

THE IMPORTANCE OF VISUALISATION IN EDUCATION

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***Abstract:** Visualization is a possibility of perceiving and processing information in a graphical form. The advantage is the universal clarity regardless of the diversity of languages. Visualization enables quicken communication communication and creates a unified and comprehensive tool for everyday communication. This paper describes the importance of visualization as an essential element not only in acquiring knowledge of students, but also in lifelong learning.*

Keywords: visualization, ICT, education, lifelong learning

INTRODUCTION

We encounter the visual communication every day. Human sees everything happening around him by eyes, receives back some information and responds to him according to the current situation. Communication with the image and using the image, is now inevitable. Examples are not only icons that surround us and have different meanings. The enormous importance is visualization on the Internet, where information is presented in various forms especially visual experience.

The visualization, however, is a part of all scientific fields such as construction, engineering, architecture, but also in geography and chemistry. Digital technology is becoming their organic components and brings a significant discovery of new knowledge, principles, and a shift in the perception of existing theory. This was still significantly recognizing for most of the teachers, students and pupils of various grades of school systems. (Bílek 2009).

Visualization is thinking view of the fact, when the results are shown so as to be perceived by the visual receptors. In education, the visualization is associated with the application of rules clarity.

By Průcha (2009) visualiation of information has universal clarity regardless of the diversity of languages, decoding speed, relativity, and more. The danger is weakened by Průcha (2009) rational operations, hypertrophy of sensory impressions, and often ambiguity of the information. The current trend has allowed just through visualization speed up communication and creates a single and comprehensive tool that allows communication in routine matters, but also for the unification of terms in science and is a key of importance of education at school and lifelong learning.

Prucha (2009) also points out that visual expression using different brands, diagrams and symbols becomes a permanent part of the communication of many professions and therefore it is necessary to pay attention to the overall level of visual and aesthetic impact of phraseology, as it creates a new visual culture, a new sensibility of person. Through the vision reinforces the imagination. In this sense eyes "thinking and feeling" and still strongly applies in interpersonal communication. It must however distinguish a passive visual culture, that is correct and well to be able to perceive and understand visual information. And active visual culture.

Active visual culture is characterized by the fact that a man is able to visually communicate and create visual communication itself. To strengthen this ability is also necessary to strengthen the development of visual culture by using didactic tools. Interdisciplinary in conjunction with the visual perception is often in some countries such as Germany replaced by subject termed "Science". This trend is not yet usual in the Czech Republic, although it would allow the current curriculum.

The visualization is encountered in science, where it is an important tool for performing the role of cognitive but also the presentation of science and technology. The advantage is that the computer technology in cooperation with visualization allows the development of critical thinking (Wiebe et al, 2001).

1. HISTORY OF VIZUALISATION

Visual attribute has been used since the second half of the 19th century thanks to technological breakthroughs associated with the use of photographs. This milestone is described by Šimůnek (2009) as a visual or image turn. In connection with the visualization of culture was gradually developing visual literacy. This does not directly literacy clearly specified research subject or a clear goal it is therefore crucial search context of visual perception and social environment. The first indication for visual literacy used in 1969 John Deebes a need to study the image folder and physiognomic vision process, including the need for interdisciplinary cooperation in the study of visual culture. Visual literacy has many definitions, which varies according to the discipline that gives this literacy in context. Definition of International Visual Literacy Association describes visual literacy as an interdisciplinary effort to understand and learn about the process of visual communication as an effort to define the relevant knowledge, skills and competencies that are required for the acquisition of trivia and other skills for

successful learning process. The key is understanding different perceptions of reality.

2. VISUAL PERCEPTION

Visual perception, visual information processing and the subsequent creation of adequate concepts for pupils is not only an essential component of science education. Visualizations are associated with cognitive activities. Visualization allows the application of scientific concepts of science education in a new context (Wiebe et al. 2001). Visualization can also be referred to as "mental image" or "mental representation" (Duval 1999). Graphical presentation represents the onset of ICT in education in all types of school systems essential part of educational materials (Bílek 2007).

Visualization is characterized by Seifert (2004) in Bílek (2007) as "visual performance" of things, phenomena, processes and emotions. Visualization may not always fully replace spoken words but the targets can be focused on:

- The concentration of attention of listeners on the essence of the presented content.
- For attracting listeners.
- Reducing the burden of teachers.
- Helping in the orientation of the audience.
- To facilitate the understanding of presented information.
- To access to the substance of presented content.
- The deepening and extension of the spoken word
- To support remembering of the presented contents
- To encourage the growth opinion on the presented content.

The key is visualization and creativity, which greatly enhance efficiency. It mainly on three aspects:

- Planning of visualization.
- Basic (support) points of visualization.
- The rules for composition visualization.

For planning are especially important answers to the following questions:

- What I want to present?
- What is the goal of prepared presentation (purpose of the presentation)?

- Who do I want to inform or persuade (target group)?

