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Introduction

The rapid increase in science knowledge entails the update of educational programs, data transfer and creation of new knowledge structures needed in everyday life. In this volume of annals we present issues related to human physiology in the context of health, as well as the naturalists' view on the role of definitions in shaping science knowledge.

Education for sustainable development remains a big challenge for teachers. At the same time, it fits into the idea of promoting future competences and all actions related to saving our planet. We still need to promote good practices in this area and cross-sectoral cooperation. Social participation, shaping responsibility, skillful leadership and entrepreneurship are some of the educational challenges that should pay off in the future by changing society's attitudes towards the natural environment. Programs implemented in cooperation with non-governmental organizations contribute to the development of key competences corresponding to the needs of the labor market, economy and society.

Contrary to popular opinion, digital technologies can largely 1) promote peer relationships, 2) facilitate teacher-student communication methods through the development of new communication channels in an atmosphere of trust and openness to change, 3) facilitate the literacy acquisition by these participants' involvement. Education of the future using the latest technologies should take into account the following trends: 1) from cognition to metacognition, 2) from diagnosis to prevention, 3) from individualism to community, 4) from knowledge to attitudes (according to Potyrała, 2017). Preparing teachers to apply new strategies and learning methods is a priority. Pedagogical theory and practice must go hand in hand to strengthen the development of a knowledge-based society.

In the chapter on the relationship between culture, art and education in the contexts of alternative education, we offer readers two articles that relate to: 1) soroban – an old Japanese abacus for performing mathematical operations. It is a subject combining old Japanese culture with modern education. It is an effective tool to popularize not only mathematical knowledge and it develops mathematical and other skills, strengthens and builds nerve connections between the hemispheres, develops dexterity and hand-eye coordination, teaches self-discipline and concentration, motivates to learn, and is also a therapeutic tool; 2) a burlesque science fiction essay as a tool to convey artistic thought and direct the viewer towards asking questions. Cinema, as the author Katarzyna Lipińska writes, as an art using a variety of artistic means at its disposal, can describe phenomena invisible to the human

eye. An example of this property of capturing the world of senses is the art of Bruno Dumont. Bruno Dumont's television essay also presents the gendarmes' attitude towards refugees as a fear of what is unknown to us, creates space for expressing our own thoughts and criticizes our attitude towards other people. We suggest adding to the teacher's competence profile skills related to creating a learning environment in informal situations.

Selected issues from the methodology of pedagogical research focus on a qualitative research approach, new tools of neurodidactics and ecological approach in pedagogical research. The quality of the data and its proper interpretation are the basis for the reliability of the results and the conclusions based on them.

I hope that this volume will allow readers to see new educational perspectives and inspire them to undertake interdisciplinary educational research.

Katarzyna Potyrała

Bożena Witek, Agnieszka Kamińska

Neuroprotective role of some microelements in the course of neurodegenerative diseases

Introduction

Neurodegenerative diseases are now one of the most serious health problems faced by the humanity around the world. According to the World Health Organization, in 2030 the number of people suffering from these diseases can reach up to 120 million. The cause of these diseases is primarily the aging of the population and, consequently, its homeostasis disorder at the cellular level. Neurodegenerative diseases include, among others Parkinson's disease (PD), Alzheimer's Disease (AD), Huntington Disease (HD) and Amyotrophic Lateral Sclerosis (ALS). The mechanism of symptom formation in these diseases is also seen in some diseases of the retina, such as glaucoma (Glaucoma).

Neurodegenerative diseases are a symptom of disturbances in the functioning of the central or peripheral nervous system resulting from the loss of nerve cells. Despite the different clinical picture and the different course of these diseases, it is believed that they are a consequence of the progressive dying of neurons (Jellinger, 2009). The loss of neurons may be the result of necrosis combined with induction of inflammation or apoptosis, i.e. programmed cell death. Aggregation of specific areas of the central nervous system, such as β -amyloid, in nerve cells is considered to be the cause. These proteins contain numerous molecules of glutamine, microtubules connected to the tau protein, or dysfunctional mitochondria and the associated oxidative stress (Martin, 2010).

Cellular homeostasis and microelements

Homeostasis is an essential condition for the proper functioning of the system. In order to maintain homeostasis, i.e. internal stability in changing environmental conditions, the human body must maintain such parameters of the internal body environment as body temperature, blood pressure, body fluid volume, blood pH value. A disruption of homeostasis means an illness.

In the complex mechanisms of maintaining homeostasis, microelements play an important role, which include, among others, transition group metals such as iron, copper, zinc, as well as non-metallic selenium belonging to the aerobes (Klecha and Bukowska, 2016). The biochemical properties of these elements' ions are based on basic biological processes occurring at the level of each cell and on the scale of

the whole organism, and the condition of proper functioning of the body is the daily supply of these microelements, mechanisms maintaining their concentration within physiological norms and interactions between them.

Both a deficiency or excess of these micronutrients can induce systemic disorders leading, among others, to pathological changes in the nervous tissue, which may in some specific areas of the nervous system direct the metabolism to the path of apoptosis or necrosis of neurons.

Role of iron in maintaining intracellular homeostasis

The effects of excess or deficiency

Adequate supply and maintenance of optimal iron concentration in the body is of particular importance for the proper conduct of basic biological processes. The physiological level of this element in the human body ranges from 2 to 3 grams (Kuras et al., 2015). Iron is part of the prosthetic groups of metalloproteins – hemoglobin and myoglobin. It is also a cofactor of cytochromes – enzymes that are part of the respiratory chain – and is part of peroxidases and catalase, which protect cells against oxidative stress (Hentze et al., 2010). Iron deficiency is the main cause of anemia, which is indirectly associated with disorders of the development and function of the nervous system. The phenomenon of hypomyelination of nerve fibers in the brain and medulla spinal cord is also associated with iron deficiency in infancy (Lozoff et al., 2013). Neurological symptoms of iron deficiency in the early, neonatal phase of individual development are manifested in school-age children as, among others, reduced cognitive ability and learning difficulties. These disorders do not retreat later in life, even after the iron levels have been adjusted. In demyelinating diseases, such as multiple sclerosis, the cause of myelinogenesis is iron deficiency (He et al., 2007).

Deregulation of homeostatic mechanisms leading to an increase in iron concentration in the body causes its excessive accumulation in various structures of the nervous system and is one of the elements that seems to play a role in the pathogenesis and development of neurodegenerative diseases (Ndayisaba et al., 2019). The accumulation of iron in the subcortical nuclei of the striatum, pale globe and reticular part of the black matter, as well as in the cerebellar toothed nuclei is a characteristic feature of a wide group of genetically and clinically heterogeneous diseases referred to as Neurodegeneration With Brain Iron Accumulation (NBIA) (Dusek and Schneider, 2012). These diseases are usually inherited recessively autosomal, and their neurological symptoms depend on the type of neurodegeneration with brain iron accumulation and may appear in various periods of individual development (from early childhood to 40 years of age). Nervous system degenerations involving excessive iron accumulation occur not only in NBIA syndromes, but also in a number of other neurodegenerative diseases, such as Parkinson's disease, Alzheimer's disease, or ALS, for which the risk factor is often old age (Millan et al., 2007).

The role of iron accumulation in the etiopathogenesis of neurodegenerative diseases has not yet been clarified. It is not known whether iron is a factor generating the occurrence of the disease or just a secondary symptom of the development

of other pathological processes that damage neurons. However, the contribution of iron to neurodegenerative processes seems to be obvious. Free iron ions Fe^{+2} (unbound to transport or storage protein) are highly toxic and in the presence of hydrogen peroxide (H_2O_2) initiate the Fenton reaction. The Fenton reaction creates free radicals that destroy the cell membrane (Altamura and Muckenthaler, 2009). The hydroxyl radical ($-\text{OH}$) that is formed as a result of this reaction is one of the most reactive oxidants and causes lipid peroxidation and structural changes in DNA and protein molecules. The consequence of these changes is cell death by apoptosis. The presence of free radicals can also contribute to the aggregation of β -amyloid proteins and play a role in the development of neurodegenerative diseases, such as Alzheimer's disease for example (Lovell et al., 1998).

Role of copper in maintaining intracellular homeostasis

The effects of excess or deficiency

Copper is an element that plays an important role in the course of biological oxidation-reduction reactions. Its physiological level in the human body ranges from 100 to 150 mg. Copper is a cofactor for many enzymes such as ceruloplasmin, superoxide dismutase and cytochrome c oxidase (Wang and Wang, 2019). Ceruloplasmin, also known as copper oxidase, is a glycoprotein that contains up to six copper atoms and acts as the main transporter of this element in blood plasma. As an enzyme with oxidase and ferroxidase activity, ceruloplasmin is also involved in the metabolism of copper and iron. It catalyzes the oxidation of Fe^{+2} to Fe^{+3} ions, enabling them to be combined with iron transporting or storage proteins. Superoxide dismutase is a metalloprotein whose prosthetic group containing copper and zinc or manganese acts as an active center. This enzyme plays an important role in the cell's defense mechanisms as a scavenger of free oxygen radicals. Cytochrome c oxidase as the last protein complex of the respiratory chain reduces oxygen by transferring electrons from cytochrome c to its molecule. The high oxidoreductive potential of copper and copper-dependent protein complexes causes that the disruption of their homeostasis can have serious consequences for the body.

In the conditions of copper deficiency, the activity of copper-dependent enzymes decreases and the amount of free radicals increases. The consequences of these metabolic disorders are mitochondrial damage, worsening of oxidative stress and ultimately apoptotic cell death (Lombardo et al., 2003). A decrease in plasma copper concentration and a decrease in superoxide dismutase activity in the cerebrospinal fluid has been observed in the most common neurodegenerative diseases such as Alzheimer's, Parkinson's disease and amyotrophic lateral sclerosis (Boll et al., 2008). Lower levels of copper in the hippocampus and amygdala than in healthy individuals have also been reported in Alzheimer's disease patients with severe histopathological disorders (Rossi et al., 2001). This demonstrates the generating effect of copper deficiency on the course of degenerative processes in the nervous system.

Excess of copper is as toxic to cells as its deficiency. It can cause oxidation of proteins and nucleic acids and peroxidation of membrane lipids, as well as stimulate

the formation of free radicals in Haber-Weiss and Fenton reactions, thus causing oxidative stress (Valko et al., 2005). Another mechanism triggered in conditions of increased copper concentration is the promotion of protein deposits formation in the cytoplasm of nerve cells that contribute to the development of neurodegenerative diseases (Dobson, 2003).

Role of zinc in maintaining intracellular homeostasis

The effects of excess or deficiency

Zinc is one of the basic micronutrients associated with maintaining homeostasis of the body. Its total content in the body ranges from 1.5 to 4.0 grams (Puzanowska-Tarasiewicz et al., 2009). The biological importance of this microelement results from its presence in the composition of many proteins, including enzymatic ones. At present, about 400 such proteins are known that have zinc in their composition, which is also the only metal necessary for the proper functioning of enzymes in all six of their classes (Andreini et al., 2006). In enzyme molecules, zinc can act as a co-factor permanently associated with its molecule or as an activator that is not permanently associated with the enzyme causing its activation and often a significant increase in the rate of catalyzed reaction. Zinc plays a special role in maintaining redox and oxidative balance in cells by participating in the construction of superoxide dismutase, a superoxide radical neutralizing enzyme. It also participates in the inhibition of iron and copper-dependent lipid peroxidation (Oteiza, 2012).

Any disruption of zinc intra-body balance, both in the direction of deficiency and elevated concentration, can lead to serious impairment of vital functions. It has been shown that zinc deficiency can lead, among others, to growth inhibition, impaired immune function, cognitive impairment and even autism (Tian and Diaz, 2012). Disorders resulting from too high a concentration of zinc are not very common due to well-developed mechanisms that maintain intracellular homeostasis of this microelement. The central nervous system is particularly sensitive to zinc, in which disturbances in its balance may be one of the factors leading to the emergence and development of neurodegenerative diseases (Craddock et al., 2012). High levels of zinc in the central nervous system lead to inhibition of neuronal growth and differentiation, and even their death (Wang et al., 1999). High levels of zinc can also induce apoptosis of nerve cells, both by activating proapoptotic proteins and directing neurons to the path leading to apoptosis, as well as by inhibiting energy metabolism causing damage to mitochondrial membranes, the outflow of enzymes into cytosol and, consequently, the induction of programmed cell death. Another effect of high levels of zinc in the body is oxidative stress caused by a reduction in the content of reduced glutathione in the cell (Craddock et al., 2012).

Role of selenium in maintaining intracellular homeostasis

The effects of excess or deficiency

Selenium was discovered in 1817 and until 1957 it was considered a toxic element. It is a trace element whose content in the human body is estimated at 10–30

milligrams. It occurs in all tissues and organs, but its highest concentration is observed in the liver and muscles. Selenium as an element has no biological effect. On the other hand, its compounds show biological activity. Most often they are the amino acids selenocysteine and selenomethionine, in which the sulfur atom was replaced with selenium atom. Thanks to this, selenium participates in the construction of many proteins – selenoproteins, including enzymatic proteins (Pitts et al., 2014). The enzymes in which selenium occurs can be divided into three main groups: glutathione peroxidases, iodothyronine deionidases and thioredoxin reductases. There are also several individual selenoproteins in the human body, of which selenoprotein P is of the greatest importance. These enzymes are associated primarily with the processes of cell defense against oxidative stress caused by free radicals, thyroid hormone production, inflammatory processes and the regulation of the programmed cell death pathway – apoptosis (Steinbrenner et al., 2016).

The association of selenium with neurodegenerative diseases is mainly associated with the action of glutathione peroxidase, thioredoxin reductase, or selenoprotein P, which are considered free radical scavengers (Pillai et al., 2014). Selenium has been proven to help protect neurons from the harmful effects of lipid peroxidation products and β -amyloid in Alzheimer's disease and can be used to alleviate Parkinson's disease symptoms such as bradykinesia (Ellwanger et al., 2015). Too high a concentration of selenium causes a set of symptoms called selenosis. Typical symptoms for selenosis are diarrhea, nausea, fatigue and joint pain. According to some researchers, excessive selenium supplementation can lead to the development of type 2 diabetes and that excess selenium may induce oxidative stress (Fairweather-Tait et al., 2011). While selenium can be helpful in treating or alleviating the effects of many diseases, including neurodegenerative diseases, its excess can have the opposite effects, such as induction of oxidative stress.

Glaucoma as a neurodegenerative disease?

Glaucoma neuroprotection

Neuroprotection in the light of recent discoveries arouses great interest and is associated with a lot of hope, because until recently retinopathies such as glaucoma or age-related macular degeneration (AMD) were treated as exclusively ophthalmic diseases, which is one of the most common causes of blindness. In 2006, glaucoma was similar to neurodegenerative diseases of the central nervous system disease, such as Alzheimer's or Parkinson's disease (Vasudevan et al., 2011). It is now known that the pathogenesis of neurodegenerative diseases is associated with the loss or death of neurons in specific areas of the central and peripheral nervous system. Within the retina of the eye, the ganglion cells and their axons forming the optic nerve are selectively killed (Rusciano et al., 2017).

The presence of similar mechanisms of nerve cell death in these diseases suggests that patients with glaucoma can receive similarly beneficial effects of neuroprotective treatment as in neurological diseases. Clinical studies have confirmed the good effect of neuroprotective treatment in glaucoma.

As it turns out, zinc and selenium play an important neuroprotective role in retinal metabolism and condition the proper activity of enzymes of this organ, such as retinol dehydrogenase and catalase. Reduced zinc supply increases the risk of age-related macular degeneration. A beneficial effect of zinc therapy in patients with AMD was also shown in comparison with the placebo group.

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Neuroprotective role of some microelements in the course of neurodegenerative diseases

Abstract

Neurodegenerative diseases are characterized by progressive loss of nerve cells in specific areas of the nervous system. Until now, it has not been clearly defined which mechanism is responsible for the death of nerve cells in neurodegenerative diseases, but as the results of research indicate, apoptosis is responsible for this process. The death of neurons causes disturbances in the functioning of the nervous system. The process of nerve cell degeneration is accompanied by the appearance of pathological changes resulting from the aggregation of misfolded proteins. Studies indicate that disruption of the balance between production and degradation of misfolded proteins causes an increase in their concentration, and consequently, aggregation leading to the development of neurodegenerative diseases such as Alzheimer's, Parkinson's and glaucoma. As it results from the presented data on the share of selected microelements in maintaining intracellular oxidation-reduction balance, they can show a protective effect, protecting cells against oxidative stress.

Keywords: homeostasis, microelements, neurodegenerative diseases

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Concentration of triacylglycerols and cholesterol in liver, kidneys and muscles of mice following exposure to ethyl alcohol

Introduction and aim

The effect of ethyl alcohol on biochemical transformations of triacylglycerols is a widely discussed research problem. Indeed, the recognition of its effect on biochemical transformations of triacylglycerols and cholesterol may have priceless practical importance for medicine and veterinary practice and procedures (Jóźwik et al, 2012). Triacylglycerols in mammals constitute approximately 98% of the total fatty tissue pool, and their level in blood depends on hormonal regulation, age and muscle work (Klusek et al, 1998, Levy et al, 2004, Sacchetti et al, 2004). There are also many reports concerning cholesterol, due to its biochemical functions and physiological importance (Chien et al, 2008, Fremont et al, 2000, Klusek et al, 2001). Considering the above-mentioned data, the aim of the study was to assess the effect of specified doses of ethyl alcohol on the concentration of triacylglycerols and cholesterol in the liver, kidneys, and thigh muscles tissue in experimental mice selectively bred for high and low analgesia.

Material and methods

The experiment was conducted on 80 male Swiss mice bred at the Institute of Genetics and Animal Breeding, Polish Academy of Sciences. When the animals reached sexual maturity, at the age of 6 weeks, they were randomly selected for high and low analgesia. In order to investigate sensitivity to pain, the mice were placed on a copper plate with a temperature of 56 °C. The animals which did not react to this high temperature for 10 seconds were marked as HA (High Analgetic Group) and designated as parents of subsequent generations of mice with high analgesia. A male and a female reacting as early as after 3 seconds, marked as LA (Low Analgetic Group) were the precursors of the generations of animals with low analgesia. In this way, two genetic lines of animals differing with respect to sensitivity to pain were mated.

The experimental animals were kept in standard conditions of an experimental farm, in a 12-hour light cycle (L:D), in a room with a controlled temperature of 21–22 °C, air exchange, and relative humidity 60–75%. They were placed in typical plastic cages, 30 × 15 × 10 cm, on a bedding of soft wood shavings. The cages were covered with a stainless steel mesh. On its mesh, there was given constantly granulated

standard feed, produced specially for feeding experimental mice, containing 16% of proteins and 14.04 MJ/kg of energy. All the mice had access to water *ad libitum*. For the entire period of the experiment the mice were provided with very good veterinary care.

Experimental animals were divided into 8 study groups.

1 – Experimental Group I – mice showing high analgesia (HA), administered 8% ethyl alcohol every day for a period of 21 days.

2 – Experimental Group II – mice showing low analgesia (LA), administered 8% ethyl alcohol every day for a period of 21 days.

3 – Control Group I – mice showing high analgesia, administered water every day for a period of 21 days.

4 – Control Group II – mice displaying low analgesia, administered water every day for a period of 21 days.

Administration to animals *per os* of ethyl alcohol at a dose of 500 µl/mouse, or the same amount of water was performed using an automatic micropipette, twice daily, at 10:00 and 20:00.

5 – Experimental Group III – mice showing high analgesia, given an intraperitoneal injection of 8% ethyl alcohol at a dose of 500 µl/mouse;

6 – Experimental Group IV – mice displaying low analgesia, given an intraperitoneal injection of 8% ethyl alcohol at a dose of 500 µl/mouse;

7 – Control Group III – mice showing high analgesia, given an intraperitoneal injection of 0.9% NaCl a dose of 500 µl/mouse;

8 – Control Group IV – mice showing low analgesia, given an intraperitoneal injection of 0.9% NaCl a dose of 500 µl/mouse.

Intraperitoneal injections of ethyl alcohol and saline solution were performed twice daily only at 10:00 and 20:00.

At the cessation of the experiment, the mice were anaesthetized by izoflurane narcose (a dose of 3030 µl/kg) and subsequently decapitated. Immediately after decapitation, the liver, kidneys and the left thigh muscles were isolated.

The liver was subjected to perfusion with saline solution cooled to +4 °C, and subsequently, a mass of 600 mg of tissue/6 ml 0.1 M phosphate buffer pH 7.4 was homogenized in Potter's homogenizer with a teflon piston (name of manufacturer, city, country), at 200 rpm/minute, performing four 'up-down' cycles for the liver and kidney, and twenty cycles for the muscle. The homogenates obtained were centrifuged in a Janetzki K-24 centrifuge for 10 minutes at 12 000 rpm/minute. Both homogenization and centrifugation were performed in a cold room at the temperature of +4 °C.

In order to determine the level of triacylglycerols in the liver, kidneys and muscle supernatant, the 'Alpha Diagnostic' test was used (Poland). The determination was based on the method of Wako, as described by Searcy (1974).

The cholesterol level was determined by means of 'Biochemtest' (Gliwice, Poland) based on the method of Allain et al. (1974).

Extinction levels were determined using the Perkins-Elmer Lambda Bio 20 spectrometer (USA). The concentration of triacylglycerols and cholesterol were expressed in µmol/g fresh tissue.

Analysis of variance was performed according to the following statistical model:

1. Analysis for each organ separately:

$$y_{ijk} = P_i + C_j + P \times C_{ij} + e_{ijk}$$

y_{ijk} – level of triacylglycerols and cholesterol

P_i – constant effect of alcohol

C_j – constant effect of selection

$P \times C_{ij}$ – constant effect of alcohol-selection interaction

e_{ijk} – error

2. Analysis for each alcohol group separately:

$$y_{ijk} = N_i + C_j + N \times C_{ij} + e_{ijk}$$

y_{ijk} – level of triacylglycerols and cholesterol

N_i – constant effect of the organ examined

C_j – constant effect of selection

$N \times C_{ij}$ – constant effect of organ-selection interaction

e_{ijk} – error

Experiments on mice were carried out with the consent of the Bioethical Commission operating at the Świątokrzyska Medical Chamber, ul. Wojska Polskiego 52 25-399 Kielce, Poland [No. 46/2016 dated 06.2016]

Results

Table 1 presents the results of changes in the concentration of triacylglycerols and cholesterol in the examined organs of mice displaying high and low analgesia, administered ethyl alcohol for 21 days and intraperitoneally.

The data presented in Table 1 show that alcohol caused a significant ($p < 0.05$) increase in the concentration of triacylglycerols in the liver in both experimental groups of mice (HA and LA) – up to 120.6% and 144.2% of control values. However, it did not reveal any changes in the kidneys, and significantly decreased their level in the muscle of LA group (to 71%). Concentration of triacylglycerols in all examined organs in control animals (LA/HA) was higher (132.3% in the liver, 139.2% in the kidneys and 133.03% in the muscle).

The table reveals that alcohol doses administered intraperitoneally significantly increased the level of triacylglycerols in the liver of animals HA group (to 136.9%) and in LA group (to 133.9%).

The animals in HA group had significantly ($p < 0.05$) higher concentration of cholesterol than LA group (8.2 and 5.7 $\mu\text{mol/g}$). The administration of ethyl alcohol to mice *per os* significantly decreased the level of cholesterol only in the liver of the HA group (down to 74.2% of the control value).

Intraperitoneal injection of alcohol decreased the level of cholesterol only in the HA group of animals in the liver and muscle (down to 78% and 73% of control values, respectively).

The data in Table 2 show that the alcohol significantly changed the level of triacylglycerols in the liver and muscle. No analogous changes were noted in the

kidneys, similarly as no significant changes were observed in cholesterol level in all examined organs.

