environment, which is determined mainly by the construction, volume and disposition of objects and workplaces, safety level of technology, machinery, equipment, acoustic, light and microclimatic conditions [5].

The culture of the working environment is considered to be one of the basic assumptions for the development of a healthy person/pupil and increase of the living standard. The main factor in stabilizing the pupils' performance at school is to create optimal conditions [7]. On the basis of the above, it can be assumed that the quality of the indoor environment in the classroom affects the pupils' performance and success.

The acknowledgement of the assumption is based on a study called Learning Environments Campaign realized in the UK. Its main goal was to provide pupils with an innovative and effective learning environment. In pursuing the goal, campaigners have sought answers to the following questions:

- What makes a good school (physical) learning environment?
- What impact do (physical) school learning environments have on pupil/student behaviour, motivation, learning and achievement?
- Which components/elements of school learning environments make the most difference to pupil behaviour, motivation, learning and achievement, and why?
- What evidence exists to indicate the relative balance between the physical environment and the emotional and cognitive environments on pupil behaviour, motivation, learning and achievement? [10].

In 1959, the opinion of Hall [9] was accepted in professional circles stating that the space "speaks in a quiet language", i.e. the classroom is perceived as a space sending intelligible messages to the surrounding area. Many authors indicate that the way a classroom is organized affects the efficiency of information transfer ([4], [9], [11], [12], [13]). Several basic elements of communication are applied during communication: sender, addressee, communication channel, message, coding, decoding, effect (response, effect, answer), feedback and noise [14].

Noise as a new phenomenon is present throughout the whole process of communication and significantly affects the achievement of expected communication result ([4], [11], [14], [15], [16], [17]).
Since information and communication media are currently being used to mediate information at school, communication noise cannot be perceived only as an existing source of tumult, preventing the quality of receiving information to recipients. It is a definition of a qualitatively new phenomenon, which is becoming an important communication element in education.

In conjunction with the fact that teachers use interactive whiteboards, computers, tablets, and present materials with data projectors to teach learners, the schoolroom becomes a significant source of communication noise with its colour, layout, lighting and technical aids, and contributes to the quality of classroom information transfer.

3 METHODOLOGICAL RESEARCH ON PREDICTION OF WORKING ENVIRONMENTAL IMPACT ON EDUCATION QUALITY

Research of prediction of the working environment impact on the quality of education was supported by the VEGA project (Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences) entitled Predicting the impact of the quality of the indoor environment on effective management and rising the level of the learning process with a solution period during years 2018 to 2020. The research objective of the project is to find out whether the pupils’ working environment affects their concentration and performance. For this purpose, the factors that are most prominent in the educational environment are defined, analysed and objectified and their interaction is examined.

During the first year of solving the project the team was analysing professional literature dealing with the issue of healthy working environment, educational environment, creation of optimal conditions, microclimate, identification and elimination of dangerous factors and so on ([3], [12], [13], [18]). Given the research objective, it is necessary to realize that the school classroom as well as the other areas of the school is a workplace with special responsibilities (education and learning) for teachers and pupils alike. In the school working environment, the participants of the educational process are influenced by the factors of the work/education environment and influence the performance and health of both teachers and pupils alike ([3], [12], [13], [18]).

We have chosen the research methodology with regard to the fact that the educational process at all levels of schools is crucially based on the optical and acoustic transmission of information. Quality communication between the teacher and the pupils/students is the basis for the success of each teaching process. The transmission of information (both optical and acoustic) towards pupils/students is always carried out through the transmission channel, which is classroom/schoolroom, and has a direct impact on the transfer of information with the highest possible quality and unchanged content [4].

Drtina [15] notes that between the factors that influence the perception of students’ learning space the most are their size, colour, lighting, noise, clarity, visibility, temperature, and others. Mentioned factors affect the psychological perception of the learning/working environment. In 2004, a research was conducted in the Czech Republic on diagnostics of teaching by measuring information transfer [11]. The proportion of application of individual sensory receptors in obtaining information at school as compared to their application in obtaining information in the natural (common) environment of the pupils is shown in “Fig. 1”.