In addition to cooperation in the study of visual culture is often seen in visual literacy also called decontextualisation and recontextualization which indicates removing visual information from the original context and adjusts its original meaning. Unfortunately, at present, with visualization decontextualisation and recontextualization often encountered due to the massive distribution of photos in various photo agencies, and social networking sites for sharing photos.

Visualization in the context of thinking can be divided into four categories (Gilbert 2005)

1. Consideration - includes the creation of new images by their repetition and existing elements. This is the basis for a visual analogy.
2. Learning physical skills - first creates a visual perception which defines the nature of physical movement arising in the performance of a specific movement (for example tuning the radio dissecting dead bodies).
3. Understanding verbal description - visualization are generated based on propositional statements (for example the structure of crystalline solids formed on the basis of verbal descriptions).
4. Creativity - can be either a reassessment of the meaning of an existing image or changing the frame of reference.

3 VIZUAL MATERIALS AS AN EDUCATIONAL TOOL

Among the image (sometimes iconic) tools which the subject expresses in two dimensions in a continuous surface. They are divided in the first approximation to the actual show (photos, pictures, diagrams, and animated display assembly) and display slideshows (with slide, slide film transparent for overhead projector, film, movies in analog or digital form, etc.) (supplemented by a Pachmann Hofmann, 1981 in Bilek et al, 2007). Photos are the most faithful depiction of reality (for example photo chemical plants, chemical products chemical apparatus, etc.). In terms of the formalization of the visual material at least formalized for example they contain the recipient abundance of irrelevant or too detailed information that can complicate the understanding of the depicted object or phenomenon.

An integral part is also a symbolization that plays in chemistry and other disciplines significantly specific role (Holada 2000 in Bilek et al. 2007). Contemporary symbolism aims above all its knowledge about objects and phenomena between people and technology, symbolized by identifying objects or phenomena, overcoming language barriers, etc.

The projected projections allow high magnification, rapid changes in the image and highlighted with light projection options and a stronger effect on increasing the attention of the students (Pachmann Hofmann 1981 in Bilek 2007). Individual

tools ranked the projected (mediated) showing we can still distinguish to static (slides, transparent, static object (picture, model, natural, etc.) using the projected visualizer (video)) and dynamic (film, video, computer animation and simulation, dynamic object (the course of chemical experiment a moving model, etc.) using the projected visualizer - camcorder).

Mares (1995) in Bilek et al (2007) notes that the way to learn from the visual material for example how to get by with visualization his new knowledge usually not in school attention. A broad concept of "clarity" is often not acting sufficiently suitable description of a graphical display in the classroom and thus acquires legitimacy analysis of visual material from different perspectives. Visual materials can be divided into pictures with visualization functions (for example Levin Anglin Carney 1987 Mares 1995 Bilek, Konířová, Pear 2002 in Bilek et al. 2007):

- Decorative.
- Representing or illustrating.
- Organizing.
- Interpreting.
- Transforming.

Picture of with visualization prevailing decorative features factually unrelated to the text. May be included in the textbook for example, to fill the empty space or to make the text more interesting for the general reader and therefore more marketable.

Overall, it can be divided into visual information (Beránková 2009):

- Pictures of informative character (eg pictograms).
- Scientific images (eg X-ray images, pictures of nature science, geovisualization).
- Media images (eg advertising, film).

4. THE ELEMENTS OF VISUALIZATION AND COMPUTER PRESENTATIONS

As support points of visualization should be further in relation to the contents reflect the media used for presentation (different types of boards, overhead projectors, data projectors, etc.) and design elements (text, graphics, symbols, diagrams, etc.).

The key to good visualization of the following elements:

- Readability - not suitable script, the computer processing is recommended simple "sans" fonts eg Arial, Calibri.

- Ensuring the cultural practices of reading texts - reading texts and presentation processes in the "left to right," use upper and lower case letters,
- Layout and orientation of the text - text border, highlighting essential parts, block diagrams, etc.
- The use of color - "less is often more" contrast text and background (white or light yellow text on a dark blue background), the use of symbolic meanings of colors (eg black - objectivity, fairness or highlighting negativity blue - friendship, pragmatism , highlighting the cool red - signal color highlighting aggression green - positive character clear path, nature, emphasizing peace and hope) (Drtina, Chrzová, Maněna 2006 in Bilek et al. 2007).

Other important elements of the visualization of data presentation in the form of tables, graphs and diagrams. Here are the following types:

- Lists and tables.
- Curve graphs (diagrams).
- Bar graphs (diagrams).
- Circular and pie charts.
- Organizational chart.
- Flowcharts and network diagrams etc.

Graphs are important tools in science for a very long time. Key is then the correct interpretation of presented data. Happonen and Aksela (2011) describe that often occur in pupils' difficulties in distinguishing x and y axes.

The elements are arranged in a certain composition which for the presentation must observe certain rules. Seifert (2004) in Bilek et al (2007) distinguishes rules into three basic areas:

- Layout of elements on the page presentation.
- Logic and arrangement of elements in terms of content and presentation of the course.
- Colors and forms.