Table.1. Concentration ($\bar{X} \pm SD$) of triacylglycerols ($\mu\text{mol/g}$ tissue) and cholesterol ($\mu\text{mol/g}$ tissue) in the liver, kidneys and muscle of mice administered ethyl alcohol for 21 day and 2 \times intraperitoneally;

Group of mice administered alcohol Control		Liver		Kidney		Muscle	
		Alcohol	Control	Alcohol	Control	Alcohol	
Triacylglycerols							
21 days administered	HA %	13.0 \pm 4.81,a 100	15.7 \pm 6.61 120.6	12.5 \pm 5.1b 100	11.6 \pm 5.9 93.2	11.2 \pm 2.5c 100	11.2 \pm 4.8 99.4
	LA %	17.2 \pm 3.32,a 100	24.8 \pm 4.52 144.2	17.4 \pm 8,.6b 100	15.1 \pm 7.1 86.9	14.9 \pm 6.13,c 100	10.6 \pm 5.53 71.0
2 \times injection	HA %	14.1 \pm 4.71 100	19.3 \pm 8.61 136.88	14.8 \pm 5.3 100	13.8 \pm 5.1 93.24	12.8 \pm 1.5 100	12.5 \pm 1.8 97.6
	LA %	16.5 \pm 7.92 100	22.1 \pm 8.02 133.94	16.7 \pm 2.7 100	15.4 \pm 1.8 92.3	13.6 \pm 1.7 100	13.0 \pm 2.8 95.6
Cholesterol							
21 days administered	HA %	8.2 \pm 6.11,a 100	6.1 \pm 3.31 74.2	8.5 \pm 4.3 100	9.0 \pm 4.4 106.8	3.4 \pm 1.4 100	3.5 \pm 1.3 103.26
	LA %	5.7 \pm 1.7a 100	6.2 \pm 2.4 108.6	8.4 \pm 3.4 100	8.1 \pm 4.2 95.9	3.3 \pm 0.8 100	3.5 \pm 1.0 108.9
2 \times injection	HA %	8.9 \pm 2.471 100	6.99 \pm 1.681 78.65	7.89 \pm 2.53 100	6.58 \pm 1.38 83.4	3.25 \pm 0.982 100	2.37 \pm 0.952 72.92
	LA %	7.0 \pm 2.6 100	6.09 \pm 2.16 87.20	7.89 \pm 2.56 100	6.79 \pm 3.14 86.06	3.03 \pm 0.99 100	3.30 \pm 0.88 108.91

1-1, 2-2, 3-3, a-a, b-b,c-c – statistically significant changes, $p < 0.05$;

Table 2. Analysis of variance (F values) for the content of triacylglycerols and cholesterol in the liver, kidneys and muscle of mice administered alcohol during 21 days.

Independent variable	Mean square value	F value
Liver		
Triacylglycerols	185.546	7.5*
Cholesterol	33.805	2.42
Kidney		
Triacylglycerols	88.850	2.45
Cholesterol	33.702	3.09
Muscle		
Triacylglycerols	46.092	3.45*
Cholesterol	1.389	1.14

* - statistical significance, $p < 0.05$

Discussion

The problems concerning triacylglycerols and cholesterol was analyzed during our previous studies, also with relation to response to the effect of alcohol (Klusek et al, 2002). In the liver and blood plasma of the experimental quail, administration of alcohol resulted in a decrease in the level of cholesterol and elevation of the concentration of triacylglycerols.

Many authors discuss the relations between the response to the alcohol taken and the changes of lipid metabolism rate according to the administration of its various doses (Oczkowski et al., 2013, Tan et al., 2012, Zhong et al., 2012).

Triacylglycerols

The results of our study indicate that 21-day administration of ethyl alcohol to experimental animals revealed a significant ($p < 0.05$) increase in the level of triacylglycerols in their liver, both in the groups of high and low analgesia, and a decrease of this level in the muscle of LA animals. In the kidney ethanol did not cause any statistically significant differences.

After intraperitoneal injection of ethyl alcohol, a significant ($p < 0.05$) increase in the investigated indicator was observed only in the liver of mice displaying high and low analgesia. The observed changes may be due to a different rate of the lipogenesis process, generated after taking considerably higher doses of alcohol during long-lasting 21-day exposure, than in the form of two intraperitoneal injections only. According to Aruna et al. (2005), the consequence of alcohol abuse may also be the impairment of the lipolysis process, which leads to an increase the concentration of triacylglycerols.

The results demonstrated that among control animals, administered water for 21 days, the concentration of triacylglycerols was significantly ($p < 0.05$) higher in groups showing low analgesia (LA), compared to HA group both in the liver, kidney, and muscle. It may be presumed that animals displaying high analgesia may more quickly and intensively utilize energy proceed from triacylglycerols than the mice showing low analgesia. Thus, the level of triacylglycerols in these organs of LA mice maybe higher because that substance is not utilized as quickly as in the tissues of animals displaying high analgesia. In the opinion of Kołataj (1993), pain exerts an effect on energy expenditure. It is a stressful phenomenon, and the stress response requires energy outlay.

Song et al. (2004) and You and Crabb (2004) stated that chronic consumption of alcohol leads to hypertriglyceridemia and accumulation of triacylglycerols in hepatocytes. Conclusions from studies by Klop et al. (2013) show that the consumption of excessive amounts of alcohol is associated with excessive secretion of low density lipoproteins (LDL), a decrease of lipolysis rate, and an increase of the transport of free fatty acids from the fatty tissue to the liver. In effect, it leads to the elevation of the level of alcohol-induced triacylglycerols. Yoon et al. (2004) also expressed an opinion that the consumption of ethanol by humans in doses higher than 30 g/daily leads to an increase in the concentration of triacylglycerols; however, the consumption of a half of this dose (15 g/daily) causes a significant ($p < 0.05$) decrease in

their concentration. Aruna et al. (2005), noted a significantly higher concentration of triacylglycerols in the plasma of rats after 45 days of administration of 20% alcohol solution. Similar results were obtained by Umamaheswari et al. (2012), also in studies on rats which were administered 20% alcohol for one month.

Cholesterol

Analysis of the results obtained indicates a relative stability of the level of cholesterol under the effect of alcohol in selected organs of mice. Its concentration decreased significantly in the liver of mice displaying high analgesia, only which were administered alcohol per os, and also in the liver and muscle of HD mice after intraperitoneal injection.

These results are consistent with the studies conducted by Klusek et al. (1998) which showed that administration of ethanol to mice may cause a reduction in the concentration of cholesterol in the liver, with a simultaneous increase in the level of triacylglycerols.

A decrease in the concentration of cholesterol in the liver of mice after administration of ethyl alcohol may result from disorders in the synthesis and degradation of lipoproteins under the effect of alcohol, which is related to the defective protein glycosylation in the liver (Song et al, 2004).

Furthermore, the reduction of the cholesterol level may be the result of reduced activity of the enzyme responsible for estrification of cholesterol – *Acyl-CoA cholesterol acyltransferase* (ACAT) induced by alcohol.

However, it should be emphasized that the effect of alcohol on the concentration of cholesterol is equivocal, which is confirmed by studies on animals. Umamaheswari et al. (2012) observed a significant ($p < 0.05$) increase of total cholesterol concentration in blood plasma of mice receiving 20% alcohol for 4 weeks, similar to Lee (2004), who administered 25% alcohol to rats for 5 weeks. However, Ehrlich et al. (2012) did not find any significant differences in the cholesterol concentration in the plasma of rats which consumed a 20% alcohol solution for a period of 12 months, compared to animals from the control group.

These results revealed some differences in the concentration of cholesterol in the liver and partly in muscle between animals of control groups and after received alcohol. It seems possible that the lack of an essential participation of cholesterol in the intensification of response is generated by a high or low ethyl alcohol threshold of sensitiveness of animals.

In conclusion, it may be presumed that the differences observed mainly in the liver were induced by the effect of alcohol and a varied level of analgesia. These changes may be the result of adaptation response in order to maintain the systemic physiological homeostasis.

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Concentration of triacylglycerols and cholesterol in liver, kidneys and muscles of mice following exposure to ethyl alcohol

Abstract

Introduction and aim. The effect of ethyl alcohol on biochemical transformations of triacylglycerols is a widely discussed research problem. It may have practical importance for medicine and veterinary practice and procedures. The aim of the study was to assess the effect of specified doses of ethyl alcohol on the concentration of triacylglycerols and cholesterol in the liver, kidneys, and thigh muscles tissue in experimental mice selectively bred for high and low analgesia.

Material and methods. The experiment was conducted on mice selected for high (HA) and low (LA) analgesia. They were given specified doses of ethyl alcohol to assess the effect of alcohol on triacylglycerols and cholesterol concentration in the liver, kidneys, and thigh muscle tissues. It was measured by spectrophotometric method.

Results. A significant ($p < 0.05$) increase of triacylglycerols was observed in the liver in both the HA and LA groups. However, in the muscle of LA the level of triacylglycerols after exposure to alcohol *per os* was significantly ($p < 0.05$) lower vs. control values. Ethyl alcohol did not affect renal function. The level of cholesterol in the liver of control HA animals was significantly ($p < 0.05$) exacerbated, with respect to LA animals.

Conclusions. Observed changes, induced by the effect of alcohol and a varied level of analgesia, may be the result of adaptation response in order to maintain the systemic physiological homeostasis.

Keywords: triacylglycerols, cholesterol, mice, ethyl alcohol, analgesia

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Definitions and nature education

Introduction

Human beings have been exploring nature since the beginning of humankind. Nature is also present throughout our lives. Our attitude to nature evolves as we grow old. Similarly, the progress of civilization has changed our attitude to nature. Back in the mid-twentieth century, society was virtually unaware of how detrimental the blissful exploitation of nature could be to planet Earth. Nature has reached a tipping point where it can no longer deal with man-made pollution on its own. This only leads to the degradation of the natural environment. Eventually, people realized that the further destruction of the natural environment could lead to catastrophe and put life on Earth at serious risk.

Since the beginning of humankind, people have collected information on nature, most notably those types of data they would be able to use. The data were primarily concerned with the benefits and risks that nature produced for human kind. All these data added to the overall human knowledge of nature.

For a long time, nature education at the early stages of instruction was limited to providing factual information. This is best evidenced by textbooks on nature education from the early 20th century (Heilpern, 1917).

Which fields of study belong in the natural sciences? There is no single answer to this question. According to Sawicki, natural sciences include biology, chemistry, physics, and geography (Sawicki, 1981). However, some specialists see physics in the realm of the exact mathematical sciences. The author of *Zainteresowania młodzieży naukami ścisłymi* is a case in point (Elbanowska-Ciemuchowska, 2010). Physics may be regarded as an exact mathematical science because it uses definitions as a means of recording the equality of two expressions, which entails a definition of a particular value in mathematical terms.

In interwar Poland, teaching methodologists distinguished between animate and inanimate nature, and that is best reflected in the respective textbooks from that time (Dmochowska, Ziemecki, 1934, Gayówna, 1937).

Contemporary methods for teaching natural sciences have gone beyond the mere transmission of factual knowledge. The focus is on the acquisition of skills, where pupils are now able to browse for facts in the relevant literature and (increasingly) on the Internet. Arguably, rote learning has now given way to operational learning.

The current curriculum in natural sciences stipulates that pupils should be able to group elements according to the provided criteria and transform the knowledge they have (knowledge defined as a combination of skills and factual information). In order to do so, they need to be able to use definitions. The common understanding of a definition is that of classical kind.

Definitions in the process of nature education

The way the very definition of a definition is formulated and how these definitions are divided into classes depends on the author and their field of scientific enquiry. Structural division is considered the most fitting for teaching purposes. For this reason, a division furnished by linguistics will be used in this article (Mortimerowa, 1987). Accordingly, each and every way to elucidate words, terms, symbols, and concepts will be considered a definition.

Definitions can perform a number of functions: they can be used for the purpose of explanation, organization, classification, and identification; they also play a prominent role in interpersonal communication. Since they help to provide a shared meaning for both the sender and the receiver, definitions are also instrumental in the process of effective communication between teachers and pupils.

The role of definitions in nature education cannot be properly described without their prior classification. Essentially, definitions can be divided into two groups: verbalized and non-verbalized. Verbalized definitions can in turn be divided into parsed and non-parsed definitions. Non-parsed definitions can either be synonymous or hyperonymous. Parsed definitions represent the following types: classical, denotational, and contextual.

Nature education begins at the very early years of children's lives. A preliminary stage in the process is that of collecting facts. At this stage, facts are only passed on or taken in from the environment, without prior classification. Children are still unable to say if a particular item of information can be qualified as referring to nature. Their first teachers, who almost invariably are also their parents, provide children with the concepts they are most likely to come across in their environment. Far from systematic, this type of knowledge is more of a loose collection of terms that children come across or descriptions of items to be found in their surrounding environment.

Given the role of definitions in children's lives, which explains the meaning of a particular term or name of an item, one can safely assume that children come across definitions from very early on in their lives. An adult holds an apple in their hand, shows the apple to a child and says: "This is an apple". This statement can be classified with two categories. The first category identifies the name of the object on display. The second points to the object called "apple". The same procedure can be used when defining a plant called marigold. On one hand, it can convey the meaning of a term by pointing out an example; on the other, it can attribute the name to the object on display.

Definitions and explanations are not the only types of information conveyed to pupils, other types include descriptions, accounts, properties, applications, etc. This

manner of instruction is used not only at the early stages of education, but also at more advanced levels and even in selected subject glossaries. Pupils, especially at the very early stages of education, are often not able to fish out a definition from the text provided in such a way.

Pupils in early years education often find classical definitions too complex, which is why ostensive definitions are used instead, i.e., definitions which combine words with gestures (Mortimerowa, 1987). Ostensive definitions belong in the category of non-verbalized definitions. Definitions of this type play a prominent role in formative years of education. When someone points to a horse and says “this is a horse”, they use an ostensive definition. Definitions of this kind should not be combined with other types of information, e.g. horses are draught animals, they are used for transport or ploughing the fields, etc., horses are now replaced by machines. These definitions are commonly used for defining individual objects. It would be very challenging to introduce children to the natural world without these definitions. Ostensive definitions are also used at more advanced stages of education. For example, a teacher shows a glass vessel to pupils and adds the following verbal comment: “This is a beaker”. John Amos Comenius is believed to have pioneered the use of ostensive definitions in teaching, which is best reflected in the following passage: “Surely, then, the beginning of wisdom should consist, not in the rote learning of the names of things, but in the actual perception of the things themselves! It is when the thing has been grasped by the senses that language should fulfill its function of explaining it still further” (Komeński, 1956). However, the ostensive definition poses a certain threat to the process of cognition. As one shows a dog to a child, one barely knows which characteristic traits the child is going to process as those of the dog. That is why children can give the name “dog” to other animals they know. Thus, an ostensive definition is usually formulated in the following way: “This is a/an X”, with X denoting the object of the definition.

The classical definition plays a prominent role in nature education. Definitions of this kind are composed of a *definiendum*, copula, and *definiens*. Such definitions are simple in structure, and as such they are easy to understand. The *definiendum* comes at the beginning of the definition, which suggests this part is going to be explained. The copula can take different forms, including words such as “is” or “are.” Pupils particularly like definitions of this type, which is also often highlighted in textbooks. If the author fails to highlight the definition, pupils can do it on their own. Textbooks also happen to provide several definitions of one term: A middle-school textbook, which provides three definitions of acid, is a case in point.

1. Acids are chemical compounds that emerge through the reaction of non-metallic oxides with water.

2. Acids denote chemical compounds whose water solutions contain hydrogen cations.

3. Acids are chemical compounds that increase the number of H^+ hydrogen compounds in water solutions (Kałuża, Reych 1999).

The structure of these sentences suggests that they all act as definitions of the term “acid” and students understand them accordingly. That said, these sentences are hardly correct as definitions, and their educational value is dubious. The correct

equivalent of the first sentence should be as follows: "Some acids can emerge through the reaction of non-metallic oxides with water". The second definition should be: "Water solutions of acids contain hydrogen ions, or, more specifically, oxonium ions". The third sentence should in turn be: "An increase in the number of hydrogen (oxonium) ions in water solutions is caused by acids". For a definition to be correct, it must be reversible and regulative (Kotarbiński, 1986). In reversible definitions, both the *definiens* and *definiendum* must denote the same object. The reversible definition stipulates that $A = B$, where A is the *definiendum* and the *definiens* is B . For this reason, the definitions presented above are not definitions in the proper sense of the word because they are not reversible, the *definiens* and *definiendum* failing to denote the same object, one designating a broader class of objects than the other.

In the first sentence, the *definiendum* is too broad for the *definiens* to denote it, as in some cases acids emerge through the reaction of metallic oxides with water.

In the second sentence, the *definiendum* is too narrow for the *definiens* to denote it, as substances other than acid solutions also contain hydrogen ions.

In the third sentence, the *definiendum* is too narrow for the *definiens* to denote it, as substances other than acids, too, may cause an increase in the number of H^+ hydrogen ions.

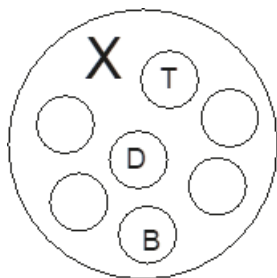
At certain stages of education, non-reversible definitions are an inevitable part of instruction. Chemical compounds with the NH_2 group in the molecule are a case in point. For school education purposes, the following statement is used: "Chemical compounds with the $-NH_2$ group in their structure are amines". This statement is absolutely true; however, it is unsuccessful as a definition of amines. It is true that compounds with the $-NH_2$ in their structure are amines. Nevertheless, selected amines do not contain the $-NH_2$ group in their structure.

The contextual definition belongs in the category of parsed verbalized definitions. Such a definition is often just a passage in a text or a sentence that may serve as a basis for the classical definition. Definitions of this kind tend to occur in textbooks. The following sentence is a case in point: "Anemometers are used for measuring the speed and direction of wind" (Encyklopedia geografii, 1999). The passage provides information on what an anemometer is. This sentence can also be used to formulate the classical definition of an anemometer. Thus, such a definition could be formulated as: "An anemometer is a device measuring the speed and direction of wind". This definition is in line with definitions from encyclopedias of natural sciences (Encyklopedia geografii, 1999). Definitions of this kind are more difficult to take in because the receiver has to identify the *definiendum* and match it with the part of the sentence containing the *definiens*. Some methodologists of teaching natural sciences argue that contextual definitions are more educational, as they make pupils analyse the text they read. Instead of being provided with the classical definition, pupils have to understand the contextual definition and then formulate a classical one. Definitions of this kind can be used at more advanced stages of education, be it secondary school or the final years of primary school.

Denotational verbalized definitions are a separate group; they are essentially used for defining collective notions. These definitions play a prominent role in

nature education, most notably at its early stages. That said, they are also necessary at more advanced stages of school education, including secondary school. The definition of electric charge is a case in point, where “there are two types of electric charge: positive and negative”.

When defining a notion which is also a set and marking it as “X”, the classical definition should not be provided because it is too difficult for the receiver. However, elements “T”, “D”, or “B” could be included as typical elements of Set “X” without mentioning other elements in the set. Figure R01 illustrates this dynamic.



Denotational definition (general model)

The statement “trees are linden, maple, or spruce” is a typical denotational definition used in the early years of education.

Synonymous definitions belong in the class of non-parsed definitions. The very name of this definition suggests that it provides a synonymous expression rather than explaining the nature of a particular phenomenon. Definitions of this kind explain the meaning of a particular term by providing a term already known to the receiver. That said, synonymous definitions are used too frequently at times. Statements such as “elements are simple substances” fail to elucidate the nature of the elements if the phrase “simple substance” was not previously explained.

Using definitions in classifications

With regard to definitions used in classifications, a study was carried out on the following statement “chemical compounds with the -NH_2 group in their structure are amines”. The statement provided above is a non-reversible definition. This definition helps students to classify a particular structural formula as a representation of an amine.

A hypothesis was offered where pupils could classify a particular structure as an amine based on structural formulas and the statement “chemical compounds with the -NH_2 group in their structure are amines”.

The statement “chemical compounds with the -NH_2 group in their structure are amines” was an independent variable, while formulas with the -NH_2 group in their structure were a dependent variable. Correct readings of structural formulas were used as an indicator.

The study was carried out on a sample of 106 middle-school third-graders. Pupils were not provided with the notion of amines prior to the study; however, they were familiar with notions such as hydrocarbons and alcohols and their structural formulas. The questionnaire survey was divided into two parts. One part contained the statement “chemical compounds with the -NH₂ group in their structure are amines”, the other provided structural formulas of eight different substances, five of which containing the -NH₂ group in their structure. 80% of the pupils provided five correct readings. Other pupils offered between one to four correct readings. Only one pupil offered no correct reading. The research hypothesis was confirmed in the study, demonstrated by the correct readings provided by the pupils.

Conclusions

Seemingly, definitions are easy to introduce in the process of nature education. However, this is far more challenging in practice. The major challenge is the structure of the *definiens*, which cannot contain two terms previously unfamiliar to pupils. In the teaching process, it is vital that in their *definiens* definitions provide terminology that is already familiar to pupils. The authors of encyclopedia entries, including those in subject glossaries, are not obliged to meet this requirement, as encyclopedia or glossary entries are provided in alphabetical order.

Many methodologists of teaching argue that teaching a new section of study should start firstly with presenting natural phenomena to pupils. Since crude oil can be found in nature, it is quite logical that the section on hydrocarbons should start with a discussion of crude oil as a fossil. This procedure seems correct and will surely find a large number of followers. Nevertheless, the definition of crude oil contains the term hydrocarbons, which is going to be introduced later. That is why, from a teaching point of view, such definitions should not be introduced at all. The term hydrocarbons can be replaced with a different term. However, this procedure results in a definition where the *definiens* is too elaborate. For this reason, as demonstrated above, teaching hydrocarbons should start with an overview of hydrocarbons and their definition instead of an overview of crude oil (Paško, 2013).

The classical definition seems to be the most accurate and unambiguous, and as such it is preferable in the education process. In some cases, it may be difficult or even impossible to use it. The choice of particular types of definitions in the process of nature education is an important task for teachers and methodologists of teaching, most notably authors of textbooks and teachers of natural sciences. When choosing a definition of a particular kind, one has to bear the age of their pupils in mind and, naturally, their previous knowledge of terminology. Teachers should select definitions which contain elements that are already familiar to their pupils. However, pupils must not only know the terminology, but also understand it. Teachers should choose definitions according to their objectives. They should choose contextual definitions whenever they plan to facilitate their pupils in formulating classical definitions.

Nature education is based on observations of nature and experiments performed by pupils. The observation of nature and experimental outcomes serve as

a basis for generalizations, which ultimately lead to the formulating of definitions. Definitions are also used when assigning observed elements to a particular set. As demonstrated in the study, a correctly structured definition allows one to assign particular elements to a particular set. This hypothesis was confirmed in a study where pupils were asked to assign amine structures to a set of amines, even though pupils had been provided no previous information on amines in class.

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Definitions and nature education

Abstract

Natural sciences include biology, chemistry, physics, and geography. The article offers a classification of definitions according to their structure. Different types of definitions were illustrated with suitable examples from the realm of the natural sciences. The article provided typical statements that are used in textbooks as definitions; however, these statements do not meet the structural criteria of a definition. Definitions other than classical and their role in the process of nature education were also presented. Research outcomes were quoted which show that correctly formulated definitions are very useful when assigning particular elements to a particular set. The article also elaborates on teaching methodology to be used when introducing definitions in nature education. Definitions of various kinds play a prominent role in nature education, which is based on observation and experiment.

Keywords: the role of definitions, types of definitions, nature education

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EDUCATION FOR SUSTAINABLE DEVELOPMENT – CHALLENGE AND LIMITATIONS.
PROSPECTS FOR IMPLEMENTING THE THIRD MISSION OF THE UNIVERSITY

Tetyana Borova, Tetyana Pohorielova

Leadership for sustainability as a reflection of students' professional responsibility

Introduction

Education in the world is currently undergoing major changes in almost every part of the system, from the buildings and grounds, the curriculum and assessment, to the sustainable and meaningful relationship between educational institutions and their local communities. Since leadership is often linked to school improvement, sustainability leadership can provide a framework for integrating these agendas, enabling a more strategic approach to addressing them.

Although the notion of sustainability is commonly associated with the environment and focuses on the need to sustain diversity and conserve our resources, lately many scholars emphasize its significant role in changing the educational paradigm and bringing up responsible leaders who are capable of working collaboratively to address complex sustainability challenges.

Hence, leadership has become a key component of an organization, management and administration of educational organizations and systems, and this development is reflected in both academic and educational policy statements throughout the world. Leadership for sustainability denotes a new and expanded understanding of leadership that signifies taking action based on common values, leading from a living processes paradigm, and creating a collaborative, responsible and reflective leadership process.

Literature review

Noteworthy are the studies on the essence of interactive learning principles that have been developed by such scholars as A. Verbitskiy, I. Alekseyev, P. Galperin, J. Athman, A. Hargreaves, D. Fink, M. Fullan, L. Stoll. The scientists consider a key function of sustainable education to help in bringing up skillful, reflexive and responsible leaders.

Among the variety of definitions of the term "sustainable leadership" suggested by different scholars, this paper reviews the widespread ones. According to the definitions suggested by D. Fink and A. Hargreaves (2006) sustainable educational leadership and improvement preserves and develops deep learning for all that spreads and lasts, in ways that do no harm to and indeed create positive benefit for others around us, now and in the future (Hargreaves, Fink, 2006). According to

L. Jackson, sustainable leadership goes beyond temporary gains in achievement scores to create lasting improvements in learning (Jackson, 2008). This is consistent with M. Fullan who views sustainability as the capacity of a system to engage in the complexities of continuous improvement that is consistent with deep values of human purpose (Fullan, 2005).

Considering the above mentioned facts, it is reasonable to study general analysis of leadership development in sustainability educational environment.

The aim and methods of the work

The objective of this work is analyzing and weaving together literature on leadership, leadership development, and sustainability education to suggest better practices in professional responsibility development.