As research has shown, one accepts a dominant amount of information (80%) in everyday life through vision. It has been shown that in the teaching process it receives 80% of the information by hearing [11]. In the scientific literature, it is reported that an individual can remember 20%, 30% through sight, and if he uses sight and hearing at the same time, he remembers up to 50% of the information ([11], [15]). Based on this, we note that in education, such forms and methods need to be applied in education so that the principle of clarity is fully applied, thereby increasing the proportion of visual perception, i.e. also the amount of memorized information increases.
If pupils education is to be effective, the teacher must apply different forms of teaching, the choice of which depends on several factors: how many pupils the teacher should teach at a given time, where the teaching will take place, how often and how long the teacher should teach the pupils, how the teaching unit should be process and other [16].

The learning outcome is also influenced by the space in which education will be taking place. Depending on the purpose and content of the education, the teaching process can take place in a traditional classroom, a designated and specialized classroom, a laboratory or outside the school or school facility.

During research on the work environment prediction, we explored how the organization of school desks in the classroom and its technical equipment impact education effectiveness. Obviously, good technical equipment supports an efficient way of learning from the point of time management with the teaching unit, applies the appropriate computer software to the teaching as an integrating element and helps the learner to understand the learning materials ([19], [20], [21]). Also, the influence of high-quality equipment in a specialized classroom on pupil/student activity during the teaching of the theme on waste in chemistry was demonstrated [22].

In our research, we have decided to monitor what time it is necessary to define for the education of pupils and for the control of independent work at different pupil workplaces, obscuration level and different quality of technical support. We have monitored the impact of the school classroom environment on the teacher’s educational activity, i.e. how it influences the effectiveness of information transfer to pupils in relevance to the organization of school furniture in the classroom, appropriate lighting and the quality of selected didactic means used by the teacher during the course of education.

The research tool was the observation of the learning process and the recording of data in observation sheets. The target group consisted of pupils of the 8th grade of primary school who were randomly assigned into three groups. The first group was educated in classroom no. 1 (Fig. 2a, 2b), the second group was trained in classroom no. 2 (Fig. 2c, 2d) and third in classroom no. 3 (Fig. 2e, 2f). The lessons were taught once a week for 120 minutes and the education was realized in specialized classrooms designed for computer use. The observation was carried out between October 2018 and March 2019. The teaching was carried out by one teacher and the same curriculum was used in all groups.

### 4 RESULTS

From the realized research we obtained the outputs, which are listed in “Tab. 1” containing the evaluation criteria and the monitored factors.

To the data in “Tab. 1” we supplement the following observations and conclusions.
Table 1. Overview of examined phenomena in selected classrooms.

<table>
<thead>
<tr>
<th>Evaluation criteria</th>
<th>Monitored factors</th>
<th>Classrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of pupils in the classroom (17 - 20)</td>
<td>✓  x  x</td>
</tr>
<tr>
<td></td>
<td>Classroom arrangement (school desks, blackboard)</td>
<td>✓ x x</td>
</tr>
<tr>
<td></td>
<td>Space for the teacher to move between desks</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td>Orientation of the classroom according to cardinal points</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>Technical equipment</td>
<td>Projection screen (the wall, projection screen, blackboard)</td>
<td>✓ x x</td>
</tr>
<tr>
<td></td>
<td>Projector</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td>Level of obscuration</td>
<td>✓ ✓ ✓</td>
</tr>
</tbody>
</table>

First of all, the most positive indicators are given in classroom no. 1. Next, we consider the "classroom orientation to the world" factor to be important. This factor greatly affects classroom luminosity during lessons. While classroom no. 1 was oriented to the northwest, classroom no. 2 and 3 face northeast. This leads to the partial conclusion that in "Fig.1" classroom no. 1 was judged to be the most satisfactory for investigating the impact of communication noise: it was oriented towards the school yard, thus avoiding traffic noise, the projector and projection screen being quality and size compliant.

The negative is the lack of a darkening in the classroom during sunny days. We would like to point out that both photos were taken in semi-clouded weather and as we can see, the obscuration level is not sufficient (Fig. 2a, 2b).

The observed "classroom arrangement" factor was in classroom no. 1 also evaluated positively. We consider the arrangement of pupil’s workplaces to be appropriate. Pupils sat longitudinally to the classroom walls, giving everyone a good view of the screen. The teacher was able to clearly controls and manages the work of the pupils and actively provides help in the various phases of the task solution. The arrangement of the classroom enabled the teacher to adjust the pace of teaching to the pupils’ needs, to alert the pupils on possible mistakes without leaving their workplace, and we also appreciate the accelerated control of the execution of the pupils' tasks. Since the teacher had an overview of pupils' activities from their position, they were active throughout the whole teaching unit. An indisputable advantage was the barrier-free access of the teacher to the individual pupils.