The page layout is an important element of the presentation which can facilitate in a number of presentations distribution areas into smaller sections to determine the gold chain etc. In computer presentation programs are preferably prepared using patterns sites called "templates". This is a draft layout of text, image, parts and combinations thereof (eg, prepared slides in a presentation in MS PowerPoint). The structure and logic of the site and the entire presentation is determined by the following aspects:

- Symmetry.
- Transmission.
- Rhythm.
- Dynamics.

When using colors and forms of presentation of the basic elements of visualization is important to realize that this is the highlight meanings of these elements. Their use is particularly meaningful:

- Highlight important information.
- Illustrating the context.
- References to the connection between presentations.
- Highlighting following the presentations.

Urbanová and Čtrnáctová (2008) pointed out that presentation is a good element for visualization of the curriculum, but the use of graphic elements it is important to use the appropriate graphic that does not pay the essence. Veřmiřovský and Bilek (2010) describe the importance of multimedia presentations but that is to be used as an accessory when not to use a real object.

When visualization of the curriculum, for example through computer presentations in PowerPoint or Impress applies especially information and formative function, motivating and stimulating function and ergonomic control and respect for individual pupil learning pace.

The basis for the creation of PowerPoint presentations is to analyze the content and structure of the material of the topic, a form of visualization and active way of learning pupils during lessons and outside. The content and structure of the curriculum in line with current trends in education need not necessarily be based on detailed knowledge of the subject matter, but rather the understanding of basic concepts and far more practical application of individual elements and their compounds. The starting point for the representation of the curriculum is to search on the Internet, which allows to obtain not only a lot of textual information but also a variety of images and video clips. Then using video clips along with visualization with own images and simulations created with the appropriate programs for effective and most efficient visualization of the curriculum. The active method of subject learning can take different forms and forms usually carried out by suitably awarded learning tasks.

5. VIZUALIZATION AND DISTANCE LEARNING

On eyes we operate by a simple text supplemented by visual documentation, photographs, videos, then operate to hearing aid music samples read words. On

senses we can also act in combination - with the help of multimedia demonstrations interactive animations and visualization. E-learning offers us a wide range of technology options that can improve learning. In principle, however, also invalidate (Kopecký 2006). The basic elements of distance learning include temporal and spatial separation of the individual studies (Soukup, 2004). At present, we meet the principles of synchronous and asynchronous communication. Keng-soon (1998) describes that is better for distance learning using the highest interaction capabilities that meet the needs of learners. A common factor in distance education, the availability and price, where unfortunately there are still students who choose this distance education can not afford. The research results indicate that visualization and more concrete examples of personal teacher feedback is very important element in the educational process of the adult population either through distance or lifelong learning the rules still apply Comenius about didactics, playing and partnerships (Soukup, 2004).

6. VIZUALIZATION, VIRTUAL REALITY AND SIMULATIONS

Visualization is currently associated with virtual reality, which is technologically possible, but on the other hand, the education is unfortunately still limited application. By Ferreira (2008) optimal would be develop a comprehensive cognitive illusion, where the learning took place in virtual worlds. Three-dimensional computer modeling and virtual reality can combine and extend existing range of methods for different disciplines (Horne, Thompson 2008). Simulations allow for independent learning activity, improved motivation, student involvement, natural semantics, safe space and cost savings. From simulators are also required large possibility of visualizing the inputs and outputs of the model (Kofránek, Tribula 2007).

Simulations are used in a wide range of teaching and learning contexts. To improve memory, cognitive simulations are used for example in agricultural mechanics, fluid mechanics, engineering, interactive digital media, virtual labs, science education in general and in terms of applications such as provision of health care (Koh, 2010). Another example is the use of simulation and visualization of geographic data using specialized software (Pang 2001, Herman 2013). The simulation tool can also be found in robotics where the aim is to improve the visualization of engineering applications at remote (Calkin et al. 1998). Eiks et al (2012) describes the use of images, three-dimensional images and an animation in chemistry where key is the use of visualization to describe to microscopic to submicroscopic level. The advantage of visualization in chemistry is refute some misconceptions reactions at the molecular level. But as the authors describe the key is correct classification of visual elements in context. Myška et al (2009) describes visualization in chemistry connecting with LMS and some visualization programs such as Jmol and JChemPaint allowing visualization of molecules.

CONCLUSION

Visualization is an integral part of education at all types of schools in different forms from full-time education after distance learning. The visualization also encounter every day in life, whether it is a static image information associated with certain activities or symbols or a dynamic visual information in the form of computer programs and animations used eg in connection with touchscreens. The key role of visualization is to facilitate remembering at one-offs, as well as routine operations. The relation of distance learning and visualization is an important element of the teacher, not only in distance but also lifelong learning, the teacher is not in its usual role of the learner, but rather in the role of guide - a tutor.

Overall, the visualization have positive significance for man which is applied in education. These include the understanding of the structure and processes in the microworld, understanding of the connections between the visualized elements simulation processes hardly realized during the preparation of pregraduate students, etc.

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