The methods, used in the work, included a problem-solving, logical and systematic, as well as structural and functional analysis of resources.

Results and discussion

It is generally acknowledged that fostering leadership involves helping students to come to see themselves as leaders. Seeing oneself as a leader, with the capacity to introduce change and positively influence the world with others, can be a transformational process. To act effectively, it is necessary to constantly analyze and improve the activity performance, according to our research it is leadership. B. Davies considers that leadership development, based on sustainability education, will involve shifting to systemic, connective and ecological ways of thinking and learning and will be focused on transformational rather than transmissive learning processes (Davies, 2009).

Considering the above-mentioned, it is possible to highlight that transformational learning is essential to sustainability education and to fostering leadership because it signifies, as S. Lambert underlines, "a deep cultural shift in the basic premises of thought, feeling that action ... dramatically and permanently alters our being in the world". This shift can alter our understanding of ourselves, our relationships with the earth, our power relationships, our vision, sense of possibilities for social justice, different ways of living, and personal joy (Lambert, 2011).

According to S. Lambert, the following pedagogical strategies for leadership development with the core elements of transformational learning include: experience, critical reflection, dialogue, an integral, global orientation, awareness of context, and authentic relationships.

Having reviewed relevant concepts, we consider the following pedagogical strategies aim to cultivate: 1) a sustainable way of being through observation, self-awareness and reflection; 2) a living processes paradigm through the inclusion of ecological and diverse perspectives; and 3) all-embracing collaborative leaders through experiential learning in community.

We do believe that strengthening students' sense of community and deepening their sense of belonging to a region is needed for developing effective leaders who are all-embracing and collaborative. Moreover, we should remember about the fact

that human beings are a part of the global environment and we need to understand our interconnectedness and interdependency.

In the light of the idea that strengthening students' sense of community and deepening their sense of connectedness, this will facilitate the development of collaboration. Furthermore, effective leaders bring people together to collaboratively create a shared vision and strategies for change. We agree with J. Cook's suggestion that to develop leadership skills, students need opportunities to create environments of collaboration instead of competition (Cook, 2014).

First and foremost, building an authentic, trusting, learning community is one of the ways to strengthen their sense of belonging and encourage collaboration. This learning community should provide learners with the opportunity to express their values and beliefs. Building relationships within a learning community also requires individuals to reflect on how they relate to other individuals and the community as a whole. According to L. Jackson (2008), by engaging in collaborative projects, learners have the opportunity to make new relationships, to relate to and appreciate those different from themselves, and to practice communication and professional skills. Therefore, creating supportive and connected communities is crucial for developing students' ability to explore their own responsibilities. By practicing leadership in a meaningful context, learners have the opportunity to support others while also experiencing personal growth.

Secondly, working with students to identify topics they are passionate about or where they see themselves having opportunities to work for change can help them to take ownership of their experiences and ultimately connect more deeply with the idea of themselves as responsible leaders. Experiential leadership development can also strengthen students' connection to place. By participating in experiential learning, students have the opportunity to explore and interact meaningfully with local communities and ecosystems (Davies, 2009). Based upon this approach it is very important to organize special training courses for students on how to operate in a local community by engaging in problem solving and project work.

In the frame of our research we gave a questionnaire for the students of S. Kuznets Kharkiv National University of Economics that included questions concerning leadership development in sustainable educational environment. More than 250 student questionnaires were observed. The findings are such as: only 25% of the students preferred more competitiveness in comparison with collaboration approach, 10% were neutral. It signifies that 65% are ready to perform as effective leaders in a changeable cooperative environment. Other results of the survey showed that new approaches to training interdisciplinary course design with involving community needs are in high demand among students.

Conclusion

Sustainable education has led to a new paradigm in education and evolution of new concepts in learning content development and introduction of a number of innovative teaching methods. The introduction of the above-discussed interactive learning environment has the potential to dramatically influence the culture of modern education.

In this regard educators who are eager to incorporate sustainable education into their institutions to foster leadership and responsibility are recommended to teach from a variety of disciplines and use hands-on interdisciplinary techniques. Thus, modern sustainable tendencies in education substantiate the need to create a pedagogical environment that would enhance leadership and responsibility of future professionals. It would be logical to continue this research in this direction and reflect upon practical tools and techniques that will help educate responsible leaders able to respond to the interplay of economic, ecological and cultural systems in their regions.

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Leadership for sustainability as a reflection of students' professional responsibility

Abstract

The aim of this paper is to analyze and weave together literature on leadership, leadership development and sustainability education to suggest better practices in professional responsibility development. The main questions addressed in the paper are: to analyze the relevant core terms, revealed in the article, and highlight the impact of sustainable leadership upon formation of professional responsibility. It also touches principles of sustainable leadership, as well as conditions for promoting sustainable leadership.

Keywords: sustainable leadership, professional responsibility, sustainability education

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Knowledge of social campaigns regarding environmental protection among pedagogy students

Introduction

In the time of climate crisis, the media, both around the world and in Poland, have conducted numerous campaigns on environmental protection in order to prevent climate change. The fact that we live in the Anthropocene (the term used to describe the current geological era dominated by human activity) seems to be widely known (Stoner, Melathopoulos, 2015). Social campaigns are one way of raising public awareness on important environmental problems. This is reported by documents such as the 1996 report to UNESCO of the International Commission on Education for the Twenty-first Century "Learning: The Treasure Within" (Delors, 1996). The report concerns lifelong learning and its title adequately represents its content. There are four principles on which modern education should be based. It also indicates the values that are the basis of lifelong education, and refers to four philosophical traditions that those values can be rooted in.

The first rule reads "learning to know". It assumes that the goal of human life is to master the tools of knowledge rather than acquire encyclopedic and codified information. Every person should learn to understand the world around them, at least to such extent that they could take advantage of the opportunities created by education. This pillar of education is the domain of constructivism, which emphasizes the competence of the individual, and is based on the understanding of the processes taking place in the mind of the student. This theory was initiated by John Dewey, Lew S. Wygotski, Jean Piaget, and Jerome S. Bruner. They demonstrated arguments that humans actively construct their knowledge, and the social context plays an important role in this process. Therefore, the teacher should build and develop the students' knowledge by referring to their previous experience. Constructivism is the pursuit of weakening the role of traditional teaching-based education – a teacher's monologue, or even of its blanket rejection in favor of dialogue and partnership. This theory adopts the view that the reality we learn is an individual construction of a student, but it is created with the help of cultural tools and adopting the meanings (Bałachowicz, 2003).

The second principle of lifelong education – learning to do – is based on pragmatism. It points at the fact that since the first weeks of schooling, the child should understand that they step-by-step acquire tools that expand their abilities. Forming student's personality is the more effective, faster, and more complete, the more

comprehensively he or she realizes the practical importance of the gained knowledge, and the more varied are the forms of the students' activity. Each collected experience allows them to avoid previous mistakes, and it gradually teaches to better predict the effects of one's own actions. In this approach, acquiring competences that will allow to cope with various life situations constitutes the foundation. This process is later extrapolated to acts carried out within various social experiences; acts conducted in the context of local or national situations, as well as to formal work, which, thanks to the development of vocational training, allows to learn how to apply the acquired knowledge in practice. The pragmatic approach is based on the assumption that "if a problem can be defined, it can also be solved". John Dewey, a scholar who lived in the years 1859–1952, is considered to be the father of pedagogical pragmatism. He believed that education should be a practical undertaking and should help people in their everyday life. He argued that philosophers should focus on the problems of modern society to make philosophy useful. Including activity and practicality in the principles of upbringing is in line with Dewey's views (Tuszyńska, 2018).

The third pillar of education – learning to live together – refers to partnership and democracy. The human being occupies the very centre of interest of pedagogy. "There are no children, there are people", as Janusz Korczak wrote. According to this concept, interpersonal contacts should be based on partnership and mutual support. The improvement of the knowledge about other people, their culture, and spirituality allows us to avoid conflicts or solve them peacefully. The basic assumption of the principle of teamwork in education is that the student's development is more efficient the more she or he is focused on cooperation with the group in which they operate. Humans are social beings. Hence, they develop optimally only in contact with the environment. Conditions of cooperation or competition are created in the group, which facilitates the development of activity. Respect, fair judgment, and understanding should be expected from both the student and the teacher. Shaping the student's personality is all the more effective the more the teacher-students team is integrated.

The fourth principle-pillar described in the Delors' report reads: learning to be. It assumes that education should contribute to the development of personality of every individual. Attention is drawn here to the fact that each person is responsible for forming their own personality and critical thinking, and working out independent judgments. Everyone should decide on the rightness of their actions in various life circumstances. In pursuit of this goal, in the educational process one must not neglect any of the resources that belong to the person's life potential, i.e., memory, reasoning, sense of aesthetics, physical abilities, and communication skills. "Learning to be" is a principle that refers to humanism. It means the ideas of free human development, freedom, freeing the person from all superstitions, stimulating the human mind for independent research. A declared supporter of the idea of humanism, and a leading representative of neo-humanism in pedagogy was Wilhelm von Humboldt. He voiced the opinion that the main aim of the development of states is to provide citizens with freedom and the society with humanistic ideals. He emphasized the need to develop the personality of young people by making them having contact

with cultural goods that in particular meet their needs and interests. The idea of humanism is well reflected in modern principles of education: the principle of motivation and individualization. The more the knowledge satisfies the child's specific internal needs, the faster they absorb it. Every motivation is a need, but not every need is a motivation. It mainly depends on the intensity of this need: if it is strong, it becomes the incentive for action. The human being learns to distinguish good from evil; more valuable phenomena from the less valuable ones. The child's behaviour is most affected by changes in the environment and in the child themselves. The reason for the child's activity is the need that is perceived as the lack or excess of some life factor. Motivation, or realizing the need, encourages us to achieve a given goal. It is necessary for the educator to approach each student individually, because he or she has their own unique habits and as well as norms and behaviors. This is especially important if the student fails a moderately difficult task, when they are showing anxiety or inhibition in speech. Reaching the disturbances in individual cognitive dispositions, as well as in the sphere of values, dreams, desires, goals is not always easy.

The directions and recommendations included in the Delors report, which are the basis of lifelong education, show that formal education systems tend to favor access to knowledge and overlook other aspects of education. Education should be considered holistically. This vision should in the future inspire and guide those who design educational reforms, both in developing programmes and in defining a new educational policy, shaping values, skill to act, and democracy. Very individual virtues, often called "the ability to be," join together with knowledge and the ability to act and create the required competences. Education should maintain a link between different forms of education ("educational pillars") because the most important becomes the ability to communicate and work with others, to regulate conflicts and resolve them. The evolution of education forms cannot be accurately predicted, so it is difficult to say how to adapt education to future work. However, one should strive to achieve the best possible learning, living in a healthy and clean natural environment. Nowadays, this aspiration is best reflected by education for sustainable development (ESD).

Sustainable development is a widely recognized concept of social change that is a result of such management of natural resources that takes into account the natural environment and its significance for the life and health of future generations. Experience and observations of social media campaigns on climate protection, the fight against smog, and other pro-environment activities show that interest in the problem of environmental protection is high. We observe protests and appeals of children and young people directed to politicians. Non-formal education for sustainable development takes place in the media and on city streets. The question raised in the paper is: how effective is it? Does the campaigns' message and the knowledge promoted by them reach the recipients?

Methodology

The goal of the article is the answer to the above-presented question. We have asked pedagogy students of the Maria Grzegorzewska University in Warsaw about their knowledge of social campaigns on environmental protection. Based on the assumption that commitment to environmental protection is associated with a higher level of civic awareness, it is assumed that these issues, among other things, should be the result of pedagogical education. The main task of the educator is to bring up and transform knowledge of their students.

The research group consisted of 100 students aged 21–25. The study was conducted in January 2019 during natural environment education classes. The participants came from various years of study, including the last year of first degree (undergraduate) studies and the first and second years of second degree (Master's) studies. Among the campaigns listed in the questionnaires there were also some that were conducted a few years ago, so younger people might not remember them, which is why older students, i.e., at least 21 years old, were selected for the research.

The survey used a questionnaire regarding knowledge of social campaigns about the natural environment. The first part of the questionnaire was the question "Do you know the following campaigns?" and a request to mark "Yes" or "No" answer. The table contained 20 campaign names, including four non-existent ones that were invented for the purposes of the study. Non-existent campaigns were: "What do you know about warming" [„Co Ty wiesz o ociepleniu"], "Fight against the Wawel Smog" [Walcz ze Smogiem Wawelskim], "Garbage and fish have no voice" [„Śmieci i ryby głosu nie mają"] and "Don't smoke like a chimney because you create smog" [„Nie pal jak smok, bo tworzysz smog"]. They were included in the questionnaire in order to better verify the knowledge of the respondents.

The second part of the questionnaire consisted of seven questions in the form of a selection test that checked not only the knowledge of campaign slogans but also knowledge about them, i.e., what they were about, where and by whom they were carried out, and who took part in them. Each question included the "I don't know" option. In one question, a poster was used that was cropped in such a way that the slogan, which could reveal the campaign was not visible. At the end of the questionnaire, the respondents were asked to answer the two following open questions: "Do you know any campaigns that were not listed?" and "What are the sources of your knowledge about the natural environment protection?" One could choose among the following sources: school, college/university, media, social campaigns, and other (what?). The research tools are to be found in the appendices (the original questionnaire in Polish and its English translation) at the end of the article.

Analysis of the results

Knowledge of social campaigns on environmental protection among pedagogy students turned out to be relatively low. The campaign "You love children, do not burn litter" [„Kochasz dzieci nie pal śmieci"] was known by the largest number of people, i.e., it was declared by 30% participants, which, however, was not even 1/3 of the

respondents. In second place (24 people) there was the campaign "The first day without smog" [„Pierwsza doba bez smogu”], in which many celebrities appeared. Only 12% of people turned out to be familiar with the campaign organized by WWF "You are an endangered species" [„Jesteś zagrożonym gatunkiem”] despite the fact that its posters appeared three months earlier in numerous public transport vehicles. A similar result (15 people) was achieved by another campaign organized by WWF, namely "Porpoise hour" [„Godzina dla morświna”]. The results are presented in Table 1.

The questionnaire included five campaigns organized by the Ministry of Environment that were accompanied by the following slogans: "We create the atmosphere" [„TworzyMy atmosferę”], "The Pole saves heat even more" [„Polak tym bardziej oszczędza ciepło”], "Eco-style Basket" [„EkoSzyk”], "A house that saves for me" [„Dom, który dla mnie oszczędza”], "Don't litter your conscience" [„Nie zaśmiecaj swojego sumienia”]. Less than 10% of the participants declared knowledge of all the campaigns. Particularly noteworthy, due to the interesting form, is the campaign "The Pole saves heat even more" with the participation of the famous actor Stanisław Tym. It contained references to the film "Teddy Bear" (1980, directed by S. Bareja) and other cult Polish films. Another worthwhile mentioning campaign was "We create the atmosphere," which created as a series of humorous drawings by the famous cartoonist Marta Frej. However, the first of the mentioned campaigns turned out to be known only to five people; the second – to seven. The "Eco-style Basket" and "Do not litter your conscience" campaigns turned out to be the least recognizable by the respondents with the results of 4 and 3, respectively.

In turn, the non-existent campaigns turned out to be "known" by quite a large group of participants. As many as 33% of respondents declared they had known the non-existent campaign "Garbage and fish don't have a voice," on account of which it took the first place in the ranking. The explanation of such a high result may be the phenomenon referred to in psychology as the sleeper effect. It consists in the fact that over time there may occur a lack of association of the stored information with its source, and in consequence, there may appear, for example, an increase of the convincing power of an argument that came from a not very reliable, according to the listener, person, but the listener already forgot where the argument came from. The name of the fictional campaign "Garbage and fish don't have a voice" refers to the well-known saying "Children and fish don't have a voice," which most of the study participants must have, undoubtedly, heard before. In a similar vein one may probably explain a relatively large number of people (18% of all respondents) who declared knowledge of the fictitious campaign "Don't smoke like a chimney, because you create smog," which in the Polish language is based on a word-play and is also a well-known phraseme. However, only six people declared knowledge of the "What do you know about warming" campaign. Its name refers to the famous quotation from the film "Kiler" (1997, directed by J. Machulski) and mistakenly often associated with the film "Dogs II: Last Blood" (1994, directed by W. Pasikowski), as well as to with a bank advertising campaign with the slogan "What do you know about saving?" The alleged acquaintance of the latter fictional campaign was significantly

lower, which may stem from the age of the participants, who were too young to remember these films and a quote with the cult status.

Table 1. Respondents declaring the knowledge of individual social campaigns [n = 100]
(Fictitious campaigns are marked with the letter "F")

The campaign	%
Garbage and fish don't have a voice (F) [Śmieci i ryby głosu nie mają]	33
You love children, do not burn litter [Kochasz dzieci nie pal śmieci]	30
The first day without smog [Pierwsza doba bez smogu]	24
Fight against the Wawel Smog (F) [Walcz ze SmoGiem Wawelskim]	24
Together we can help Poland breathe [Razem możemy pomóc Polsce odetchnąć]	19
Don't smoke like a chimney, because you create smog (F) [Nie pal jak smok, bo tworzysz smog]	18
Porpoise hour [Godzina dla morświna]	15
You kill with the smoke from the stove [Dymem z pieca zabijasz]	14
Unmask My City [Demaskujmy smog przez cały rok]	12
You are an endangered species [Jesteś zagrożonym gatunkiem]	12
A house that saves for me [Dom, który dla mnie oszczędza]	9
Don't litter in the net [Nie śmieć w sieć]	9
Diet change not climate change [Zmieniaj dietę, nie klimat]	8
We create the atmosphere [TworzyMy atmosferę]	7
Rivers Guardians [Strażnicy rzek]	7
With a camera among litter [Z kamerą wśród śmieci]	6
What do you know about warming (F) [Co Ty wiesz o ociepleniu]	6
The Pole saves heat even more [Polak tym bardziej oszczędza ciepło]	5
Eco-style Basket [EkoSzyk]	4
Don't litter your conscience [Nie zaśmiecaj swojego sumienia]	3

The second part of the survey, conducted in the form of a multiple-choice test, has also revealed respondents' lack of knowledge about individual campaigns. For all questions, the answer "I don't know" was most frequently marked.

Question No. 1 read "Who organized the 'Adopt a bee' campaign? 23% of the participants knew the correct answer, which is a high score compared to others obtained in this study. It is likely, that the location where the study was conducted, Warsaw, was of significance. In the centre of the capital, there were many Greenpeace volunteers who asked for support for various initiatives, so presumably the study participants may also have encountered them. The second most frequently chosen answer (7%) was "WWF," i.e., another well-known organization that organizes numerous campaigns for the protection of endangered species. 70% of respondents marked the answer "I don't know."

Question No. 2 concerned the city, where the Green Tram rode. The vehicle that was part of the anti-smog campaign in Upper Silesia in October 2018 was riding in Katowice and neighbouring cities. The tram was painted green with floral motifs and plants inside. Only 15% knew the correct answer. The location might have been influenced the answers. If people living in Katowice were asked, the percentage of the

respondents who would know the answer would probably be much higher. People living in the capital could learn about it only through the media. 14% of respondents associated the initiative with other cities (Warsaw – 7% and Poznań – 7%), while 71% of respondents marked the answer “I don’t know.”

Question No. 3 read “What event did the WWF campaign ‘You are an endangered species’ refer to?” Only 12% chose the correct answer, which was the climate summit in Katowice. More people mistakenly associated the campaign with two other events that were widely reported in the media: the smog alert (16%) and the cutting down of the Białowieża Forest (16%). The answer “I don’t know” was marked by 56% of respondents.

Question No. 4 read “Who is the author of humorous drawings for the ‘We create the atmosphere’ campaign?” Only 7% of respondents declared knowledge of this campaign, while only one person knew the correct answer to the question about the author of the drawings (Marta Frej). 10% of participants marked the answer “Andrzej Mleczko,” which could stem from the fact that this cartoonist is well-known and addresses various topics in his works, including the ecological ones. 89% of participants marked “I don’t know.”

Question No. 5 asked about actors who took part in the “First day without smog” campaign. Numerous celebrities participated in it, including Mateusz Damięcki, Szymon Hołownia, Małgorzata Foremniak, Joanna Jabłczyńska, and Magda Gessler. As it turned out, none of the participants on the study remembered that the actor Arkadiusz Jakubik appeared there as well. Most people chose Marek Kondrat (10%), who took part in another advertising campaign on smog organised by ING Bank Śląski. 3% of participants marked Tomasz Kot, an actor at the peak of his popularity, but who has not participated in this campaign.

Question No. 6 concerned one of several posters promoting the “Year of the Vistula River” campaign. Although the questionnaire was cropped in such a way that the slogan “Vistula drags in” [„Wisła wciąga”] was not there, the poster still remained quite characteristic in its form. In 2017, those posters were hanging all across Warsaw, e.g., at bus stops. As it turned out, only 20% of participants recognized the poster and answered correctly which campaign it came from. The same number of participants associated the poster with completely different initiatives. 60% of respondents checked to answer “I don’t know.”

The next question concerned which area was addressed by the “With a camera among litter” campaign. It is a parody of a documentary, where individual types of garbage are presented as animal species, e.g. a pet cigarette is Cigarette Buttus, the bottle is Emerald Bottlebill. The narrator of the film is Krystyna Czubówna, and the title of the film refers to the TV show “With a camera among animals.” Only 10% of respondents knew the content of the film, while the vast majority of the people participating in the study was not aware of the campaign at all. Upper Silesia and the Gulf of Gdańsk were wrongly chosen by 4% of respondents each. 82% of people marked the “I don’t know” answer.

The last question read: “Do you know any campaigns that were not listed?” Respondents named the following campaigns (in the absence of the exact campaign name, the participant’s description was quoted):

- Stop smog [Stop smog];
- All of Poland reads to kids [Cała Polska czyta dzieciom];
- Bottle from nature [Butelka z przyrody];
- Hold your breath / Hold your breath if you do not want to breathe smog [Wstrzymaj oddech / Wstrzymaj oddech, jeśli nie chcesz oddychać smogiem] (7 people);
- Campaign regarding plastic straws / Drinking without disposable straws [Akcja o słómkach plastikowych/Picie bez słomek jednorazowych];
- WWF wolf protection campaign [Akcja o ochronie wilków WWF];
- Friends are not thrown away [Przyjaciół się nie wyrzuca];
- Package for a homeless person [Paka dla bezdomniaka];
- Public television campaign on smog made for children [Kampania TVP o smogu dla dzieci];
- Campaigns on violence [Kampanie dotyczące przemocy];
- Campaigns addressing drunk driving [Kampanie dotyczące jazdy po alkoholu];
- Drive carefully [Jedź ostrożnie].

Participants listed only six campaigns on environmental protection that were not given in the questionnaire. Seven people mentioned the “Hold your breath” (“Hold your breath if you do not want to breathe smog”) campaign, although no such campaign was organized. Presumably, the participants had in mind the “First day without smog” campaign, where, in the video, we see celebrities holding their breath.

The answer chosen the most to the question “What are the sources of your knowledge about the natural environment protection?” was “media.” Among the answers indicated as other, where the participants could name the sources not listed in the proposed answers, the respondents wrote down the Internet (2 people) and Facebook (1 person). The number of answers adds up to more than 100 because more than one option could be selected.

Table 2. Sources of respondents’ knowledge about the natural environmental protection [n = 100].

What are the sources of your knowledge about the natural environment protection?	%
media	81
college/university	36
social campaigns	18
school	3
other: Internet	2
other: Facebook	1

According to the research on the level of ecological awareness conducted among students, the media, and mainly the Internet, play an important role as a source of knowledge about the natural environment. For example, more than half of the students of the Agricultural and Technical University and the Pedagogical University in Olsztyn, when asked who or what had an impact on their attitude towards the environment, replied that it was the mass media (Szulborski, 2001). Moreover, the students of the Medical University of Poznań claimed that for them the source of

knowledge about the environment was the Internet (75.3%), television (67.3%), and the university classes (66.7% of the respondents) (Poniedziałek, Rzymski, 2010).

Summary and conclusions

It should be stated that knowledge of social campaigns on environmental protection is relatively low, and is, therefore, not satisfactory. What is more, the respondents, i.e., pedagogy students, are future teachers and educators, whose responsibilities will also include fostering their pupils' ecological sensitivity, their interest in the natural environment, and positive attitude to it.

Nowadays, the creators of social campaigns have numerous tools to enhance or make more attractive the message they want to convey through the campaign; the tools that would be difficult to apply or not necessarily appropriate for formal education, e.g., the participation of well-known and liked celebrities, humor, the use of a stronger message in order to shock (to a reasonable extent) the recipients, generate cognitive dissonance in order to induce self-reflection. As a result, the campaigns became an interesting and important complement to what formal education offers. Therefore, one should consider why this source of knowledge and shaping attitudes is so little known and reaches such a small group? Is it the fault of the potential recipients who are not interested? Should the campaign organizers or contracting entities change the form of distribution? Presumably, the truth lies somewhere in the middle.