From the point of view of the influence of the classroom arrangement and its equipment on the level of communication noise in education, the inaccuracies were observed due to the projection of information on the wall of the classroom without special surface treatment (unevenness on the surface of the screen created shadows and there was not enough contrast between colour transitions). Nevertheless, the records in the observation sheets showed that the effectiveness of the information transfer was 38% higher compared to classroom no. 2 and pupil self-evaluation was up to 54% shorter.

a) Classroom no.1 with partial illumination.  
b) Classroom no.1 with full obscuration.
c) Classroom no. 2 – spatial arrangement.
d) Classroom no. 2 – size of projection screen and quality of projection.
e) Classroom no. 3 with partial illumination.
f) Classroom no. 3 with full obscuration.
g) Classroom no. 3 spatial arrangement of school furniture.

Figure 2. Spatial arrangement and technical equipment in classrooms as a source of communication noise.

From the results recorded in observation sheets, classroom no. 2 (Fig. 2c and 2d) was evaluated as completely unsatisfactory. Its arrangement was a source of great communication noise caused by the following negative factors: poor quality projector, small projection area, image accompanied by frequent breaks in projected data, pupils were not able to see the teacher, teacher from his/her workplace did not see the work of pupils and also had no opportunity to go to pupils if they needed advice or expert assistance. The poor arrangement caused the pupils to be inattentive, leading to inactivity of the pupils during education and subsequent disturbance.

In classroom no. 3 there was similar arrangement to classroom no. 1, meaning that the teacher sat behind the backs of the pupils and saw their work on the monitors from his/her workplace. The disadvantage was that the pupils in this classroom sat in pairs on the right side, but on the left side they sat in groups of four. This in turn restricted the teacher’s access to the left-hand part of the
classroom and limited the pupils, who needed the teacher's assistance to solve the given task (Fig. 2g).

It has also been shown that by sitting pupils in long benches in succession, the teacher was prevented from checking the work from his workplace. The teacher had to stand up to see the activity of the pupils on the monitors in the front rows of the classroom. This had a negative effect on the extension of the time needed for the interpretation of the curriculum, respectively, independent work of the pupils.

Negative arrangement of working space in classroom no. 3 was also the sitting of the pupils directly under the projection wall, as they could not see the entire projected information (Fig. 2e, 2f). From the point of view of eliminating the communication noise in the classrooms, the quality of the projector was evaluated positively, which in the normal darkening of the room enabled an effective reading of information without distortion (Fig. 2f).

5 CONCLUSIONS

The quality of the school classroom environment has a significant impact on the effectiveness of pupils' education as the teaching process can be assessed as a special transmission system. The major components of the transmission system are the transfer channels of the dominant receptors. When transmitting optical and acoustic information in teaching, the interference signals penetrating the transmission channel from its surroundings are significantly applied [4]. Unlike our research, the issue of the impact of the educational environment on the health of pupils/students and school staff in the Slovak Republic is mainly addressed from the point of view of school climate, protection of pupils' health and characteristics of dangerous factors in the educational environment. Abroad, attention is paid to the influence of the school environment on the protection of pupils' health in terms of proper diet, physical activity and only marginally addresses the issue of the quality of the educational environment as a factor affecting pupils' performance in education. Emphasis is placed on educational activities not only for pupils and teachers, but for the whole community around the school. The most extensive research in this area was carried out in the Czech Republic by Drtina ([4], [15]), who focuses on optimal conditions for learning in a schoolroom, but did not investigate the impact of the monitored factors on the specific improvement of pupils'/students' learning outcomes.

In this paper we pointed out the importance of the spatial arrangement of the classroom and its technical equipment in terms of the elimination of communication noise in the education of primary school pupils. Our research has confirmed that communication processes, i.e. the level of communication noise affects the layout of the classroom. In accordance with the results of the researches published so far ([4], [10], [15]), it has been showcased that classroom arrangement, projector quality and projection screen are the most significant negative factors in computer-aided pupils' education. It has been shown that the correct arrangement of the pupils' workplaces in the classroom had eliminated the communication noise in the classroom, which has resulted in an increase of teacher's work efficiency.

ACKNOWLEDGEMENTS

This contribution was created in connection with the project VEGA1/0668/18 (Scientific Grant Agency of the Ministry of Education, science, research, and sport of the Slovak Republic and the Slovak Academy of Sciences) called Predicting the impact of the quality of the indoor environment on effective management and rising the level of the learning process.

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