One explanation for the low awareness of the campaigns, which is demonstrated by the presented study, can be found in a 2012 research on the students' support for various institutions and initiatives (Ciężela, 2014). The participants declared low support for environmental initiatives in comparison to other types. The protection of an endangered animal species and the construction of an environmentally friendly facility received lower support than an addiction therapy centre; and the ecological organization obtained lower support even than helping motorcyclists after accidents caused by fast and reckless driving. This may indicate that students are not interested in environmental protection campaigns due to low support for this issue in general. On the other hand, however, one can also consider the existence of an inverse relationship, i.e., the lack of support could be linked to low knowledge of what ecological campaigns are about, and what their goals are. Perhaps, more light on the problem could be shed by the studies that would compare the knowledge of campaigns on environmental protection with campaigns on other topics, such as "All of Poland reads to kids" that was mentioned by the participants of this study, or other social companies addressing violence and drunk driving.

This sad picture of the low level of civic awareness in relation to environmental protection is the result of the low level of formal education in this area. Despite the alarms about increasing concentrations of environmental pollutants, their disastrous impact on human health, the climate catastrophe, formal education does not fulfill its role. In the core curricula of general education, protection of the environment and human health is not given its proper place. Moreover, in academic education, especially in humanities and social sciences, these issues are ignored as

well. On the list of graduate competences, there is just one general statement that says that a graduate should be convinced of the need for lifelong learning.

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Appendix 1:

Research tool used – a questionnaire consisting of a survey and a selection test regarding the knowledge of the campaign and two additional questions [translation of the original questionnaire in Polish]:

Do you know the following campaigns?

1.	We create the atmosphere	YES / NO
2.	First day without smog	YES / NO
3.	You are an endangered species	YES / NO
4.	Together we can help Poland breathe	YES / NO
5.	Unmask my city	YES / NO
6.	The Pole saves heat even more	YES / NO
7.	Rivers Guardians	YES / NO
8.	What do you know about warming?	YES / NO

9.	Porpoise hour	YES / NO
10.	You love children, do not burn litter	YES / NO
11.	Fight against the Wawel smog	YES / NO
12.	Eco-style Basket	YES / NO
13.	Don't litter your conscience	YES / NO
14.	With a camera among litter	YES / NO
15.	You kill with the smoke from the stove	YES / NO
16.	Don't litter in the net	YES / NO
17.	House that saves for me	YES / NO
18.	Diet change not climate change	YES / NO
19.	Garbage and fish have no voice	YES / NO
20.	Don't smoke like a chimney because you create smog	YES / NO

Please select the correct answer by circling. If you do not know the correct answer, please mark the "I don't know" answer:

- Who organized the "Adopt a bee" campaign?
 - Greenpeace
 - WWF
 - Our Earth
 - Gaja Club
 - I don't know
- In which city did the green tram ride?
 - Warszawa
 - Katowice
 - Poznań
 - Olsztyn
 - I don't know
- What event did the WWF campaign 'You are an endangered species' refer to?
 - the climate summit in Katowice
 - smog alerts
 - cutting down the Białowieża Forest
 - hurricanes in Poland
 - I don't know
- Who is the author of humorous drawings for the 'We create the atmosphere' campaign?
 - Andrzej Mleczko
 - Henryk Sawka
 - Szczepan Sadurski
 - Marta Frej
 - I don't know
- Who took part in the "First day without smog" campaign?
 - Tomasz Kot
 - Marek Kondrat
 - Arkadiusz Jakubik
 - none of the above

e) I don't know

6. What campaign does this poster come from?



- a) River guards
- b) Not for smog
- c) Year of the Vistula
- d) Hour for porpoise
- e) I don't know

7. What area does the "With a camera among litter" campaign concern?

- a) the Vistula River
- b) Upper Silesia
- c) the Kampinos Forest
- d) the Gulf of Gdańsk
- e) I don't know

Do you know any campaigns that were not listed?

What are the sources of your knowledge about the natural environment protection?

- a) school,
- b) college / university,
- c) media,
- d) social campaigns
- e) other (what?)

Appendix 2:

[Original questionnaire in Polish]

Czy znasz następujące kampanie?

1.	TworzyMy atmosferę	TAK / NIE
2.	Pierwsza doba bez smogu	TAK / NIE
3.	Jesteś zagrożonym gatunkiem	TAK / NIE
4.	Razem możemy pomóc Polsce odetchnąć	TAK / NIE
5.	Demaskujmy smog przez cały rok	TAK / NIE
6.	Polak tym bardziej oszczędza ciepło	TAK / NIE
7.	Strażnicy rzek	TAK / NIE
8.	Co Ty wiesz o ociepleniu?	TAK / NIE

9.	Godzina dla morświna	TAK / NIE
10.	Kochasz dzieci nie pal śmieci	TAK / NIE
11.	Walcz ze SmoGiem Wawelskim	TAK / NIE
12.	EkoSzyk	TAK / NIE
13.	Nie zaśmiecaj swojego sumienia	TAK / NIE
14.	Z kamerą wśród śmieci	TAK / NIE
15.	Dymem z pieca zabijasz	TAK / NIE
16.	Nie śmieć w sieć	TAK / NIE
17.	Dom, który dla mnie oszczędza	TAK / NIE
18.	Zmieniaj dietę, nie klimat	TAK / NIE
19.	Śmieci i ryby głosu nie mają	TAK / NIE
20.	Nie pal jak smok, bo tworzysz smog	TAK / NIE

Proszę zaznaczyć prawidłową odpowiedź poprzez zakreślenie kółkiem. W przypadku braku znajomości prawidłowej odpowiedzi, proszę zaznaczyć odpowiedź „nie wiem”:

- Kto organizował akcję „Adoptuj pszczołę”?
 - Greenpeace
 - WWF
 - Nasza Ziemia
 - Klub Gaja
 - nie wiem
- W jakim mieście jeździł zielony tramwaj?
 - Warszawa
 - Katowice
 - Poznań
 - Olsztyn
 - nie wiem
- Jakiego wydarzenia dotyczyła kampania organizowana przez organizację WWF pod hasłem „Jesteś zagrożonym gatunkiem”?
 - szczytu klimatycznego w Katowicach
 - ogłoszenia alarmu smogowego
 - wycinania Puszczy Białowieskiej
 - huraganów w Polsce
 - nie wiem
- Kto jest autorem rysunków humorystycznych do kampanii TworzyMY atmosferę?
 - Andrzej Mleczko
 - Henryk Sawka
 - Szczepan Sadurski
 - Marta Frej
 - nie wiem
- Kto wziął udział w kampanii „Pierwsza doba bez smogu”?
 - Tomasz Kot
 - Marek Kondrat
 - Arkadiusz Jakubik

d) nikt z wymienionych

e) nie wiem

6. Z jakiej kampanii pochodzi ten plakat?



a) Strażnicy rzek

b) Nie dla smogu

c) Rok Wisły

d) Godzina dla morświna

e) nie wiem

7. Jakiego terenu dotyczy kampania „Z kamerą wśród śmieci”?

a) rzeki Wisły

b) Górnego Śląska

c) Puszczy Kampinoskiej

d) Zatoki Gdańskiej

e) nie wiem

Czy znasz jakieś kampanie, które nie zostały wymienione?

Z jakich źródeł czerpiesz wiedzę na temat ochrony środowiska?

a) szkoła,

b) uczelnia,

c) media,

d) kampanie społeczne

e) inne (jakie?)

Knowledge of social campaigns regarding environmental protection among pedagogy students

Abstract

The subject of the paper is the knowledge of social campaigns regarding the natural environment among students of pedagogy at the Maria Grzegorzewska University in Warsaw. The article presents the results of research on the knowledge of names and issues of the campaign conducted in January 2019 in a group of 100 people. The knowledge about the campaigns turned out to be low. Most of the listed campaigns were known only to a small percentage of respondents. Even the campaigns carried out shortly before the study and widely promoted by numerous posters in the city were known only by the few participants. The research leads to the conclusion that the interest among the pedagogy students in education for sustainable development, and in particular in the protection of the natural environment is low and thus there is a need to include these issues in academic programs, especially in the curriculum of humanities and social sciences.

Keywords: social campaigns, natural environment, environment protection, education for sustainable development

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Barriers and limits in activities for sustainable development based on the example of the Polish public pedagogical university – current status, perspectives and good models of intersectoral partnership

Sustainable development is now a widely recognized concept of social and economic changes, according to which they should be carried out with respect for the natural environment (not only for the present but also for future generations). Pedagogy, as a social science based on values, aims to raise a man responsible for himself and the environment, and thus also for the optimal development of civilization. For this reason, pedagogy is the most natural ally of the idea of sustainable development.

However, the experience of recent years and problems with the implementation of the idea of sustainable development in teacher education in Poland show that academic pedagogy needs support from third parties able to finance some non-standard educational projects.

First of all, it is about promoting education for sustainable development within lifelong education (so that every member of the society understands the essence and principles of sustainable development, but above all, that these values can be expressed in his attitude and everyday choices). In the teacher training, this is particularly important because they are, due to the professions related to upbringing, the natural leaders of social, and therefore civilization changes.

Their educational leadership in local communities is not limited to responsibility for children education. Through children, but also in direct contact with all other members of local communities from the school's orbit, teachers are responsible for lifelong education in this environment. Intersectoral partnership could here consist of joint responsibility for training of the leaders of education for sustainable development, which teachers should become in their local communities.

The benefit seems to be mutual. Academic pedagogy in Poland has a long tradition of education in relation to the cultural needs of society, but it is not very sure in the field of education in relation to civilization needs (especially those that translate into the economy) and needs external partners. Unfortunately, in the field of business in Poland, we do not have a tradition of understanding "implementation projects" as such, which begin at the level of education system, where business objectives begin to develop by raising young generations, and even a step earlier: in

the professional preparation of those who in the future will be responsible for upbringing. It seems, therefore, that both parties would benefit from the intersectoral partnership in educating pedagogues for sustainable development: academic pedagogy and the economy.

The ideal model of lifelong education in relation to the cultural and civilization needs of contemporary societies is described in the Report of J. Delors, for the International Commission for Education of UNESCO for the 21st century. There are four pillars of education which worth reinterpreting. The report is entitled: Education: there is treasure hidden in it.

The first of the four pillars – “Learning to know” – emphasizes that learning is not about acquiring and possessing knowledge, but about mastering the tools that are necessary to understand the world and to take advantage of the opportunities offered by education. This understanding of education is the domain of constructivism. It assumes that knowledge is the own construction of the mind, dependent on the experiences and possessed views. The constructivist approach encourages constant questioning of possessed knowledge – it becomes a dynamic resource that still leaves field for new discoveries. Therefore, an effective teacher should know and use the cognitive models that students use to explain the environment in which they live. These models are focused on research independence, drawing conclusions based on the source data available to the student. The teacher becomes a co-constructor of the student’s knowledge, he stops only passing and enforcing, and becomes a guide and translator (Brooks, 1993)¹.

“Learning to do” – learning to act is the second pillar of lifelong education. This includes the idea of education, as acquiring competences that allow you to deal with different situations, act within various social experiences, in different contexts and needs of yours and your environment. The principle of “learning to act”, postulates education to constant readiness, “predisposition”, openness and sensitivity to the changing reality.

“Learning to live together” – the third pillar – emphasizes the need for continuous enrichment of knowledge about others, which helps to avoid conflicts or solve them peacefully. Sustainable education, caring for the welfare of humanity now and in the future, is education based on the understanding that both successes and failures usually have many fathers, facilitating the perception of interdependence and understanding of the other. Man is a social being, he develops optimally only in relationships. This community creates conditions for cooperation and competition, and these mobilize for activity. Model education for sustainable development is a training to care for common.

The fourth pillar of modern education should be the principle “Learning to be” – referring to humanism. It formulates towards the education system a postulate to stimulate the human mind to research itself and its own needs. Man absorbs knowledge faster, the more he satisfies his specific inner need. Education should help in discovering, naming and valuing the individual’s needs, and thus raising them.

1 Brooks J.G., Brooks M.G., (1993), *In Search of Understanding: The Case for Constructivist Classrooms*. Alexandria, VA: Association for the Supervision and Curriculum Development.

All these pillars had a postulative character twenty years ago. Their role was to direct education to raise integral and mature people so that they would create “sustainable” societies. Although Poland in the sphere of political declarations joined the international activities for education for sustainable development, it quickly turned out that institutional support is insufficient and there are no systemic solutions².

The main animators of education for sustainable development have become natural science teachers and the academic environment related to environmental protection. Several international pedagogical projects were created with the participation of Polish teachers (e.g. “Education for Change” – a project financed from the European Union funds under Comenius 2.1.). Almost all these activities were limited to narrowly understood education for sustainable development as pro-ecological activities. Unfortunately, the idea of education for sustainable development has not broken through in Poland as an impulse for community-based, upbringing activities far beyond the natural aspect.

This situation has many causes. In the inheritance after the socialist era, practical training, closer to the economic needs of society, still carries a less prestigious stigma. Hence, universities in Poland consider it a point of honor to conduct academic studies, although Polish law gives the opportunity to conduct them in the form of studies with a practical profile. In the area of pedagogical sciences, practical studies are even considered as proof that the university has failed to achieve university standards. For this reason, the postulate “Learning to Act” is present in the content of educational curricula in Poland only as a theory. More often, the future teacher hears about learning in action than works to learn it. The minimum of action enforced by law is the practice in educational institutions related to the field of study. Volunteering, related to over-personal personal commitment and dedication, nowhere in Poland is an integral part of the studies. The state does not require the university to promote voluntary activities, and the lack of a social tradition of such activities is not conducive to their self-reliance among students. In Poland, the ethos of social involvement is still low – it is also a remnant of the era of forced “common” domination over “individual” in socialist times. As pedagogy at the academic level is not involved in projects related to community activities, the local community, especially business, does not see any benefits in cooperating with the academics’ environment, and in particular the sense of engaging financial resources in this cooperation. It will not be an exaggeration to say that there is a kind of undercoat between the two sides, a sense of superiority between the French model of separation of the state and the Church.

A major obstacle to the implementation of the idea of sustainable development is also dominant in Poland substantive type of patriotism. Unlike the conventional type, it focuses on the community of territory and blood. Historical conditions have meant that belonging to the community, in the belief of the majority of Poles, is acquired due to birth, not because of its usefulness for the community or its own contribution and merit in building its cohesion and prosperity – as it is in the United

2 T. Borys, P. Rogala (eds.), (2008), *Jakość życia na poziomie lokalnym*, UNDP Polska, Warszawa 2008.

States, a country built by immigrants. Although the “substantial” understanding of patriotism now brings many negative effects, new obstacles constantly appear to change this situation. In education in Poland, the emphasis is now on individualization – this is not conducive to building a sense of positive reciprocity between people. Individuality is built in opposition to others. As a consequence, the “stranger” will always remain “foreign” and “different”, and as many Poles think this is good. That is why it is difficult to implement the American model of a citizen as a shareholder in Poland: you can draw on a common if you have invested first (“Do not ask what the country can do for you, ask what you can do for the country”). Perhaps this is also why the implementation of the idea of “Learning to Live”, emphasizing personal responsibility for the community, still faces resistance in Poland.

To better understand at what stage, after twenty years from the J. Delors Report, education for sustainable development in Poland is, in 2017 an analysis of educational programs in pedagogy faculties in sixteen of the largest universities in Poland was undertaken. It turned out that neither in the name nor the contents of any of the currently run subjects there is the term “sustainable development”. At the Maria Grzegorzewska University in Warsaw, in the academic year 2017/2018, for the first time a general university subject called Education for Sustainable Development was included in the education program. The subject is obligatory for students of the second year of MA studies in the field of pedagogy (for all specialties, teachers and non-masters). Its introduction created an opportunity to implement the second part of the research project: at the beginning of the classes, the lecturers conducted a survey diagnosing the level of students’ awareness of the goals, tasks and manifestations of sustainable development. The group covered by research included 23–25 year-olds, who would soon receive the right to take positions of educators at various levels of education and care for children and youth, they would also deal with shaping educational policy in Poland and with pedagogical counseling ($N = 226 = 100\%$). The participants of the study have completed first degree pedagogical studies at various universities in Poland. A large part of the surveyed group, in parallel with the second-cycle studies, have already started work in accordance with the qualifications granted to them by bachelor studies: 82% of respondents declared employment in various educational institutions. The rest also work, and even though outside the profession it can be said that all respondents have a certain professional and life experience.

The study did not require the respondents to know terminology or the theory of sustainable development. For the purposes of the survey, “awareness of sustainability issues” was understood as (also intuitive) knowledge, views, declared skills and readiness to take actions for the benefit of the environment in the spirit of the idea of sustainable development. The problems diagnosed in the study mainly concerned:

- general knowledge of students about: the condition of the human environment, its responsibility for this state, the personal sense of student’s efficiency in this area and their diagnosis of social demand for education in the scope of sustainable development goals,
- views on human responsibility for sustainable development,

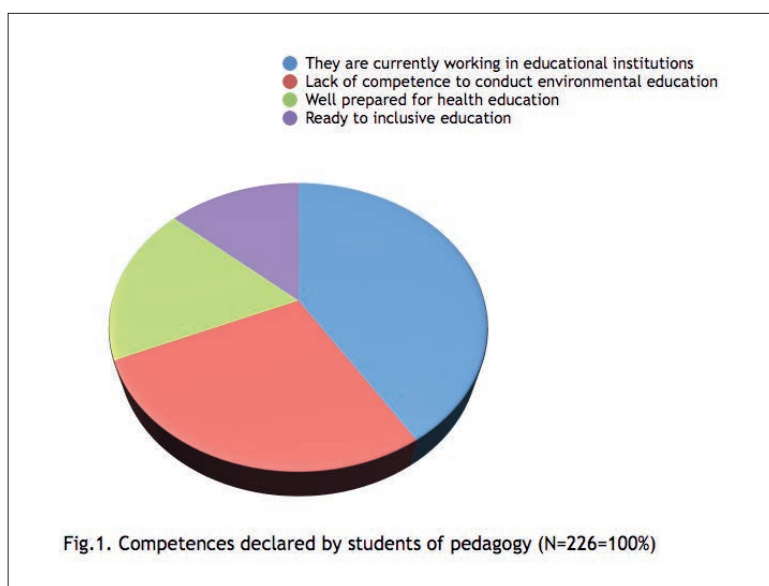
- own activities and students' readiness to take actions for sustainable development.

Although the researchers are aware that only questionnaires, opinions and feelings can be examined using the questionnaire, the results seem symptomatic and worth describing.

Over a third of respondents (36%) are considered to be well prepared to conduct health education activities among children, slightly more than a quarter (27%) is ready to engage in inclusive education (Fig. 1). Both these areas – thematic and methodical – belong to the issues that are of particular interest to education for sustainable development. At the same time, more than half of respondents (55%) declare lack of competence to conduct education for their environment (Fig. 1). A large percentage (20%) chose the answer “I have no opinion”, revealing the lack of prior interest in the subject, and thus probably lack of competence.

Already from the first cursory analysis, it follows that the understanding of the social role of teachers is narrowed only by students of pedagogical studies to those activities that are confined by school walls and related to the transfer of knowledge.

The weight that the subjects attach to knowledge can be seen in other areas of the study. In verifying questions (on sources of information about the environment, on education for the environment and man's responsibility for the environment), students declare that their information comes from scientific journals (95%). Internet (86%) and television (32%) ranked second (Fig. 2.). Declarations on scientific journals should probably be treated as an attempt to create their own image, but it is an interesting attempt. It seems that here also the students confirm how deeply important the image of “the teacher as a person who knows” (knowledge as



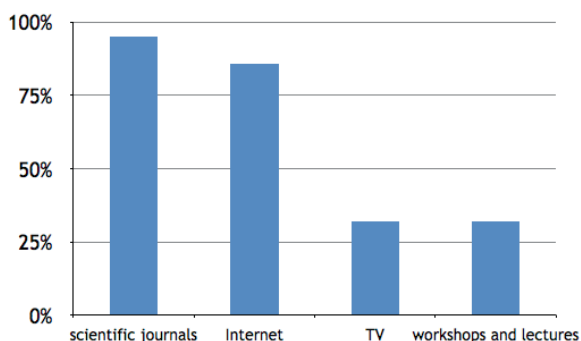


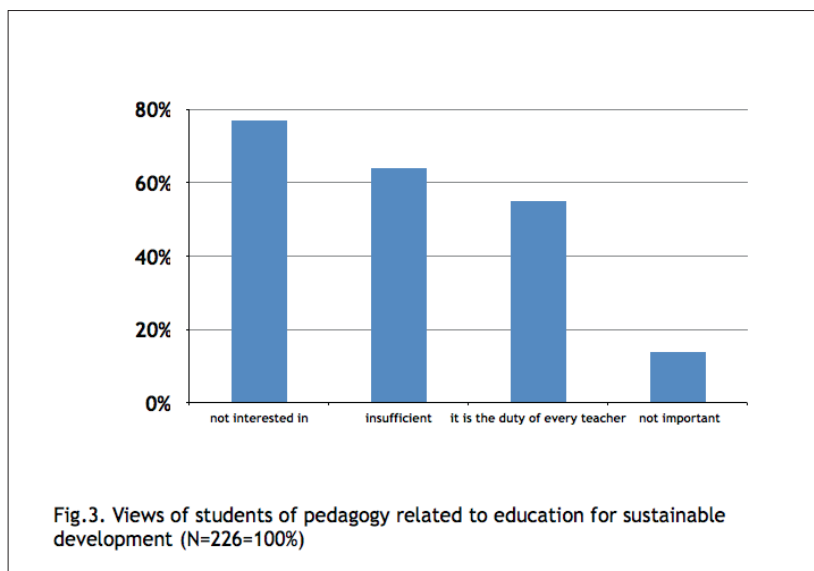
Fig.2. Sources of knowledge declared by educators (N=226=100%)

legitimization of the role) is and how they perceive the teacher's role: "I know and transmit this knowledge myself".

It is also significant that only a very small percentage of respondents give academic and other forms of education as a source of information on sustainable development. Most of the respondents are people who have completed undergraduate studies at various universities and teacher studies. Only 32% of them have ever participated in courses or trainings concerning education for the environment, there were few declarations that the knowledge and skills in education for sustainable development were acquired in practice and outside the walls of the facility (e.g. during field activities) (Fig. 3). And yet the whole of Poland is covered by a network of field nature trails, social, and historical, designed to educate local communities in the spirit of responsibility for their surroundings. There are countless organizations and non-governmental institutions in Poland that conduct such activities. This shows another problem of the Polish education system at all levels: the poor cooperation of educational institutions with the environment. Respondents, when asked about examples of environmental educational paths in their area, in 77% refused to answer ("I do not know" or no answer).

The results of this study should be treated as a red card for us, representing academic pedagogy. It should be noted, in the context of the first pillar of education for sustainable development, that attempts made for years to make education less encyclopedic and more focused on the learning processes, action, and especially cooperation, remain only in the stage of postulates. Students at the end of preparation for the teaching profession still present the conviction that their role is mainly the transfer of knowledge and the way they were taught: in the walls of the school hall.

The presented research allows for, on the other hand, cautious optimism in looking into the future. Over half of the respondents (55%) agree with the statement



“The duty of each teacher is to conduct education for sustainable development, e.g. through the implementation of educational projects”. Only 14% of respondents considered only insignificant content and tasks of sustainable development in education (Fig. 3).

Since most of the respondents admitted to work and have experience in pedagogical professions, it seemed reasonable to ask their opinions about the desired forms of teacher training. Up to now 74% of respondents considered completed studies and forms of improvement as insufficient (Fig. 2). It turned out that half of the respondents considered the updating and supplementary workshops run by academic centers as the most valuable (guaranteeing the quality of transmitted content) form of professional development. To confirm this thesis, it is worth mentioning that some of the students admitted to studying in parallel at post-graduate studies, giving various additional professional qualifications.

Respondents expressed interest primarily in such forms of professional development that would enhance their creative competence. They are expecting more methodological classes to teach children to become active and to design teaching aids useful also for students with special educational needs. Many of the respondents showed a need for training in the area of implementing joint projects with the local community. It seems that here finally, from the declarations calculated on the self-creation of the image fitting into the traditional image of the teacher, there is a need for tools that will actually reach the students. Interestingly, the study clearly marked a positive correlation between the level of professional experience in the teaching profession and the demand for training in methods of working with children. This confirms the role of practice in teacher education. Practice allows you to verify theory and mature in the belief that knowledge is not possible without having the ability to acquire, process and transfer it.

The second goal of the survey was to diagnose the current state of education for sustainable development in educational institutions in which our students work. Therefore, the respondents were asked how it looks in their workplace, whether the principles of sustainable development are well-known, respected and propagated.

Very good condition of education for sustainable development in their workplaces was assessed only by a marginal number of people working in professions related to upbringing and teaching. The vast majority (64%) described this state as “weak” and “bad”. Poorly educated students become defective teachers who raise the next generation of students ill-prepared to take responsibility for the common good. Polish teachers are well prepared theoretically, worse in practical terms. Their professional preparation process is still taking place primarily in the lecture halls and they will work with the pupils themselves later. In Polish educational colleges there is a lack of good practices on a larger scale for the benefit of the local environment and university associations with the environment. Cooperation with business is practically non-existent. It is not easy to understand the goals and knowledge of ways to raise money for the education of future educators from sources other than scientific grants and state funds.

This weakness of academic education for sustainable development in Poland can only be fully understood when we look at the model program of student education based on the practice and cooperation of many environments. We want to describe such a model using the example of a program functioning at the American University of Madonna in Michigan. The following observations and conclusions are the result of a three-month scholarship by a co-author of the article – Agnieszka Pawlak, PhD – at Madonna University, and her monthly stay in Haiti as part of volunteering.

Madonna University is a small university for American conditions. Annually, it educates nearly 5,000 students, including teachers. Last year (2017) it celebrated its 80th anniversary.

In education, the university has a model status, awarded by federal bodies, and has numerous accreditations of offices, organizations and associations supporting and controlling academic education. The quality of education at Madonna University is best confirmed by the passing rate of certifying teacher examinations (Madonna graduates in 90% pass them on the first attempt).

The university can boast of having technologically advanced solutions (students have at their disposal TV studios, scientific laboratories, modern equipment of lecture halls). A lot of pioneer and unique courses are run there. Among other things, students are trained in international programs in cooperation with China and the United Arab Emirates.

In all decisions, a lot of attention is paid to sustainable development. It finds expression not only in promoting pro-ecological architectural solutions, but above all in the social involvement of the entire university community. Madonna is the first college in Michigan with the Community Engagement Classification award from the Carnegie Foundation, created by the United States Congress. The Carnegie Foundation is involved in promoting those institutions that can be called institutions perfecting themselves through researching and satisfying the needs

of the environment. He defines social involvement in the Carnegie Foundation as cooperation between higher education institutions and communities (local, national and supranational) for the mutually beneficial exchange of knowledge and human resources. In this spirit, Madonna University's mission is to "stop waiting for others to solve problems and fix the wrongs of our times". The university sets itself an ambitious goal of educating change leaders: referring to the work of Paul Schmitz "Everyone Leads. Building Leadership from the Community Up", in the Madonna University environment, leadership is defined as an action to which everyone is obliged to practice values and engage in cooperation for the benefit of the community³.

Consistently, the involvement of the Madonna University community in volunteering is impressive. On average, except for compulsory hours resulting from the education program, the staff and students devote approximately 27,000 hours to environmental activities outside the university. Students teach sign language to people with disabilities and their families, work in hospices and nursing homes, run on-site fundraising to support the poor in their environment, but also in Third World countries. One of the regular forms of volunteering practiced at Madonna University are 7–10-day trips to Haiti, in groups of several students with carers. Trips are organized outside the program of studies, always during the student's free time (during holiday breaks and holidays). Part of the costs are borne by the students themselves. In Haiti, they carry out a voluntary activities program based on the competences obtained from studies and those expanding competencies. Above all, however, these are trips of charity and education – their goal is to help people in Haiti, but also the personal development of students.

How does Madonna University finance such projects?

Madonna University, like all universities in the States, is financed from tuition income. However, it covers only 80% of its expenses. The remaining 20% and all additional costs coincide with the income from cooperation with the environment. The Madonna emphasizes the role of rooting a university in the local community. Many students (and later graduates who then perform various functions in business and society) come from the immediate vicinity of the University. That is why there is a mutual support program "Preferred Partners" at the university. It combines business and organizations operating in the immediate vicinity of the University with the academic community. Students among "Privileged Partners" are looking for places to practice, and later and permanent work. The business cooperating with the university are often companies founded or run by graduates of Madonna

3 "In Paul Schmitz's book, 'Everyone Leads: Building Leadership from the Community Up' the definition of leadership has three parts. The first: that leadership is an action that many can take and not just a position that a few people hold. The second: leadership is about taking personal and social responsibility to work with others for common goals. The third: that leadership is about the practice of values that engage diverse community members and groups in working together effectively. How many of us have heard this definition of leadership before? We are at a point in history that demands that we stop waiting for others to solve problems and right the wrongs of our Times", <https://www.madonna.edu/about/mission-and-history/> [9.09.2018].

University. A lively bond with graduates is a pillar of university identity: "Our graduates and friends help shape our traditions, sustain our success and build our future". Graduates are the group of university benefactors most involved in the assistance. Active contributors include writers, business owners, directors, religious leaders, doctors, lawyers and artists – in the past Madonna University students. There are so many graduates who want to participate in the life of the University, that their association is divided into regional chapters. They deal with the organization of social events, cultural events, take care of the official guests of the University and organize fundraising for various purposes. Fundraising does not mean the publication of the relevant account number. Graduates organize film screenings with discussions, promotions of valuable books, concerts, guided tours, golf competitions, "University Night", jubilees and celebrations, charity marches, balls and auctions. The benefits of cooperation are mutual: local companies, in addition to tax deduction in connection with donations for the university and its individual programs, gain access to know-how, consultations in various areas, but also advertising in a prestigious environment. Cooperation with the University gives them access to a larger cooperation network: those who meet in graduate associations support not only their university but also each other.

From the Polish perspective, the level of understanding in the local environment of the role played by the university is surprising. This understanding is expressed by the number of entities applying for inclusion in the list of "Preferred Partners". If you take into account that small business cooperating with the university is not only hotels, training and recreation centers, nursing homes, but also doctor's offices, small computer companies and even an exclusive tailor's workshop, you can see how wide, sometimes unobvious, maybe even for Polish people amazing, the a range of potential mutual benefits is.

Madonna University also finances its educational and volunteer programs with funds from foundations and special purpose funds set up at the university. They are also strongly associated with graduates. The Patrick Moore Foundation supports the development of sport. He manages the money saved to the university by her former student, Patrick Moore, a well-known sports journalist in the United States.

The second foundation, Nancy L. Grandillo Leadership Fund for Women, which is operating at the university, acquires funds to support women's education as leaders in their communities.

The widest scope of activity, however, is the Madonna Foundation, which raises funds for activity, in Poland called the "third mission of the university" (the university as a forum for social activity). Thanks to her collections Madonna from 2013 leads, for example, the already mentioned program of regular help to families with deaf children in learning sign language. Sign language teachers, mostly students, visit the homes of families with deaf children once a week throughout the school year and devote two hours to preparing them for living in a bilingual world. Classes serve not only to learn sign language, but also to strengthen family ties and family activities in the local community. The activities of the program are addressed especially to groups with low cultural competences and material status. The program, moreover, was launched in the context of the financial procedure of the great industrial

center that was then the first in the history of the United States, which was Detroit throughout the 20th century. As a result of bankruptcy, the city ended financing all additional social programs, including the only school in the region for the deaf children, Detroit Day School for the Deaf.

There are also special-purpose funds at the university, which are financed entirely from public collections. Mosaic Leadership Academy grants scholarships to students from minority backgrounds, whose access to education at the academic level is difficult due to their origin. The fund acquires partners who sponsor the acquisition of additional competences by selected students: a student internship at reputable companies, job fairs, conferences, and sometimes tuition fees at other universities where the student may acquire additional skills or perform research. Broadcast & Cinema Arts Guild is an association of graduates, parents and people supporting the technological development of the University.

Thanks to the funds obtained from outside, since 2010 Madonna University also runs the first distance learning program in Haiti in the United States. The social responsibility of the University is not limited only to the immediate environment. In 2010, an earthquake killed over 300,000 people, one-third of the Haitians have suffered injuries, lost their homes and livelihoods. The cataclysm destroyed almost the entire infrastructure of this country. Then the community of Madonna University decided to get involved in the reconstruction of Haiti. However, it was recognized that help should not be a one-off reflex. Haiti had the status of the poorest country in the western hemisphere even before the earthquake. Therefore, it was recognized that what is most needed there is access to education and training of elites who are able to take responsibility for the future of Haiti. Since the majority of Haiti's economic problems have been for years dealt with in a demotivating way for Haitians – either through the transfer of food and other basic necessities to the island or the economic migration of Haitians – the aid proposed by Madonna University was innovative. Experiences and preparation of the university to conduct courses on Internet platforms and the fact that in the mission of the university an important role is played by reaching out to marginalized communities and providing such help is aimed at the future. A special undergraduate program in the field of running a business was created. In addition to the courses normally offered to American students, elements of the ESL (English as a Second Language) course were introduced – intensive English learning for foreigners, and the type of obligatory practices in institutions and organizations operating locally – in the local community in Haiti. To reduce the risk of fast migration of graduates of the course and motivate them to act on the spot, the recruitment of candidates included local companies and organizations, which then guarantee the graduates employment on preferential terms. In the selection of candidates for studies, their age or material status does not play a greater role. Preference is given to candidates already involved in the life of local communities, especially in educational activities.

The Haiti program requires a huge financial and organizational effort. It would not have been possible without the involvement of many institutions and companies at the international level. American foundations and companies from outside the nearest circle of Madonna University participate in financing the course (e.g.

Fulbright Foundation, banks and individual sponsors). Americans, for many years shaped cooperation culture, allowed to work out mechanisms of matching sponsors and seeking support. It also takes place thanks to external organizations specialized in such intermediation, such as the Volunteer Match – an international cooperation forum in which parties interested in support and support meet.

Thanks to this approach to responsibility for sustainable development, in the current academic year, Madonna University is already educating the sixth year of the Haitians. The money obtained for this activity is not only enough to fund the on-line course itself, but also to fly professors and students between Haiti and Detroit (not all classes and exams can take place online) and optimistic thinking about developing a study offer for Haitians (plans for further courses, among others in the field of tourism and hospitality).

Conclusion

The above-described observations and our experience indicate that the inter-sectoral exchange of experience in higher education should meet the conditions enabling a better transition of students to the labor market and didactic and scientific-research development of the staff. In this context, cooperation at the university-business line is important to define the areas and principles of cooperation and the transfer of innovation and creative solutions⁴.

The 2030 Agenda for Sustainable Development announced by the United Nations and its objectives have historical significance for the whole world – for our planet and for all people.⁵

Seventeen Sustainable Development Goals and the implementation of related tasks can contribute to building societies where restrictions on sustainable development activities will be lifted. Poverty will be eliminated and people will not suffer because of it. The objectives of the Agenda are focused on economic growth, social development and environmental protection. Tasks related to goals apply to both developing and developed countries. They concern everyone, because the focus is on improving people's quality of life, social protection and the natural environment. These optimistic prospects for achieving the goals, which are the above-mentioned values, will not be achieved without the general involvement of educators in conducting education for the benefit of ZR. However, in order for this to happen, it is worth paying attention and postulating an obligatory education in the field of ZR of this professional group. The review of international and national desk research practices, review of indicators, development of methodologies, talks with interested stakeholders and pilot studies seem to be of particular importance.

4 <https://www.frse.org.pl/wspolpraca-sektora-szkolnictwa-wyszego-ze-swiatem-biznesu-kategorie-obszarow-i-wskazniki-realizacji/>

5 <http://www.unic.un.org.pl/zrownowazony-rozwoj---cele/agenda-na-rzecz-zrownowazonego-rozwoju-2030/3042>

Barriers and limits in activities for sustainable development based on the example of the Polish public pedagogical university – current status, perspectives and good models of intersectoral partnership

Abstract

Academic education, which truly meets the needs of the present, is necessarily connected with building a cross-sector partnership. Also in non-traditional areas related to the economy – as in the case of pedagogical studies. Pedagogy, as a social science based on values, aims to bring up a man responsible for himself and the environment, and therefore also for the optimal development of civilization in the interests of present and future generations. It needs support from entities able to finance some non-standard educational projects.

This paper is connected with the research carried out in one of the largest Polish pedagogical universities. The level of awareness of pedagogy students in the area of sustainable development issues was examined. It turned out that the pedagogues are not prepared to take on the role of local community leaders in activities for sustainable development.

This is due to the limits of the current method of their education, culturally and historically conditioned. The Polish educational system is still releasing the years of socialism, preferring individualism over the interests of the community.

Injuries from the past are a barrier in promoting and taking responsibility for the needs of a wider circle of beneficiaries (which is expressed, inter alia, in the absence of the tradition of volunteering). The fruit of the previous era is also the lack of elaborated procedures for universities and colleges to obtain education in humanities and social fields that could co-finance long-term activities related to upbringing.

The authors postulate introducing to pedagogical education subjects related to the concept and principles of sustainable development understood as education for responsibility for present and future generations. They also want to show, as a result of experiences from their own volunteering, good practices in this field applied at Madonna University in the USA. From 2015, there is an educational program for sustainable development, in which students from Haiti are educated remotely at an academic level from several to several dozen each year, giving them a university degree, enabling them to undertake activities for their country.

The program consists of the work of many tens of people: business entities responsible for financing, academic staff responsible for the education program and classes, students implementing various voluntary programs and technical service responsible for maintaining the internet platform and access to it from a country where electricity is not an obvious thing.

Keywords: partnership, education, responsibility, sustainable development, good practices

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The implementation of the third mission of academic tertiary education institutions by means of the social-occupational activation of a local milieu. Good practices originating from activity

Introduction

Every organization, and an academic tertiary education institution is no exception, conducts its activity upon the basis of the mission and the strategy, which determine the scope and the direction of undertaken initiatives. In particular, a mission is an important element of the organizational culture, and it provides a *sui generis* offer of an academic tertiary education institution for an external milieu. In the times of the intensification, and objective necessity, of collaboration between academic tertiary education institutions and the representatives of employers, of the commercialization of scientific research, the third mission of an academic tertiary education institution is becoming a significant pillar of tertiary education. However, this activity ought not to be restricted to the mutual dependence between an academic tertiary education institution, the market, and also the states, and, to express it more succinctly, between an academic tertiary education institution and finances and profit. Academic tertiary education institutions can, and ever more frequently actually do, conduct their activity for the benefit of a local community, by means of broadening their offer for the various groups of recipients, including those who are in the danger of social exclusion. This is an important initiative from the point of view of society, and it presents an academic tertiary education institution as a place accessible to all those who may be interested, as a building in which a nursery school attendee and a senior individual can feel good and develop. Regardless of the type of an academic tertiary education institution, every such institution is a learning organization. Not only does its activity exert influence upon its students and upon its employees, but it also shapes knowledge society. The opportunity to share its output, and initiatives that are to benefit various social groups, renders it possible not only to broaden the third mission of an academic tertiary education institution. It consists in building social capital, to rendering it possible for knowledge to be diffused, to achieving economic and cultural profits.

Three missions – the multitude of the directions of activity

In the Polish system of tertiary education, in particular, while observing the period since the year 1989, one can notice that intensive changes, both pro-qualitative and pro-quantitative, have been taking place. The following ones ought to be regarded as the most important:

- the commercialization of knowledge and of scientific research;
- increase in the number of students;
- increase in the number of non-public tertiary schools;
- increase in the mobility of students and the employees of academic tertiary education institutions;
- the implementation of European standards, among others, ECTS, and two- and three-tier structure of degree studies (Wasilewski, 2017).

However, the fundamental mission of an academic tertiary education institution has remained unchanged for years, and it is defined as education and conducting scientific research, including such as fulfilling the needs of the economy and the market. The transformations which occur in the environment of an academic tertiary education institution, in particular, those determined by the processes of globalization, the development of technology and knowledge society, determine an increase in the expectations towards the establishment which is constituted by an academic tertiary education institution. These very expectations are formulated not only by the official organs of the state, but also by particular social or occupational groups, or by particular individuals. There arises a question about the cause of such a change within the scope of the perception of the role of an academic tertiary education institution, and its, *sui generis*, ancillary nature in terms of the environment? The answer to this question is a multi-aspect one, and it depends upon a several factor. Nevertheless, it ought to be indicated that academic tertiary education institutions ceased to be elitist establishments, accessible only to the chosen ones. Academic tertiary education institutions are not, in contemporary reality, perceived in the categories of institutions which deserve deference and respect just because they exist. It is their activity that earns them the recognition of the environment, among its future students and in the entire community.

By means of numerous agreements with social partners, with the organizations of the third sector, or with entrepreneurs, academic tertiary education institutions become a part of numerous undertakings, also such as are conducted on a nationwide scale. All the time as well, there occurs the process of the institutionalization of the relations between an academic tertiary education institution and an external milieu. Establishing official organs such as conventions, and the councils of stakeholders, renders it possible to exchange the expectations and experiences of the authorities of particular academic tertiary education institutions, the members of self-governmental authorities, or employers. Formal determinants obliging higher schools to consult, among others, their curriculums, and to take under consideration the comments of employers within the scope of expected qualifications (knowledge, abilities and competences) that the graduates of a given major ought to have mastered, are conducive to that. It is also society that formulates very clear

and detailed expectations towards academic tertiary education institutions and the scope of their activity. Employers want to exert influence upon the quality of the education of their students, and particular occupational groups develop the standards in accordance with which education preparing to a particular occupation is to be conducted. Polish higher educational institutions, leaving aside the issues of changes occurring within the scope of legal regulations, are facing the necessity of opening to the problems and needs of the external environment, both local and on a nationwide scale, and, further, of the global societies. Knowledge, as the crucial element of contemporary economy and its competitiveness, cannot remain the monopoly of the lecture rooms of academic tertiary education institutions. Commencing research collaboration, conducting implementation activities forming clusters¹, the commercialization of research,² are the typical areas of the exchange of knowledge between an academic tertiary education institution and an enterprise, and particular industries. However, restricting the influence exerted by an academic tertiary education institution to the collaboration of this kind, fails to provide all the opportunities of taking advantage of the potential of an academic communities, both of the personnel and students alike.

Not only does a free-market economy eliminate particular occupations; it is also a *sui generis* creator of the new ones. It is that very economy that determines the demand of the labor market; a occupation chosen by an individual may, but may not be, needed at a given moment. As it was rightly indicated by W. Furmanek (2017), the contemporary labor market favors the educated, and provides opportunities for talented, hard-working and creative individuals, for those who want to acquire knowledge and develop their abilities, which implies new challenges and expectations towards the educational market. Contemporarily, being educated, possessing broad technical abilities, cannot guarantee that an individual will achieve

1 Clusters are usually composed of 80–100 entities. They include three types of institutions: enterprises (70–80% of which are small and medium-sized companies), business environment (training centers, center of the transfer of technology, technological parks and business incubators) and scientific units (academic tertiary education institutions and research institutes). Clusters are one of the most important tools of the policy of regional development and the innovation policy of the UE. They include companies and organizations working near each other (among others, producers, suppliers, recipients and distributors), which, even though they compete with one another on the market, simultaneously wish to exchange experiences, and also to collaborate for the benefit of the common objective and benefits. These may include, for instance, developing, in collaboration with scientists, new technological solutions (website http://naukawpolsce.pap.pl/sites/default/files/201807/RAPORT_science_Zastosowane.pdf, accessed on 12.08.2019).

2 The commercialization of the results of research, and also of technologies, ought to be defined as: selling the results of research, most frequently in the form of know-how or know-why, selling licenses, taking advantage of patents. The term 'commercialization' is applied as well to the entire scope of activities which are connected with the transfer of knowledge into economic practice. This is the process which renders it possible to provide the market with innovative technologies. In a more restricted meaning, it is interpreted as particular instances of handing over knowledge or abilities to make use of them on the market in the form of services, or products. In conclusion, commercialization is a very complex process, which is to transfer the results of research scientific on the market (Gołabek, Flisiuk, 2016: 65).

success on the labor market. The changes in the organization of work, the arrival of new occupations, and the partial disappearance of those already existing, and, first and foremost, a very rapid development of technology, are the principal determinants of demand on knowledge, yet, the demanded knowledge must be up-to-date, and, therefore, an employee is expected to participate in continuous education. As it is expressed by Violetta Drabik-Podgórna, (2010: 100), "contemporary model of the transition connected with globalization, the segmentation of the labor market and occupational chaos involves a lot of unpredictable phenomena, repeating and involving the various spheres of life". Not everyone can cope with the new challenges on the market, and, first and foremost, not everyone ever has a chance to prove the worth of the competences which they have acquired.

Academic tertiary education institutions are charged with providing such knowledge and abilities, which, in the future, will increase employability, therefore partly shape the educational-occupational future of an individual. Theoretical knowledge, which, for many years, young people acquire at academic tertiary education institutions, is certainly an element needed to perform a particular occupation, but it has to be combined with occupational internships, or by contacts with the milieu of employers. It is also lecturers who can exert influence upon their students, and encourage them to undertake self-education and active participation in the life of an academic tertiary education institution, which, in the future, will bring forth the fruits of being a more successful player on the labor market. An academic tertiary education institution, its mission, that what it offers to its students, is not only knowledge, but also shaping attitudes, behaviors and motivating them to strive for perfection. Therefore, studying ought to be conducive to the development of personality, including, as well, the personality of an employee. Knowledge and increase in its significance in modern societies have contributed to paying substantially more attention, also by politicians, to the activity of academic tertiary education institutions. More involvement is expected of higher schools, both regionally, and on a nationwide scale, not only within the scope of the transfer of knowledge, but, as well, within that of integration with the surrounding society, the integration of employees, and the integration of students.

However, it is difficult to claim that academic tertiary education institutions ought to do nothing else than to prepare to an occupational career. Their task is as well to broaden general knowledge about the world, to contribute to the development of science, and to respond to the needs of society. For that very reason as well, so much emphasis has been placed in the recent years upon the development of the so-called third mission of an academic tertiary education institution. Too frequently and erroneously is the third mission of an academic tertiary education institution perceived in the categories of a complement to the two traditional academic mission. In particular, its social scope is not taken under consideration, and this is the very activity within this scope that is significant for a change in the perception of an academic tertiary education institution in our country. Attempts to define the third mission of academic tertiary education institutions in European conditions have been made since the mid-1980s. It was in Great Britain that the necessity of changing the attitude to the management of academic tertiary education institutions,

departing from tertiary education based only upon collaboration between the state and academic official organs, was noticed. Permitting other social groups interested in the activity of academic tertiary education institutions, paying attention to their interests and expectations as well, was changing the priorities of academic tertiary education institutions. Partly under the influence exerted by the environment, the arrival of the new recipients of the process of education, academic tertiary education institutions started to formulate individual missions, adjusted to their own abilities as well.

A mission, as it is emphasized by Z. Ratajczak (1997: 83), "is a responsible task to be fulfilled, an important order to be processed, a mission. There are cultural, scientific or social missions, and also the diplomatic ones. Missions are served, accepted, fulfilled, delegated and entrusted. An individual who undertakes a mission certainly feels that if this mission is not completed, they will be blamed for that, therefore, this task has some features of a moral imperative, of responsibility".

There are two principal priorities within the scope of the third mission of an academic tertiary education institution:

1. The transfer of innovations and modern technologies to economy in order to develop competitive advantage. This is the task, in particular, for academic tertiary education institutions which conduct research within this scope, and which also possess sufficient financial means.
2. The transfer of academic knowledge to particular groups in order to solve social problems, a dialogue with society and consultations. The third mission is, in this case, perceived in the category of social involvement, and can be served by every higher school regardless of its category.

The third priority, which is not frequently mentioned, is the third stream of incomes connected with the transfer of knowledge and granting licenses for intellectual property rights in collaboration with the private sector, private associations, and also with the state sector. The lack of the complete conceptualization of the notion of "the third mission of an academic tertiary education institution" provides the opportunity of the implementation of this area by every academic tertiary education institution, and adjusting it to its strategy of activity.

Because of the above-mentioned transformations, and also constantly increasing social expectations, an academic tertiary education institution is becoming an important segment of societies, both in the local dimension, and in the global one, alike. The synergy between academic tertiary education institutions and economy, the transfer of knowledge for the benefit of the industry, and of modern technologies, is a positive aspect of serving the third mission. Nevertheless, academic tertiary education institutions are contemporarily expected to provide the different forms of involvement in solving the problems of social life. Broadening educational offer, which includes rendering it possible to benefit from lifelong learning, is a response to the needs of knowledge-based society. Establishing numerous academic tertiary education institutions for children, the universities of the third age, are the different forms of activity engaging further social groups in academic life. Simultaneously, they indicate that higher schools serve their third mission in a planned manner, frequently with the use of their own resources, including the financial ones.

The third mission of an academic tertiary education institution – in the direction of the prevention of social exclusion

Restricting the third mission of an academic tertiary education institution to conducting activities concentrated upon developing economical superiority upon the basis of the transfer of knowledge from academic tertiary education institutions to an external milieu fails to take under consideration a number of initiatives and particular activities undertaken by these organizations for the benefit of societies, culture, education and individuals in the danger of exclusion. More and more willingly, academic tertiary education institutions implement activities which reach far beyond the scope of the traditionally-understood third mission. Their popularization is not only recommended in the perspective of developing a positive image of tertiary education, but it also contributes to a greater involvement of community in the initiatives of academic tertiary education institutions.

Serving the third mission of academic tertiary education institutions requires a conception, workload, and, of course, financial resources. However, the instances of numerous Polish academic centers in the recent years demonstrate that the authorities of academic tertiary education institutions and scientific personnel have original ideas for the implementation of activities within the area of the third mission. In particular, it is recommendable to pay attention to projects which support individuals being the members of so-called risk groups. Improvement in their situation, social and occupational activation, demonstrate the big role that is played by academic tertiary education institutions in fulfilling the needs of a local community. One of the instances is the implementation, at Jan Długosz University in Częstochowa, of the project "Transition into Adulthood with the Competences of the Future", co-financed from the means of the National Center for Research and Development.

The general objective of this project is to raise competences (crucial for the economy and development of the country) in the case of 60 individuals aged 14–18 coming from care and education institutions situated in the area of the city of Częstochowa, and also of the county of Częstochowa. Providing support for the above-indicated group results from, first and foremost, their more difficult (in comparison with that of their peers) situation, and also from the specific traits, frequently meaning that this group is in the danger of social exclusion. The lack of emotional support of the family is the most severe problem for this group. Very frequently, it results in various kinds of emotional disorders, reaching for drugs as early as at a very young age, and adopting a passive attitude to life, consisting, in principle, in the lack of self-confidence and trust in their own abilities. This project will contribute to making those under the care of orphanages independent by means of occupational activation, education, development and improving the chances of finding a job. Achieving the adopted objective was based upon reaching by the project team the following fragmentary objectives:

- raising the level of knowledge and abilities of those under their care;
- the development of the linguistic competences of those under their care;

- the development of personality, and the development of interests, including shaping social abilities;
- shaping entrepreneurial attitudes.

Under the project, the following tasks are conducted:

- certified courses of a foreign language;
- workshop classes with career advisors and educational brokers within the scope of occupational activation;
- planning the path of further education;
- training within the scope of entrepreneurship and interpersonal communication preparing to functioning in social and occupational groups;
- visits and study trips providing the opportunity of making oneself acquainted with the educational offer of a region, including academic tertiary education institutions and prospective jobs.

The fact that all the classes for the participants in the project are conducted by the scientific and didactic personnel of Jan Długosz University in Czeszochowa, and on the premises of this academic tertiary education institution, is significant in the perspective of serving the third mission of an academic tertiary education institution. Not only do the those under their care have a chance of making themselves better acquainted with the infrastructure of an academic tertiary education institution, but, first and foremost, they can see tertiary education as a stage in education open to everyone regardless of their financial situation. The lecturers conducting the classes, the teachers of foreign languages, apart from following the curriculum, make attempts to involve those under their care in the everyday activity of this academic tertiary education institution. Those under their care participate in cultural events organized by its students, and are guests at lectures and sporting events. The Faculty of Pedagogy of this academic tertiary education institution educates its students within the scope of care and educational pedagogics, and these students have started to take an active part in the implementation of the project. The exchange of experiences between young people, inspiring stories, staying on the premises of an academic tertiary education institution, provides individuals in the danger of social exclusion with a new perspective, and the feeling of belonging to a new community, being an academic community. Academic tertiary education institutions, opening to the various groups of stakeholders, demonstrate simultaneously that, as institutions, they can effectively support and assist various social groups. Thanks to that, they develop a modern image of tertiary education, namely open and developing civil society.

It is assumed that the implementation of the project will also contribute to developing a model of support for those in care and education institutions within the scope of the development of crucial competences, which will be possible to be used both by an academic tertiary education institution as an institution educating career advisors, pedagogists and therapists. Also, lobbying in favor of their proposals of changes in national legislation relevant to the process of becoming independent in the case of those in care and education institutions will take place.

Final remarks

The mission of an academic tertiary education institution, similarly to the mission of every organization, is defined in the categories of the principal objective of its functioning, and also conducting activities which are undertaken both for the benefit of an academic community and an external milieu. In the case of academic tertiary education institutions, listing all the recipients of its activity is not, contrary to what might seem, an easy task. This fact results, principally, from the significant broadening of their offer and conducting the activity of Polish academic tertiary education institutions, in particular, in the area of the so-called third mission. Collaboration between higher schools and the external environment is contemporarily not restricted to the commercialization of research, to the exchange of experiences or to the internships of its students. This consists in actually exerting influence upon a community, the situation of it and activity involving particular groups in academic life, an instance of which is the implementation of the described project. For academic tertiary education institutions, serving the third mission is not only a challenge, but it is also an opportunity to use the possessed resources of knowledge in practical activity, in activity directed to assistance and support. This develops the new kind of an academic tertiary education institution based upon alterocentrism. As it is emphasized by J. Kumaczewski (2013: 65), "an academic tertiary education institution cannot resign from traditional values: academic, formative education, preparing the graduate also to honor and live by universal values, ethics in their actions, objectives 'of higher order', upon which the future of civilization needs to be built". Appropriately implemented, not only is the third mission not in contradiction to the above-mentioned ideals, but it rather provides the opportunity to transfer them to the different groups of local communities.

The current process of the implementation of the third mission in academic tertiary education institutions is a challenge requiring the involvement of both the academic milieu and the external environment. This consists in a change in the ways of thinking about an academic tertiary education institution as a closed institution, which confines itself, principally, to conducting research and educating. It means the perception of an academic tertiary education institution as an organization having a substantial potential in terms of personnel, methodology and research facilities, which can be implemented in solving local problems.

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The implementation of the third mission of academic tertiary education institutions by means of the social-occupational activation of a local milieu.

Good practices originating from activity

Abstract

This article is relevant to the implementation by academic tertiary education institutions activities within the scope of the third mission of higher schools, which, apart from didactic and research activity, ever more frequently activate local community and collaborate for the benefit of it. The principal objective of this paper is to present the contemporary direction of the development, and the scope of the third mission of academic tertiary education institutions by means of critical analysis of the domestic and foreign literature, and also presentation of good practices within this scope. To achieve this objective, the study of the conception of the so-called third mission, namely, the various activities of higher schools dedicated to particular groups, was undertaken. The accompanying objective is also to provide the answer to the question of the significance of the third mission in the strategies of the management of higher schools in Poland in reference to traditionally-defined academic missions, namely education, and also conducting scientific research.

Keywords: university, third mission, transit, good practices, activation

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EDUCATIONAL CHALLENGES IN THE FACE OF CULTURAL AND SOCIAL CHANGES

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Educational practice in the context of democratic and cultural changes

In a significant part of the world, democracy was recognized as the basic principle of the organization of social and political life, acquiring, according to Amartya Sen (2001), the status of the “political technology” of our time. We are observing a rapid growth of democracy as a political practice, characterized by quite fundamental differences, which are influenced by local cultural and social conditions. Although in 1900 there were no countries which were fully democratic at all, as early as 2000, 63% of the governments covering 58% of the world’s population were considered democratic (Mair).

In our considerations regarding democracy, special attention should be paid to all assumptions about the “universal values” which lead to theoretical and practical problems by being able to be read differently, depending on the cultural location in different parts of the world and historical diversity. Democratic mechanisms should be treated as conscious co-creation of the future, reaching a peaceful agreement on interests and goals, creation of equal opportunities and leveling of opportunities for individuals and social groups. Then, democratic systems have a chance to create an information society, and in the future a knowledge society and a civil society in which a man will be a political, decision-making citizen, and not just a buyer, customer, consumer, the object of marketing and advertising, the audience and the subject of corporate manipulation (Zacher, 2003: 84).

Democratic changes in the system cause social discussion about changes in education and inspire the process of educational changes, becoming one of the most important indicators of the dynamics of social development. Decisions regarding the new shape of education should take into account the positions and views of not only teachers, but also parents and students. J. Naisbitt (1997) rightly emphasizes that in participatory democracy, people, by participating in the decision-making process, inspire many new initiatives.

The prospects of education development were analyzed in various national, European and global reports. They emphasize the role of the school as an education centre and indicate a need for changes in its functioning and the need to define its new functions and tasks. Priorities and problems of education were considered, among others, in the following reports: *Learning to be* (UNESCO Report, 1982), *Learning: the treasure within* (UNESCO Report, 1998), *Future of the World* (UNESCO Report, 2001), *No Limits to Learning* (Report of the Club of Rome, 1982), *Possible Variants of European Education in the Future. Project I: prepare the man for life in the*

21st century (Council of Europe, 1972), *the White Paper of Education and Training. Towards the Learning Society* (European Commission, 1997), *Education for Europe* (European Commission Report, 1999).

These reports show a need to improve the quality of all aspects of education and set out ideas and directions of change leading to this goal. They show education as an opportunity that should be used in the pursuit of humanity's ideals of peace, freedom and social justice, the eradication of poverty, exclusion, misunderstanding, oppression, and they constitute an important factor in the development of the individual and society. The following ideas and directions of pedagogical changes are to serve this purpose:

- teaching should become learning to acquire knowledge and shape the personality of students. Education should ensure that they acquire the learning tools;
- an important direction is to develop appropriate relations between education systems and other areas of life: technology, work, employment, which should be the basic elements of educational activities;
- a need arises for co-operation between the public education sector and the non-school sector, which should be subject to further expansion;
- a person should learn throughout the entire period of activity, in accordance with the principle of continuing education and the idea of the "learning society" and "educating society";
- teachers play a special role in educational changes, which is why their education and participation in reforming the school should be given a special status;
- it is expected that a person should acquire the skills in the education process to perform appropriate roles and tasks in a democratic society.

Education and training become essential carriers of identity and personal development, as well as a means of leveling educational and life opportunities. The school's task is not only to transfer knowledge, but, above all, to shape the personality of learners through the dominance of innovative and anticipatory learning, as well as to prepare them for democracy, freedom and implementation of the slogan of modern education: "Understanding the world – guiding yourself". These changes require the provision of appropriate economic and socio-political conditions, as well as a well-prepared teacher whose education, attitude, competence and, above all, responsibility become the guarantee of understanding the continuous development of civilization (Banach, 2001, Cieśleńska, 2019).

In order to improve the education policy and focus it on the activities aimed at the development of democracy, sustainable development of humanity and mutual peaceful understanding among the nations, the authors of the report entitled *Learning: the Treasure Within* (1998: 12–14) rightly propose to overcome the tensions which were found in the centre of issues arising in the 21st century. These are tensions between:

- what is global and what is local;
- the universal and the individual;
- tradition and modernity;
- long-term and *ad hoc* actions;
- the inevitable competition and concern for equal opportunities;

- the extraordinary development of knowledge and the human ability to absorb it;
- spirituality and materiality.

Facing the current and future challenges requires setting new education goals, enabling the individual to discover, stimulate and strengthen the role of his creative potential. To this end, education should include four aspects of training, which will become a certain pillars of knowledge for each individual: *learning to know*, i.e. to acquire a tool of understanding; *learning to act*, to be able to influence your environment; *learning to live together*, to participate and co-operate with others on all levels of human activity; *learning to be*, i.e. a striving related to the previous three, connected with the ability to shape independent and critical thinking and to develop the independence of courts in order to be able to independently decide on the rightness of actions taken in various circumstances of life (Delors, 1998: 85–95).

For the proper coexistence of people in a democratic society, moral and social education is also important (I. Wojnar, J. Kubin (eds.), 1996), whose role is to develop pro-social attitudes and behavior, shaping altruism and empathy, triggering a culture of feelings, respect for others, upbringing thinking individuals, able to communicate with others, sensitive, experiencing, which, in other words, is to teach them “to be human”.

Important activities in the field of education are undertaken by UNESCO, especially within the “Education for All” program, initiated at the World Conference in Jomtien (Thailand, 1990). The goal of the “Education for All” program is to meet the basic educational needs of all people. The balance of achievements of the “Education for All” program, prepared by UNESCO member countries for the “Education for All” World Forum in Dakar (Senegal, 2000), made us aware of the existence of many new areas of activity and the huge needs arising from the diverse economic and political situation of the Member States (the Polish UNESCO Committee).

Because the world is becoming more and more culturally diverse, and global migrations take on an unprecedented scale in the history, the issue of cultural education is taking on a new meaning (Polska w obliczu..., 1991: 35–36; Świat przyszłości a Polska..., 1995: 133). Cultural education is important for the functioning of individuals and societies. Article 27 of the Universal Declaration of Human Rights of 10 December 1948 gave it the status of universal, customary law applicable throughout the world. According to the Declaration, “everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits”.

The European discourse on cultural education is conducted under the slogan of *Arts Education*. Eckart Liebau (2018: 1219–1239) distinguishes five main trends which simultaneously justify the rudimentary significance of cultural education for the lives of societies and nations. In modern countries located in Western, Central and Northern Europe, North America, Australia, New Zealand and Southeast Asia, China and the Pacific Region, Liebau attributes economic factors to the overall functioning of national arts education systems. In his opinion, contact with culture and art stimulates the creativity of individuals, and this becomes a source of social development, improvement of communication skills, dialogue and international

co-operation. It also has a positive effect on the growth of cognitive competences (e.g. linguistic, mathematical).

The second trend emphasizes the responsibility of societies for the protection of cultural heritage and sustainable development. It refers to the cultural heritage and diversity as an important factor in socio-economic development and a means of seeking agreement in the regions affected by ethnic or religious conflicts.

The third important trend in perceiving arts education is its perception as a therapy for individuals and societies confronted with various pathologies, such as inequalities in access to education, violence, marginalization, exclusion and drugs.

The fourth trend in perceiving the importance of arts education results from the equalization of cultural education with general education, which is particularly popular in Europe. According to this position, the individual's contact with culture and art opens up unlimited creative possibilities, enriches knowledge, activates him/her intellectually and enables him/her express emotions. Therefore, it has a significant impact on his/her personality (I. Wojnar, 1976; I. Wojnar (ed.), 2006).

The fifth trend is associated with the belief in the relationship between arts education and the qualitative development of culture, especially art. The importance of pedagogy of culture and innovative forms of cultural communication, co-operation of cultural institutions with schools and social groups, as well as the care for amateur artists are highlighted.

Cultural education, therefore, permeates many aspects arising in the context of aesthetic forms of expression and manifestations of human activity, understood both as purposeful and conscious activity and as unconscious, spontaneous activity, manifested in everyday life, various practices, customs and rituals.

UNESCO's Report *Notre Diversité Créatrice. Rapport de la Commission mondiale de la culture et du développement* (1996) exposes a need to open European culture to the dialogue of cultures, to extend the basic ethical thinking about culture by its ethnic dimensions. By exposing the creative diversity of culture in a global perspective, it draws attention to a need of finding ethical principles common to the world. Thus, the European way of thinking about culture is "constantly opening up in harmony with the rhythm of the developing world pulsating with changeability (Wojnar, 2010: 25)". This creative coexistence of traditions with innovations and variability is characteristic for the specification of culture and its educational tasks. Cultural education is expected to be a permanent and integral element of the education system and to play an important role in shaping national identity, enriching personal sensitivity, imagination and creativity of learners as developing and multidimensional beings.

The tasks of education are global, which is why they should prepare people for:

- lifelong learning, openness to everything new, gaining an ability to understand and to ask questions;
- adopting a responsible attitude towards nature and the environment;
- defending peace by stimulating mutual understanding between various nations, communities and religions, trying to silence aggressive and intolerant attitudes, strengthen dialogue, and develop human skills as a citizen of the world and a citizen of one's own country;

- a dialogue between the cultures of the world revealing man's identity through various forms of existence, by teaching understanding, tolerance, opening the mind, showing lasting and universal values reflected by various philosophical, religious and artistic expressions;
- building critical awareness of the man, thanks to which he will be able to verify what is happening in reality in terms of values, such as, for instance: ecological balance, development of individuals, equality and social justice, autonomy, solidarity, participation, satisfaction of personal and socio-economic needs at a higher level. Then the man will not give into fascination with dangerous complications and will be characterized by personal independence;
- alternative thinking coinciding with the humanistic vision of development and progress, understood as creating possibilities of something more rational, more valuable and effective than what is happening now, allowing him to develop utopias which have a chance of being realized (Suchodolski, 2003: 81–94; Szempruch, 2012).

P. Dalin and V. Rust analyze eight areas of important tasks of education, paying attention to the limitations of modern educational models which focus only on selected areas. The tasks of education include:

1. Education for democracy – developing skills to make choices, experiencing self-governance, developing understanding and skills necessary for civil and participatory democracy;
2. Education for multiculturalism – developing acceptance and respect for cultural diversity and promoting understanding of unique cultural and ethnic heritage, shaping values, skills and knowledge in the field of interacting with different diverse cultures;
3. Tasks of education towards the media – shaping openness to new technologies, developing criticism of the contents of messages, skills in assessing their value;
4. Tasks of schools for coexistence – developing the ability to live in harmony with the natural environment, education for peace, development of habits promoting health, making efforts for equal opportunities for children, adolescents and adults;
5. Building close relationships between the school and the world of work – developing skills in coping with the labor market, helping in changing the profession, combining three mechanisms of job distribution: free global market, competences and people's needs;
6. Education for beauty and culture – which, seen as social imperatives, should be more widely included in the education programs; they are also a factor in shaping the aesthetic tastes of producers, sellers and buyers;
7. Preparation in the course of education to serve the local community – shaping the ability to identify with this community, act for its development, learn to participate through planning, action and evaluation of changes in the local environment;
8. Education to work on oneself – acquiring the ability to understand the systemic nature of the world, the meaning of the collective sense and individual wisdom, understanding the relationship between individual development and global

dimensions, shaping readiness to solve global, local and personal problems, as well as a sense of responsibility. Preparing to work on oneself also requires the ability to co-operate, empathy and a positive attitude towards differences and creativity, as well as efficient communication with other people, free of negative attitudes, prejudices and stereotypes (Potulicka (ed.), 2001: 136).

The tasks of education are also formulated by the Council of the Club of Rome.

It mentions:

- “acquisition of knowledge;
- shaping intelligence and developing a critical sense;
- better understanding of oneself and conscious recognition of one’s own abilities and limitations;
- mastering the ability to overcome one’s own unwanted drives and destructive behavior;
- permanent awakening of creative abilities and imagination;
- acquiring the ability to perform a responsible role in social life;
- acquiring the ability to communicate with other people;
- helping others to adapt to and prepare for changes;
- enabling each person to form his or her own, most comprehensive and holistic, view of the world;
- making people more operative and ready to solve many new problems” (King, Schneider, 1992: 202).

Education has also found its rightful place in the development strategy of Europe until 2050, where the main development priority is to put Europe in the highest phase of the development of information civilization and adapt it to the requirements of the new phase of the development of the future market economy by building a modern knowledge-based economy. This requires a broad approach to development goals, taking into account the needs of the ecological breakthrough and the associated civilization change, and thus expanding its social and ecological content (Karpiński, 2007: 37–43).

Education is also becoming an important priority for Poland. The social change in Poland initiated in 1989 caused not only significant economic and social transformations regarding the realization of the ideals of freedom, but also caused a change in the conditions of human existence and accelerated the reform of the educational system. In order to collectively reconstruct the social and economic order in Poland and strive for modernity, freedom, openness to the world and other cultures, while preserving our own heritage and identity, attempts have been made to change public education for children, adolescents and adults. The idea of lifelong learning, which opens up new opportunities for organizational, program and methodological solutions to education, has gained new meaning. In 2009, UNESCO Member States assigned a significant importance to lifelong learning in solving global and educational problems and challenges. They emphasized the relationship between learning and the successful development of humanity. Much attention was devoted to the postulates of determining the place of education in the development strategy of Poland. The goals and tasks of the education system were reformulated with a view to a wide range of challenges of the modern world and human fate.

In preparing the man for functioning in a changing democratic society, attempts are made to reconcile two educational approaches presented by Bogdan Suchodolski: “instrumental education” preparing for a profession, achieving a career or performing specific social roles, and “selfless education” based on the concept of existence (the “to be” principle) and belief in the unit value of the experiences which make up the human life.

Conclusions

Analysis of democratic changes on a global scale and the role of education in the environment of such changes justifies the conclusion that the time has come for a new education which will make an effort to help people recreate and understand their past, shape key skills to understand their environment and efficiently adapt to it, and which will also help them to change their current location and communicate in a multicultural world. A change in thinking about education aims at preparing people to create the future in conditions of its opacity (Kwieciński, 2007: 29), helping to develop competence for reflectiveness, critical reflection on the world, culture and one’s own humanity, continuous learning and interaction with others. Education understood in this way will enable a person to actively achieve self-realization, develop his/her own self, as well as achieve full developmental opportunities.

In changing educational practice, it is important to educate man to humanistic development, the transformation of democracy, freedom and civilization. It is important to base education on universal values and European education ideals.

Interdisciplinary knowledge of man, world and education should be the basis for creating visions and models of humanized continuing education, making up a lifelong individual. In a modern society, it is education that determines success, and the reflective creation of oneself and the effective work of the individual on its own development is becoming more and more important.

The issue of educational change should be analyzed by all those who face difficult educational problems and challenges in the present and the future, especially by teachers, educational politicians, parents and others problems of the functioning of education. It is also important in the organization and implementation of the education process in higher education, as learners in the humanities education system should become autonomous actors capable of thinking themselves, deciding and responsible procedure.

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Educational practice in the context of democratic and cultural changes

Abstract

The article addresses the important issue of democratic change in the modern world and their impact on changes in education. On the basis of an analysis of changes in education and the prospects for its development presented in the UNESCO, Rome Club, Council of Europe and the European Commission reports, it presents the most important tasks of current and future education. It also analyses the place of education in Europe's development strategy by 2050. Questions arise from the analysis: What should educational practice look like to prepare children, young people and adults for their conscious and responsible functioning in a democratic society? What action should be taken to prepare individuals to address future challenges and strengthen their creative and critical thinking potential?

Keywords: education, democracy, change, education policy, education tasks

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How contemporary women and men combine family and work

Introduction

Socio-cultural and economic changes taking place nowadays – in the times of globalization and homogenization of the world – enable us to experience cultural pluralism on everyday basis as a result of the mass media, as well as increasing mobility. Undoubtedly, we live in a “global village” (McLuhan, 1964), in which everyone has access to the same sort of information, goods and is able to participate in the same events regardless of their dwelling place wherever it is. Being the recipients of culture, we encounter various ways of life currently being promoted, the multiplicity of personal models and different relations between individuals and social groups. The job market requirements have already changed, individualization is increasing, traditional bonds and social relations are disintegrating.

The relations between males and females are also changing rapidly, liberating themselves from cultural and traditional pressure. While the exclusion of traditional bonds makes an individual free from controlling and previous compulsions, it also deprives them of security and support, which were prevalent in the conditions established in pre-modern society (Beck, Beck-Gernsheim 2013: 55–58). Due to these transformations, we can notice that a traditional way of demonstrating femininity and masculinity has been disappearing and the standards determining both of these categories are no longer obligatory. Consequently, it leads to the situation in which the features and roles traditionally assigned to a given sex are becoming less and less meaningful. Traditional attributes characterizing both of the sexes were the basis for a distinct, frequently unfair treatment of men and women in private, professional and public spheres. It is the sex which has revealed the most considerable disparities in people's positions and their social functioning.

Gender – female and male role transformations

Traditional social roles attributed to men and women are regulated by the so-called “gender contract”. It is a socio-cultural contract determining the relations between men and women. Traditionally, it assigned women to the private sphere, connected with household jobs, while men's roles were attributed to professional careers.

In consequence, it results in doing unpaid jobs consisting in household maintenance, taking care of children, ill people, the disabled and the elderly on the part of women. The female activeness in household is treated by the public opinion as the way of realizing their natural roles of wives and mothers (Titkow, Duch-Krzystoszek

2009: 35). Informally, activities done at home and for the family have been defined as “household jobs”, which are considered to be unpaid. That is why female activeness in household is rarely perceived in the “work” category, being defined in economy as one of the production factors, whose value is determined in terms of payment. The notion of “household jobs” has not been included in the economic workflow, since women are not to be paid for them. Nevertheless, the term “job” or “unpaid job” used to define the female activities done at home or for families seems to be justified. It has been confirmed by the surveys related to the activities performed in order to maintain the household. The majority of respondents claim that such activities should be treated in terms of a job. Almost half of the interviewees regard childcare to be a job and they say that household jobs should be financed by state budget (Titkow, Duch-Krzyszczek, Budrowska 2004: 183).

Together with implementing the necessity of abiding European Union standards concerning equal rights and respecting citizens, Poland has undertaken to treat men and women equally. The equality of male and female rights is legitimized by Amsterdam treaty and the Council of Europe orders. Gendermainstreaming ought to be respected in all the social, political and economic actions, which was noted down in UN declarations in 1995 (Beijing declaration). Essential questions regulating actions related to male and female equal rights are included in the final document of the 4th World Conference about women’s rights, which took place in Beijing in 1995 – “Platform for Action”. It summoned all the governments to form national programs aiming at popularization of male and female equal treatment in law, job market, family, political and social life. Transformations taking place after 1945 connected with women’s massive activation and changes at the job market initiated an increase in female professional activeness, as well as gradual incorporation of men into the private sphere.

Thus, it can be described as gender emancipation taking place nowadays. *What does it mean, however, for men, and what for women? And what are the consequences for their functioning?* An interesting attitude in this matter is presented by Ulrich Beck and Elisabeth Beck-Gernsheim (2013). They claim that an increase in equality leads to realizing the existence of an inequality, which is even growing (2013: 18). It reveals the contradictions between the traditional forms of marital and family life and new experiences – as it may initially seem – emancipational. While tradition is being blurred, partnership may be of some support. However, there is also a contradiction in the sphere of partnership, which was practically invisible in the times when marriage required a woman to give up a career, take responsibility for the family and follow the way dependent on her husband’s professional path. It becomes clear only when spouses “*want or have to be dispositional due to the provision of existence, being dependant on a job*” (Beck, Beck-Gernsheim, 2013: 45).

U. Beck points out the factors determining the release of men and women from their traditional roles. In women’s case, these are: the displacement of biographical structure and life event order, restructuring household jobs, an increasing use of contraceptives, growing number of divorce indicating the vulnerability of marriage and the equalization of educational prospects. As far as men are concerned, we can observe the process of releasing themselves from being the only breadwinners as

the result of taking up jobs by women, spoiling the family harmony, as well as their growing awareness of being dependent on women in everyday and emotional matters (Beck, Beck-Gernsheim, 2013: 39–41).

Equal rights of men and women constitute two completely separate transformational directions in their functioning. It involves prospects of better education, growing professional chances and less work in household for women, while for men it means more competitiveness, resigning from the career, and doing more household chores. U. Beck notices that although there is a growth in freedom on the part of women, they are not provided with sufficient social protection, which is a new source of their enslavement. Men, on the other hand “*trained themselves in the rhetoric of equal rights*” (Beck, Beck-Gernsheim, 2013: 18) and they do not proceed from words to deeds, unfortunately. They hope that it is possible to reconcile the male and female equal rights with keeping previous share of duties. They justify existing inequalities using biological reasons and women’s predispositions to maternity, as well as their feeling responsible for family and household. (Beck, Beck-Gernsheim, 2013: 18).

This is the reason of conflicts, which put both men and women in difficult situations. Such conflicts lead to manifesting the antonyms between the sexes more and more clearly, while the most frequent subjects – catalysts are: children, economic security and, in turn, family well-being and a professional career.

Gender in family and at work

The most frequent subject matters of conflicts between spouses are family and work. These are the two values determining Poles’ aims of life. The results of CBOS research (2019, no. 22) indicate that for many years family has invariably been placed at the top in the value system of Polish citizens (80%). More than one third of respondents regards profession to be the most important (36%), and this is the profession which took seventh place in their value system all in all. What is more, in the course of time the importance of job has gradually decreased (44% in 2008, 41% in 2013, 36% in 2019).

Despite the importance of family in human life, professional career is an indispensable sphere of activity, determining, constructing and validating an individual’s social position. It accompanies a person for the whole life and influences their value system, shapes their lifestyles and personalities, decides on consumptive abilities, and, what is the most important, is their source of income (Domański, 2004: 105). Having obtained by women the possibility of education and pursuing a career resulted in improving their social status. In consequence, the family model which until now defined the female and male duties as family and professional ones respectively, must be changed.

At present, men and women have to set down relations between job and family. Both of these activity spheres interfere with each other and rarely are we able to show the boundary separating them.

The necessity of combining the family and professional sphere is becoming more and more difficult for European societies, as shown by the research of European Quality Life Study EQLS (2017: 39–40). It has been stated that:

- 60% of respondents from EU countries (in Poland 63%) claims that at least a few times a week and a few times a month they come home from work too tired to do basic household chores;
- 38% of respondents (in Poland 50%) has difficulty performing household duties due to the amount of time devoted to professional career;
- 19% of respondents (in Poland 28%) finds it difficult to concentrate at work because of family commitments.

The type of occupation and working conditions have a considerable influence on the relations between an individual and their family. There are several forms of family–job relations:

- *independent*: little or lack of mutual influence of job and family environment, work time is limited, work is performed outside the house (officials, clerks etc.);
- *infiltrating*: one sphere of activeness (family life) shapes the other one (professional work), successes, failures and emotions are transferred from one sphere to the other (artists);
- *conflicting*: a direct transfer of tasks and professional duties to the family sphere, caused by flexible working time and the need of full availability, as well as disturbing the professional role owing to family duties (scientists, managers, jobs connected with security and health protection);
- *compensatory*: equalizing and compensating one sphere by the other one (job compensates for the shortcomings or failures in family life or family life compensates for failures in professional life);
- *instrumental*: treating a job as the means enabling an individual to achieve other objectives, which is often connected with the realization of financial needs necessary for leading a successful family life;
- *integrated*: carrying out a professional life almost in family (farmers, craftsmen, people working in home workshops) (Evans, Bartolome, 1984; Paszkowska-Rogacz, 2002; Piorunek, 2009: 118–119, Smyła, 2016).

The influence of profession on family life is the source of numerous conflicts, which results in: smaller number of marriages, greater unwillingness to maternity, postponing the decision to have the first child, an increase in professional aspiration on the part of women, workload, perceiving job and family as the domains competing with each other, changes in the amount of time spent together by family members (Tomaszewska-Lipiec, 2017: 172–175). At the expense of family cohesion, greater emphasis is put on the feelings of freedom and ease (Tyszka, 2003). Family bonds are weakening, illegitimate relationships and single parents are growing in number (Szymański, 2002: 161–170). Workers suffer from stress and depression due to flexible working hours, overtime, employers' growing demands. Moreover, women encounter difficulties while coming back to work after childbirth.

Analysing female position on the job market one should take into consideration socio-cultural factors as its main determinants. As regards women who are

professionally active on everyday basis, there are still barriers related to the access to a job market. These are the following:

1. *Internal barriers and limitations*: emerging through inner emotions, dilemmas, hesitations, fears, low self-esteem, uncertainty, disbelief in one's own abilities, etc.;
2. *Assigning traditional roles to women*: those roles are connected with maternity, and their burdens are not considered at the stage of planning the organization and institution functioning;
3. *Family-job conflict*: connected with the necessity of joining the family and professional duties on the part of women due to their being burdened by more household chores;
4. *External barriers connected with discriminating attitude*: attitudes, the norms of political and professional environment functioning;
5. *Distinct socialization*: generating different expectations related to professional jobs, family life and duties connected with them;
6. *Employment discrimination*: mainly appearing in employers' preferences to take on men rather than women;
7. *Professional segregation*;
8. *Token syndrome*: consisting in noticing women more than men at workplace, especially in those trades where women constitute a minority, and in consequence noticing their failures. They are under pressure to demonstrate their skills and put more effort in performing their duties. In spite of this, they are excluded from informal structures;
9. *Excluding women from informal contacts*: being established at workplace. It is visible by not allowing women to join casual meetings, their impossibility to participate in those meetings due to the necessity of performing household duties or their unwillingness to take part in male gatherings;
10. *A man of success stereotype*: which characterizes a man or a person possessing features commonly regarded to belong to men (Mandal, 2004: 16–18).

Reconciling work and family conditions being based on male and female responsibility may be demonstrated by the following family classification: 1) *traditional family*, in which a man is exempted from the responsibility for doing household duties while a woman is forced to reconcile professional job with carrying out most household chores; 2) *role-sharing family* – based on partnership, characterized by activeness and responsibility in professional and family sphere on the part of both men and women; and 3) *participating family* – being an intermediate sort in comparison with the previous ones. It occurs when a husband helps in household but it is the woman's responsibility to take care of home (Lisowska, 2008: 105).

Considering the spouses' profession as the division criteria, economic family models have been developed. We can enumerate the following categories:

- *male breadwinner*: a traditional model, according to which a man is the one who earns a living while a woman takes care of home and children;
- *modernized male breadwinner*: family model in which a woman works part-time in a profession and her income constitutes only a part of the house budget;

- *dual earner – female double burden*: family model in which both of the spouses work professionally and a woman is additionally responsible for household duties;
- *dual earner – dual carrier*: model based on partnership, in which a man as well as a woman work professionally and are together responsible for bringing up children and they share household duties (Baranowska, 2007: 404).

Here emerges the question: *What does the issue of a family model look like in practice?* A recent opinion poll of CBOS (2018, no. 127) indicates that although many respondents declare they realize the model based on partnership, it is not necessarily reflected in reality. Working professionally by both of the spouses has little influence on sharing household duties. “Typically female” tasks remain as such despite the flow of time, while “typically male” ones are more and more frequently performed together or in turn. 20% of Polish respondents admits that everyday life, household duties and messy house are the most popular causes of conflicts and arguments (CBOS 2019, no. 48). Poles are getting more and more willing to have multigenerational families nowadays, which is connected with two phenomena. On one hand, grandparents can help look after children, and on the other hand they can expect support and care in their everyday lives, which appears to be the simplest way to realize in multigenerational home (CBOS 2019, no. 46).

Thus, how to combine professional and family life? Its solution may be the idea of work–life balance, involving the ability to connect professional work with other spheres of human life. Achieving such a balance is possible only when work and life do not function on their own. The work–life balance idea generated in the USA in the late 1980s. It was mainly caused by the needs of employees who considered it essential to work in a good atmosphere and be able to reconcile professional duties with private life (Encyclopedia of Management, access April 20, 2019). The research shown in “*Workers Preference and Workplace Ability*” (2014) proves that for 42% workers in Poland and 56% workers in the world, work–life balance is much more important than earnings and promotions (Leoński, 2015: 3).

Balance can be seen as “satisfaction and good functioning at work and at home with a minimum of role conflict” (Clark, 2000: 751). Balance between work and private life constitutes some sort of a symbol and stipulated way of thinking. Each of us decides as an individual what their priorities are and finds their own way to achieve harmony, satisfaction and feeling of security (Rzepka, 2016: 11–12).

Summary and conclusion

The process of intertwining family with work is visible in male and female lives. Traditionally, women were more burdened with family duties and housework and only today a part of these chores is being taken over by men. It is difficult or even impossible to determine unambiguously which sex is in a better position. Both females and males find it difficult to carry out their home and professional duties at equally satisfactory level. An opinion poll published by CBOS is not optimistic, claiming that in spite of growing professional and social activeness women are still burdened by household duties. *Therefore, is gender contract still functioning, but in a slightly*

implied form? This being the case, we should pay more attention to the correlation between professional and private lives of women and men.

In postmodern times, when people of both sexes have to face the necessity of making continuous choices this is the freedom which used to be the guarantee of equal rights and it is now enslaving both males and females making them choose steadily. They still have to strike a balance between work and home. It is necessary to find a golden mean allowing them to fulfill the commitments arising from the role of a wife, mother and worker on the part of a woman who has so far been treated as the one guarding hearth and home and, in the case of men – previous breadwinners who now have to take over the roles of workers, husbands and fathers. This role reversal forces people to make ceaseless choices, reach compromises and find new solutions to the conflicts continuously emerging in this context. However, it is not possible to solve those conflicts only on home ground, since, as it has been pointed out by U. Beck (2013: 32) *“family is only the place, but not the cause of events”*. In addition, results of surveys conducted in 21 European countries (Riedmann et al., 2006: 49–51) indicate that reconciling home life with work is no longer a worker’s private matter. That is why private and political strategies should be implemented in a mutual relation. There is a need for institutional solutions which would ease “domestic” conflicts in relations between males and females.

The aim of this paper was to outline urgent problems which men and women have to face rather than presenting ready prescriptions and solutions. At present I reckon that considering the subject matter complexity it is a difficult task that requires further profound analysis. I do hope, however, that this discourse will be an inspiration to additional considerations and seeking new solutions, which will facilitate the reconciliation of private and professional life, contribute to changing men’s and women’s stereotypical images being too deeply rooted in the society, and allay chaos in their relations in order to build equivalent relations satisfactory for both sides. The connections between those two most significant spheres of human life will constitute the area of further scientific explorations.

People who suffer the most from the imbalance between these two areas and those who are able to counteract it should take interest in learning how women and men can balance their careers and private lives and how to apply the concept of work–life balance in practice. Such people include: (1) **management practitioners** – in their case, the imbalance experienced by the employee produces expenses for the organization, reduces the satisfaction resulting from the job, and may lead to absences and problems in finding replacements; (2) **politicians in charge of social and economic policies** – a common imbalance may produce adverse effects on the society and reduce the professional activity of the people experiencing it; (3) **workers and family members** who experience the effects of imbalance directly. This imbalance may lead to greater stress, poor health, diminished disposition and satisfaction from family and professional lives, professional burnout, and disintegrating families; (4) **specialists: psychologists, educators, physicians, social workers**, etc., who can take advantage of continuing research and proposals of practical solutions to help implement the work–life balance concept into the life of workers and

workplaces and reduce the effects of potential imbalance for the aforementioned entities.

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How contemporary women and men combine family and work

Abstract

This article covers the relations between the family lives and careers of contemporary women and men. The process of intertwining family with work is visible in male and female lives. The text analyses the most important transformations in the roles of women and men in scope of “*gender contract*”, which have occurred in Poland and in Europe in recent years. Due to the growth in equality between women and men resulting from Poland joining the European Union and the socio-cultural and economic changes, the relations between males and females are also changing rapidly, liberating themselves from cultural and traditional pressure. This leads to the following question: *What does it mean, however, for men, and what for women? And what are the consequences for their functioning?* This is particularly important in the context of relations between family lives and careers, because this is an area of frequent conflicts between spouses.

Keywords: gender, work–life balance, gendermainstreaming, gender contract

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Katarzyna Lipińska

“CoinCoin et les Z’inhumains”: creative thought of Bruno Dumont

Four years after the television premiere of the mini-series *P’tit Quinquin* (directed by Bruno Dumont, 2014), in September 2018, the French channel ARTE aired the continuation of the adventures of the gendarmes from Pas-de-Calais¹. Bruno Dumont’s new creative work, to which the director gave the title *CoinCoin et les z’inhumains*, was, according to him, the second season, which, like an “echo”, referred to the first one². Bruno Dumont’s artistic talent had gained recognition among his colleagues in the cinematographic industry, sealed by the honorary Golden Leopard, awarded to the director during the Locarno Festival in 2018. In the meantime, the series received mixed reviews from French film critics. The grotesque nature of the situations and the characters, which delighted Vincent Maulsa and Jean-Philippe Tessé of *Cahiers du Cinéma*³, was the object of disapproval by *Télé 2 Semaines*⁴. On the positive side, Jacques Mandelbaum, a journalist from *Le Monde*, referred to the director’s philosophical past⁵, emphasizing the value of *CoinCoin et les z’inhumains* as material inviting the spectator to think in terms of a “burlesque science-fiction essay”⁶.

If “burlesque” and “science fiction” are the raw materials used by Bruno Dumont to convey his artistic thought, what other narrative tools does the definition of an essay allow the director to use? According to the analysis of the French researcher Françoise Berdot, the features of the documentary essay⁷ are, above all, a free choice of subject matter and an original choice of form. Transferring this definition to Bruno Dumont’s creation, his television series takes on an intellectual aspect

1 Pas-de-Calais is one of the five departments that make up the Hauts-de-France region.

2 B. Dumont, *Splitch! Splatch!* interview, “Cahiers du cinéma”, number 747, September 2018, 13.

3 V. Malusa, JP. Tessé, *Le grand carnaval*, «Cahiers du cinéma», number 747, September 2018, 8.

4 *Télé 2 Weeks* opinion about *Coincoin and the Z’inhumains*: <http://www.programme.tv/c32793315-coincoin-et-les-z-inhumains/noir-ch-est-noir-135766573/> (date of access: 14.11.2018).

5 In the past, Bruno Dumont was a philosophy teacher in high school.

6 J. Mandelbaum, “Coincoin and the Z’inhumains”, *Bruno Dumont’s burlesque science fiction*, “Le Monde”, https://www.lemonde.fr/televvisions-radio/article/2018/09/20/coincoin-et-les-z-inhumains-la-science-fiction-burlesque-de-bruno-dumont_5357572_1655027.html (date of access: 20.09.2018).

7 F. Berdot, *L’essai documentaire*, «La télévision d’auteurs», Aleas 2003, 146.

with the use of “burlesque” and “science fiction” in the form of stylistic games. Such games allow the artist to use “burlesque” and “science fiction”, thanks to the originality of the proposed aesthetics, to express the depth of his intellectual content. Following upon the ideas developed by Jacques Mandelbaum and Françoise Berdot, this article is an attempt to define the creative thought of director Bruno Dumont based on the example of his four-part series *CoinCoin et les Z'inhumains*. To this end, we will need to explore the themes and aesthetic means chosen by the director to tell the story of CoinCoin and the gendarmes. “Burlesque” and “science fiction” are examples of narrative techniques used, among which one may also observe the emphasis placed by Bruno Dumont on the Flanders landscape and the presence of carnival symbols. By his choice of style and subject matter, does the director lead his viewers to reflection?

The analysis of the production context will help to understand the extent of the essayist's freedom of artistic expression via television.

Deviating from tradition

To determine the subject matter of *CoinCoin et les Z'inhumains* and to explore its potential for classification in the category of the essay, let us take a preliminary look at the intrigues and heroes of this series. This will be the first step in defining the genre affiliation of *CoinCoin et les Z'inhumains* and an indication of the direction that has been given to the thought contained in the series.

The hero of the first season, Quinquin, has grown up and has a new name: CoinCoin. The boy avoids mental effort, killing time with pointless driving through local villages and countryside, without a driver's license. In addition, CoinCoin does not obey traffic rules, angering the local gendarmes, who are preoccupied with conducting a new investigation. It soon turns out that Commandant Van der Wyden and Lieutenant Carpentier are actually the main characters of the mini-series, pushing CoinCoin into the background. The gendarmes are trying to find out who or what is responsible for the strange black substance falling from the sky, which, according to their observations, “is black, living, but inhuman”. The result of their speculation is the hypothesis of an alien attack on the Earth. Although there is no UFO, the Pas-de-Calais heroes are struggling to solve the mystery of the doubles that are appearing on their territory. Lieutenant Carpentier cannot understand the situation when a clone of Commandant Van der Wyden is sitting next to him in the car while at the same time the original is calling him. This confusing situation leads the Lieutenant to phone Van der Wyden's doppelganger, considering himself the victim of a bad joke. It is worth recalling that in the 1970s a similar situation was faced by the French gendarme Ludovic Cruchot, played by Louis de Funes in the film *Gendarme et les extra-terrestres* (directed by Jean Girault, 1979). The gendarmes at the police station had their doubles, the cause of many comic situations resulting from misunderstandings.

In the two films, both the object of the investigation and the image of the police officers differ from both reality and the tradition of the French criminal series. According to Jacques Baudon, who has distinguished a number of the features of

this genre, an important element that gives rhythm and shape to the intrigue is the meticulousness of the method used by the investigating hero, which guarantees him credibility and a certain charisma. For example, the first episodes of *Les cinq derrières minutes* (1958–1996, various directors) take the form of a social reportage by exploiting Commissioner Bourell's insight about the psychology of the witnesses and their environment⁸. And Commissioner Maigret in *Les enquêtes du commissaire Maigret* (1967–1990, directed by Claude Barma and Jacques Remy) "listens to conversations in suburban bars, collects impressions, feels the atmosphere in order to extract the essence of human passions"⁹ and finally to unmask the perpetrator of the crime. Both the attitudes and the methods of action of these police officers are similar to those that exist in reality. The confirmation is the statement of **professor Marek Stefański** on the website of the Higher School of Security in Gdańsk: "One of the important elements distinguishing an officer is his impeccable moral and ethical attitude and professionalism"¹⁰.

Unlike Bourell and Maigret, we note that the Pas-de-Calais heroes cannot boast of having these qualities. We observe that images of Lieutenant Carpentier and Commandant Van der Wyden definitely differ from the general symbol of a public service officer, and the reference to the gendarme from Saint-Tropez, perhaps unconscious, heralds the burlesque style in which Bruno Dumont writes his series. Critics from *Cahiers du Cinéma* have noted an analogy between the concept of the television series as a series, what is serially produced in the factory – a series of repetitions¹¹ – and the call for a series of gags, typical in burlesque.

Getting a laugh, the immediate effect, is more important in burlesque, as Emmanuel Dreux suggests, than a moral message or the psychology of the characters, and the structure built on gags outweighs the dramaturgy¹². In turn, Jean-Philippe Tessé, observing characters interpreted by Chaplin, Buster Keaton or the Marx brothers, came to the conclusion that the aim of burlesque is to create chaos – "disorder, in opposition to order"¹³. One might therefore (dare to) conclude that in Bruno Dumont's series the characters' features contradict the ethical and moral attitude that a gendarme should have. Why not consider that Bruno Dumont's gendarmes are clowns who play with the improbability of their behavior and situations? The commandant's use of the word "clown" when speaking about his own clone can be understood as a clue that he is meant to be the clown in *CoinCoin et les Z'inhumains*. His clown character is indicated by the scene in which Van der Weyden shoots at refugees, arbitrarily suspecting them of being black "magma": "alive, black,

8 J. Baudon, *Bon sang, mais c'est bien sûr! Les séries policières de la TV française*, in: „Les feuillets TV européens”, G. Hannebelle (ed.), CinémAction, number 57, 1990, 122–123.

9 Idem: 127.

10 Definition of a candidate for the position of a security officer according to Professor Marek Stefański: <https://www.wsb.pl/gdansk/studenci/studia-ii-stopnia/sciezka-tradycyjna/kierunki-i-specjalnosci/funkcjonariusz-sluzb-publicznych> (date of access: 25.10.2018).

11 V. Malusa, J.P. Tessé, *Le grand carnaval*, «Cahiers du cinéma», number 747, September 2018, 8.

12 E. Dreux, *Le cinéma burlesque, ou la subversion par le geste*, l'Harmattan, Paris 2007, 17.

13 J.P. Tessé, *Le burlesque*, Les Petits Cahiers, Paris 2007, 55.

but not from here”, “are they extraterrestrials?”. His reasoning is illogical, he lacks methodology and the way his sentences are constructed and pronounced makes it difficult, even for the French viewer, to understand what he is saying. In addition, his investigation is more like a neighborhood patrol than a criminal case. Long camera angles, a slow rhythm, non-professional actors, burlesque dialogues and situations, an intrigue constructed on gags – all of this seems to play with the aesthetic codes of television, diametrically different from the tradition of a French police series. In an interview for *Cahiers du Cinéma*, the director confirmed that he hoped that the viewer, in face of this type of philosophical surprise, would enter a “state of strangeness”, whose aim is to make him laugh¹⁴.

In his philosophical essay *Le rire*, Bergson had already drawn attention to the social function of laughter¹⁵. Laughter hides “unconscious communication”¹⁶, “complicity” with others in the same group who laugh at the same object. We observe that television series watched at the same time by a group of viewers can similarly create “complicity” between them via laughter. Indeed, television has the power to create the illusion of community. The shared laughter of people sitting in front of their TVs can explode with considerable force. Laughter can therefore be useful and effective when it spreads throughout society, inviting citizens to think.

Television viewers invited to think

Bruno Dumont’s essayistic film attitude is evident from the very beginning of his career. In 1997, after the premiere of *The Life of Jesus*, in an interview for the French publication “Express”, the director accused television of “creating an insensitive generation”,¹⁷ but he also proposed a solution. His suggested communicational way to escape television formatting was to create alternative films that would make people think. As Gilles Deleuze suggested, cinema, and we may add the audiovisual arts in general, can take the form of “meditation on Cogito”, where an empirical figure cannot exist without the transcendental subject who thought of it or the subject who watches it¹⁸. The very act of making a film is subjective and inseparable from the director’s intentionality. Bruno Dumont builds his films on the principle of an essay that gives him the opportunity to freely express his own thoughts, but at the same time leaves space for the viewer’s activity as the subject who co-creates the meaning. Although Bruno Dumont himself admitted in an interview with the *Cahiers du Cinéma*¹⁹ that the artist has more creative freedom in directing a film for cinema

14 B. Dumont, *Splitch! Splatch!* interview, “Cahiers du cinéma”, number 747, September 2018, 14-15.

15 H. Bergson, *Le rire*, Éditions Alcan, Paris 1924, electronic version, http://classiques.uqac.ca/classiques/bergson_henri/le_rire/Bergson_le_rire.pdf, 12.

16 Idem: 11.

17 S. Grassin, G. Médioni, *Cannes 97 - Bruno Dumont : la philosophie du cœur*, «L’Express», 15 May 1997.

18 G. Deleuze, *Cinema 1. L’image-mouvement*, Editions de Minuit, Paris 1983, 107.

19 B. Dumont, *Splitch! Splatch!* Interview, “Cahiers du cinéma”, number 747, September 2018, 12.

than in working for television (even if he directs for ARTE²⁰), he managed to negotiate his own vision in three television works: *P’tit Quinquin* (2014), *Jeannette* (2017) and *CoinCoin et les z’inhumains* (2018). The director managed to cope with the television refusal of long shots that are accepted in the cinema, using other means to express his thoughts. Although the scenes are composed of a multitude of cuts to provide the rhythm standard in television, in *CoinCoin et les z’inhumains*, the motionlessness of the camera is responsible for the overall impression of stagnation.

Other artistic methods adopted by Bruno Dumont are the exaltation of nature and the choice to work with non-professional actors, aspects already notable in the director’s earlier works. Absurdity and the grotesque are the means by which, in confusing the viewer, the director leads his audience to pose questions, even those of a metaphysical nature²¹. One may therefore hypothesize that the mini-series broadcast by ARTE in 2018 is a further promulgation of the thoughts of the essayist-director and his maieutic approach towards television viewers and cinema amateurs via the televised format. Addressing audiovisual essays to television audiences can be understood as a natural development in Bruno Dumont’s undertaking to create works that stimulate viewers’ autonomy. Jean-Pierre Esquenazi observed that the narrative and stylistic qualities of series could help viewers in the process of identification. This French researcher has observed that to retain the viewer, creators seek to maintain the “connivance of an audience with his series”, “a set of gestures addressed explicitly to viewers”²². According to this thought, we can affirm that Bruno Dumont seeks to create a communicative complicity with the audience. In an interview with Marie Richeux for Radio France Culture on 19th September 2018, the director described his position towards the viewer as follows: “It is necessary to take advantage of the presence of the viewer, who, while being (in front of the TV), should be active, it is superfluous to give him instructions. It is the viewer who is the hero.”²³ Bruno Dumont counts on the independence of the interpretation of the television audience, which is ready for more than mere entertainment in their choices for their free time. It is the responsibility of the creator to produce works of art that stimulate the mind and senses. This objective can be achieved thanks to the narrative specificity of the series, which, for Jean-Pierre Esquenazi, communicate with the viewers through the heritage of the popular culture of its carrier²⁴. *CoinCoin et les z’inhumains*, which was broadcast on two September Thursdays during prime

20 ARTE is a Franco-German public television channel with cultural programs as its editorial line. When it comes to showing feature films, documentaries and series, ARTE buys or co-produces artistic, ambitious and creative works of art.

21 B. Dumont, *Splitch! Splatch!* interview, “Cahiers du cinéma”, number 747, September 2018, 14.

22 J-P. Esquenazi, *Les séries télévisées. L’avenir du cinéma ?*, Armand Colin, Paris, 2012, 44.

23 B. Dumont, interview with Marie Richeux, *Il faut avoir une pensée penchée*, «Par les temps qui courent», France Culture, <https://www.franceculture.fr/emissions/par-les-temps-qui-courent/bruno-dumont> (date of access: 19.09.2018).

24 J-P. Esquenazi, *Les séries télévisées. L’avenir du cinéma ?*, Armand Colin, Paris, 2012, 138–159.

time can be included in such works. At that time, over a million French viewers²⁵ sat in front of their TV sets in their homes. In this way, they agreed to follow the adventures of the characters of *P'tit Quinquin* in a sensual-intellectual way. When the series deals with social and political issues, public interest is more stimulated, as David Buxton has already noted²⁶. *CoinCoin et les z'inhumains* discusses sociopolitical themes by playing on the affective, intellectual and aesthetic complicity of the public. This communicative dimension will be analyzed later in this article, mainly through the study of the role of represented landscapes and the use of carnival codes by Bruno Dumont.

The invitation to reflect is evident from the very title, *CoinCoin et les z'inhumains*. After translation, it might look like this: "CornerCorner and the inhumans". Quinquin – human has turned into a CoinCoin or CornerCorner if we translate it into English. The character's perspicacity and sense of observation are limited, as if enclosed in the "Corner" of a triangle. It would be wrong, however, to accuse Bruno Dumont of making a mockery of his hero in giving him the name mentioned above. This rather indicates that he is the archetype of Bergson's disconnected dreamer/comedian, possessed of a mechanical rigidity, unable to react in a flexible and attentive way²⁷. It is this posture, which arouses laughter, which aims, by holding a tension, to "remove symptoms of stiffness from the social body". "This rigidity," as Bergson says, "is comedy, and laughter is its punishment."²⁸ Thus, the title's combination of the name of CoinCoin (CornerCorner), who represents the human species, with non-humans, may suggest the presence of phenomena and beings, whose comprehension by the human mind can only encounter obstacles, when the human mind loses its consciousness. The word "inhuman", understood as the opposite of the noun "human", is a term for animals, supernatural forces and machines. It is worth noting that machines and their sounds are omnipresent in the series, which accentuates the presence of mechanical rigidity in all bodies. Finally, the title points to the existence of two heroes: the individual, namely CoinCoin, who represents humanity, and the collective, which is inhuman. It is worth recalling that the series is constructed around the gendarmes (omitted from the title). Like CoinCoin and the other characters in the series, the gendarmes are also victims of the automatisms that push them toward absurd actions and behaviors.

The above-mentioned mechanical rigidity which also finds its expression in the title, its graphic form and its *sonority*, invites us to reflect. Hearing the name CoinCoin pronounced in French, a viewer familiar with *P'tit Quinquin* will almost automatically recall the character from 2014. This sonic resemblance may suggest a natural evolution of the boy who was Quinquin into the teenager CoinCoin. The critics from *Cahiers du Cinéma*, Vincent Malusa and Jean-Philippe Tessé, who

25 *Un million de fans pour CoinCoin*, «Nord Littoral», 24/09/2018: <http://www.nord-littoral.fr/103453/article/2018-09-24/un-million-de-fans-pour-coincoin> (date of access: 25.09.2018).

26 D. Buxton, *Les séries télévisées. Forme, idéologie et mode de production*, Paris: l'Harmattan, 2010 7.

27 H. Bergson, *op. cit.* 13.

28 Idem: 16.

welcomed the series with great enthusiasm, have no doubt about it. Quinquin and CoinCoin evoke the same hero, reflecting each other's "echo" and "asymmetry"²⁹. In this sense, CoinCoin is a deformed copy of his original³⁰.

It is also interesting to note the original, graphic expression of "z'inhumains", which creates a mark that does not exist in the standard written, officially accepted French language. The choice to combine the letter "z" with "inhumains" suggests that the action takes place in the department of Pas-de-Calais, recreating the characteristic way the inhabitants of this area accentuate these words. Applying this rule, the title *P'tit Quinquin* could take the form of *Lil Quinquin* in English or *M'ły Quinquin* in Polish. "Petit" in French means small. The protagonists of Bruno Dumont's films, inhabitants of the area of the Strait of Dover (Pas-de-Calais) in French Flanders, drop the pronunciation of the "e" sound in the word "petit", which gives a spoken version of "p'tit". Analogically, we can imagine that in English they might pronounce "lil" instead of "little" or, speaking Polish, they would "swallow" the "a" in the word "mały", saying "m'ły".

So as not to occlude the oral specificity which gives a characteristic melody to the French words spoken by the protagonists of *CoinCoin et les z'inhumains*, and to retain their geographical and cultural identity, we have opted for the original title and character names in the next part of our article.

Flanders Landscapes

The style of expression used by the protagonists in Bruno Dumont's series is not the only feature that reveals their geographical affiliation. Etymologically, the name Quinquin derives from the Flemish word "quinquin"³¹ meaning "boy". *P'tit Quinquin* is the protagonist of a 19th century song heard in one of Lille's cabarets. Thus, to those in the know, the title of the mini-series *P'tit Quinquin* already suggests the setting. Like its predecessor, the title *CoinCoin et les z'inhumains* indicates its connection with the culture of northern France, as mentioned above. However, the most visible proof of the series' inscription in the French Flanders landscape is its scenery. *CoinCoin et les z'inhumains* does not include a single indoor scene, and the action takes place mostly against the backdrop of nature. We may even get the impression that the main character is nature. In the same way, Janusz Gazda noted that a similar role was given to Mazury in *Knife in Water* (*Noż w wodzie*, Roman Polański, 1962): "For Polański, the environment, landscape, the environment in which his film characters move is never an insignificant *background*, it is always a matter, the basic material, next to man, from which a film is made³². Would it be too daring to wonder if, for Bruno Dumont, nature is an extension of the "interior" of the human characters?

29 V. Malusa, JP. Tessé, *Le grand carnaval*, «Cahiers du cinéma», number 747, September 2018, 8.

30 Idem.

31 L. Vermesse, *Vocabulaire du patois lillois*, Béhague, Lille 1861, 151.

32 J. Gazda, *Poczucie obcości i chęć wtopienia się w inność. Podróże filmowe Romana Polańskiego*, „Kwartalnik Filmowy” 1993, number 4, 141.

To respond to this question, we need to examine the director's intention in choosing the scenery of Flanders in the context of the system of co-financing of films by the French regions. It is worth noting that a discussion of the choice of outdoor location for economic rather than artistic reasons, i.e. the dependence of the film on financial considerations, could destabilize our portrayal of an essayist-philosopher, i.e. Bruno Dumont whose free thought is motor. What mainly motivates the French regions to subsidize films is the promotion of their territory and their culture through image. It is worth noting that the dissertation about the choice of scenery for economic, not artistic reasons, the dependence of the form of the film on the financial argument, might upset our hypothesis about the free-thinking attitude of Bruno Dumont. Briefly, to receive such a subsidy, the film must be shot to a large extent in the region of the sponsor, be inscribed in its culture and landscape and emphasize its tourist attractiveness. The co-producer of *CoinCoin et les z'inhumains* is Pictanovo, the organisation that manages the Hauts-de-France film fund, where part of French Flanders is located. In 2014, Pictanovo also supported the first season of the *P'tit Quinquin* mini-series with a grant of €150,000³³.

However, financial considerations had little influence on Bruno Dumont's choice of scene location. Dumont set all his films, except for *Twentynine Palms* (2003) and *Camille Claudel 1915* (2013), in his native Flanders. The choice of this landscape is connected to the artist's natural attachments. Bailleul, the Flemish town near Dunkirk, is the director's birthplace and childhood home. It served as an open-air workshop for the *Life of Jesus* (*La vie de Jesus*, 1997), Dumont's first feature film. The landscapes of Flanders are ubiquitous in the works of the French director because they are part of the natural world to which he belongs. For Dumont, this geographical area is like Heidegger's *Umwelt*, naturally present in his films because it helps him express his emotions, artistic visions and thoughts.

According to the philosopher Maurice Merleau-Ponty, literature, music, image are able to capture the sensitivity of the invisible world³⁴, in which the body and mind of the creator are inscribed. Cinema, as art, can also communicate phenomena invisible to the human eye by means of a variety of artistic resources at its disposal. The art of Bruno Dumont is an example of this ability to capture the world of the senses. The director, through his films and series, reflects the sensitivity of Flanders, which is dear to him. He has observed these landscapes since childhood. Because his body and mind are connected to this place, the artist feels Flanders as the land of his origins. This relationship between the director and his natural environment is obvious in *CoinCoin et les z'inhumains*. Thus, we can observe the spontaneity with which the artist places the temperament and the bodies of his heroes in the natural open air of the Côte d'Opale and the surroundings of Boulogne-Sur-Mer. This is the ambient world, the natural environment and the place where life unfolds. This attachment allows the director to raise more general issues. In an interview with Aurélie Charon for *France Culture*, Bruno Dumont confirms that the landscapes of Flanders

33 Information available on the Pictanovo website: <http://www.pictanovo.com/oeuvres/p-tit-quinquin/>, (date of access: 13.11.2018).

34 M. Merleau-Ponty, *Le visible et l'invisible*, Editions Gallimard, Paris 1964, 196–197.

and the characters inscribed there are for him a means of describing human nature, the “inner four seasons of the year” that every human being possesses inside him/herself³⁵. It should be noted that it is not the director’s intention to illustrate the life of the inhabitants of northern France³⁶. Bruno Dumont’s landscapes, despite their omnipresence in the mini-series, do not aim to copy reality. Images are “not”, as Vincent Amiel wrote “mirrors”, they “shape our grip”³⁷ of reality. The use of landscapes in *CoinCoin et les z’inhumains* serves as a metaphor for the sensitivity of the protagonists to help us, the viewers, to “grasp” the atmosphere, to understand the world presented. The sea, tanning beaches and dunes express emotions, internal states that are difficult to explain, and even more difficult to describe. To express these emotions, Bruno Dumont creates a subjective film language and brings chaos into the harmonious landscape of Flanders. By borrowing the method and themes of Flemish painters such as Hieronymus Bosch and Pieter Bruegel the Elder, who introduced chaos into landscapes by filling them with fantastical characters and situations, the director believes that disorder conveys more about human nature than order. Chaos, a characteristic of the burlesque, is something that, unlike the norm, disturbs us, makes us wonder and ask questions. One such aesthetic trick of the director is to include the science-fiction phenomenon of a black, bubbling magma falling from the sky, in a natural, harmonious landscape. The black ooze disrupts the landscape in which the beautiful lighthouse in Boulogne-Sur-Mer stands facing the sea, symbolizing rescue for lost sailors. Commander Roger Van der Weyden describes this unnatural state of affairs as a ‘brothel’, ‘disorder’ or even an ‘apocalypse’. For him, this is a case of an attack of unidentified objects sent by an extraterrestrial civilization. According to the hero, the above mentioned attack heralds “the end of life, the death of everything, even the gendarmerie!”

The landscape of French Flanders, in the Dumont series and in reality, also includes refugees. They stroll along urban roads, waiting to gain access to the UK. Almost every journalist asks Bruno Dumont about his intentions, about his message concerning the issue of refugees in *CoinCoin et les z’inhumains*. The director systematically responds that they are now part of the landscape of the Pas-de-Calais region. By including their image, the director describes the reality of the landscape of today’s Flanders. Refugees settle at camping sites, we can meet them walking along the roads, spending time on the beaches, strolling through the surrounding meadows or dunes. According to the director, they appear in the series as the figure of the “stranger” and he describes the attitude of some inhabitants of the North towards them. The director denies sticking his political “gęba”³⁸ in, claiming that in *CoinCoin et les z’inhumains*, as in reality, refugees simply are; nobody is interested in them; nobody bothers them; they are part of the landscape that his series reproduces.

35 B. Dumont, interview with Aurélie Charon, *Les z’inhumains de Bruno Dumont*, «Une vie d’artiste», *France Culture*, 29.09.2018.

36 Idem.

37 V. Amiel, *Le corps au cinéma*, PUF, Paris 1998, 6.

38 The phenomenon of “culcultising” the children, analyzed with irony by Witold Gombrowicz in “Ferdydurke”, can be moved to the foreigner “culcultised” by the natives.

CoinCoin et les z'inhumains warns once and for all against the scapegoat mechanism, whose importance for the group in a crisis situation is described by René Girard³⁹. In a scene where a black magma falls from the sky on the commandant's head, he accuses the refugees of being behind it. He starts shooting at them, running after them, terrorizing them. From an entity that lives in harmony with its environment, they become, in the blink of an eye, responsible for disorder in a crisis. Before the police officers discover the existence of the black substance, a group of Africans passes by on a nearby road. The commandant looks at the refugees when the car he is in passes them by. This is the most banal of scenes, a vehicle drives alongside characters walking on the road. Yet this inscription in the scenery takes on a different meaning after the local gendarmes discover the black substance. Instead of corpses, the object of their investigation is this magma, which shows signs of life. The gendarmes nervously demand that a group of refugees, passing near the "crime" scene, identify themselves. The situation is ironic, because in shouting "papiere!" the officers require identification from people unable to prove their identity. This impossibility of presenting the requested documents confuses the commandant, who notes an analogy between the skin color of the African foreigners and the black color of the magma, commenting under his breath: "black hole", "black, alive and not from here". After a while, he asks the scientific expert: "Are they aliens?" and the specialist responds: "These are men, my commandant".

In this scene, the empty yellow meadows and the crossroads where the gendarmes stop the refugees emphasize the "helplessness" of the camera. This aesthetic language, the impression of the cessation of life, may signify a lack of judgment on the part of the director, his aversion to the moral verdict of the police and to all Manichaeism. According to Bruno Dumont, the commandant is neither good nor bad: "He's a real man."⁴⁰ "The commandant is in each of us." It can be deduced, following the logic of Bruno Dumont, that the commandant Van der Weyden is one interior landscape of human nature.

General confusion

Bruno Dumont's TV essay presents the attitude of the gendarmes towards the refugees as a fear of the unknown. The Commander and his assistant are hostile towards "those who are not from here", provoking a reaction from the viewer. Aude Dassonville, a *Telerama* journalist, notes that the series leaves "a strange impression: the kind we feel when we listen to the embarrassing words of people we thought we loved"⁴¹. It can be assumed that the intended effect of the burlesque is achieved: to confuse, to throw on the viewer a cream pie, to turn his/her system of values upside

39 R. Girard, *Le bouc émissaire*, Editions Grasset, Paris 1982, 300.

40 B. Dumont, *Splitch! Splatch!* interview, "Cahiers du cinéma", number 747, September 2018, p. 16.

41 A. Dassonville, *Regardez les deux premeirs épisodes de „CoinCoin et les z'inhumains”, la suite de P'tit Quinquin*, 17 september 2018, <https://www.telerama.fr/series-tv/regardez-les-deux-premiers-episodes-de-coincoin-et-les-zinhumains-la-suite-de-ptit-quinquin,n5809528.php> (consultation : 28.10.2018).

down. The gendarmes are deliberately comical, even grotesque, and their attitude to refugees illustrates in an exaggerated way the position of the extreme French right towards migrants. In one of the scenes, Roger Van der Weyden and Carpentier do not want to shake hands with a Muslim imam, so they turn away. In retaliation, the imam slaps Lieutenant Carpentier's head. The entire *CoinCoin et les z'inhumains* series is built on similar gags that, according to the burlesque theory of Emmanuel Dreux, are intended to set the tone for the narrative⁴².

Instead of presenting reality in the style of his new-wave colleagues, Dumont creates film-like curved mirrors that deform it. In Dumont's series, the characters are misshapen and take the form of surrealist figures, as if extracted from the paintings of Francis Bacon. Gilles Deleuze noted that the distortion of the face or body in Bacon's paintings is characterized by a static state, "subordinating the movement to force"⁴³. We can observe a similar process in *CoinCoin and z'inhumains*. The faces of Commandant Van der Weyden and Lieutenant Carpentier are tired and their dentition is incomplete. They also express, in a natural way, the forces that act on their bodies from the inside, the symptoms of their emotions. The commandant's fear of the unknown manifests itself when his mouth becomes like a balloon, producing a multitude of noises. The deformation is also visible in the linguistic sphere. The speech of our heroes is unclear, stretched out like the spilling creations of Bacon. Bruno Dumont himself compares the commandant to a cubist figure during the interview with Sonia Devilliers for *France Inter*: "The commandant is a square, he lacks rounding"⁴⁴. In order to get his own emotions and personality out of the commandant, the director used absurd. He whispered illogical speeches about order and disorder into the ear of the actor who played Van Der Weyden⁴⁵. The lack of logic in these speeches encouraged the actor who played Carpentier to review the information he heard. For example, viewers see Carpentier's confusion when Van Der Weyden announces that "the disorder surprises him." The Lieutenant, like Voltaire's naive *Candide*, asks: "My Commandant, could it be otherwise? - What is surprising is order!". The Commandant compares order to the gendarmerie, which is a law enforcement agency, so "what's surprising is disorder! The whole mess!". This dialogue gives us, the viewers, a clue to identity of the perpetrator of the "crime". Disorder, according to Jean-Philipp Tessé, is a characteristic feature of burlesque, which "is a trouble, a disorder, an opposition to order"⁴⁶. So the guilty party in this artistic chaos is the burlesque!

Confusion is visible even in the extreme right-wing "Block", where one of the leaders is deformed. He is depicted as a teenage boy who speaks in deep baritone. He gives very serious instructions to CoinCoin and his friend, Le Gros (Fatty), to raid the refugee camp, where they arrive as if to colonize the place. However, they cannot

42 E. Dreux, *op. cit.*, p. 74.

43 G. Deleuze, *Francis Bacon. Logique de la sensation*, Editions de la différence, Paris 1984, p. 40.

44 B. Dumont, interviewed by Sonia Devilliers, broadcast by "L'Instant M", *France Inter*, 20.09.2018.

45 Idem.

46 JP. Tessé, *op. cit.*, p. 55.

break anything. Bruno Dumont compares the teenagers to imbeciles, who throw words into the wind and have no clear idea of the policy agenda they are serving⁴⁷. They put up propaganda posters for the "Block" more out of boredom than out of party vocation. Their meeting with an African girl is proof of their political guilelessness. Her human presence evokes from them simple sympathy, as if she were their kid sister. Tichner might say that this dialogical relationship⁴⁸ established between them has annihilated "evil". The girl's face, devoid of any mask, the authenticity of her look, reminds the boys of their ethical responsibilities and the duty of respect to others, as stipulated in the philosophy of Emmanuel Levinas⁴⁹. We can perceive the presence of this philosophy in Dumont's series when the director summarizes that people are equal. However, he remains skeptical of the idea that man is by nature a social being: "we are all animals, all living beings"⁵⁰.

Comedy and laughter, omnipresent in *CoinCoin et les z'inhumains*, direct our attention to the order that has been disturbed. Bergson's idea of mechanical rigidity is transferred to the bodies and minds of the characters. CoinCoin confesses with much artificiality his eternal love for his ex-girlfriend Eve. He declares that he will always love her, even if she prefers women now, "or something else" and even meets one of his replacements. CoinCoin takes on the attitude of the unhappy lover who, out of despair, has no choice but to "make love with someone else". The tone of this scene veers momentarily to that of a soap opera. CoinCoin's inner state is reminiscent of Buster Keaton in love, he will do anything for his lady love, even run faster than speed. This nod to the burlesque, the construction of the series on gags are used to confuse and disorient. In one scene, Dany, CoinCoin's uncle, walks in circles in the backyard in front of the barn. At one point, the wall of the barn falls on Dany, who comes out of the situation unscathed, because he happens to be standing directly in front of the opening of the door. The reference is a gag from *One Week* (directed by Edward F. Cline, Buster Keaton, 1920) with Buster Keaton. The structure of the house collapses around him, unaware of what is happening until the end because he is auspiciously placed where he will not be injured by the destruction happening around him.

Another indicator of artificiality in the Bruno Dumont mini-series is the figure of the clone, which symbolizes for him a reflection of ourselves that we had not expected. When the Commandant meets his double and sees himself in mirror, he does not know how to react other than to surround the house where the clones gather. At this point, laughter, which according to Daniel Grojnowski requires another human being, loses its meaning. Its social function is disrupted when we divide in two to become our own interlocutor⁵¹. Evidence of this is Commandant Van der Weyden's

47 B. Dumont, interview with Aurélie Charon, *Les z'inhumains de Bruno Dumont*, «Une vie d'artiste», *France Culture*, 29/09/2018.

48 J. Tichner, *Filozofia dramatu*, Znak, Krakow, 2006.

49 E. Levinas, *Altérité et transcendance*, interview with Angelo Bianchi (1985), Fata Morgana, coll. Essais, Montpellier, 1995, p. 173.

50 B. Dumont, interview with Aurélie Charon, *Les z'inhumains de Bruno Dumont*, «Une vie d'artiste», *France Culture*, 29/09/2018.

51 D. Grojnowski, *Le rire de Bergson et ses limites*, Etudes, November 2014, n°11, p. 57.

inability to communicate with his clone. The hero cannot explain the reproduction of doubles or the falling black substance in any other way than as signs of the end of the world: "it's the Apocalysspssse." A deformed word coming out of the mouth of a police officer evokes laughter. This situation, however, draws attention to the new paradigm of catastrophe that our society is currently facing. Philosopher Michael Foessel explains the rise of "contemporary apocalyptic fears"⁵² by the loss of faith in the value of the world, and the belief that it is going to self-destruct. The nuclear threat, health or environmental crises, are all examples of disasters that have led to apocalyptic fears and a new paradigm, based on a fear that wrongly interprets "as a disaster the distress that cries out for new inventions"⁵³. Symptoms of the Apocalypse in the series include: the black substance falling from the sky, the presence of doubles and the zombification of characters.

Bruno Dumont proposes a cure for this apocalyptic distress. The carnival turns out to be a panacea, thanks to which everyone can express his or her disagreement with the laws of the new paradigm. Mikhail Bakhtine highlights the transgressive function of the carnival in his essay devoted to the analysis of the work of François Rabelais who transforms a formidable hell into a fun show that can be shown in a public place⁵⁴. The carnival takes on a similar role in the series *CoinCoin et les z'inhumains*, as a place of shared play, singing and clapping of hands. The carnival created by Bruno Dumont can be compared to the process that Deleuze and Guattari called "rhizome"⁵⁵. Humanity comes together in a great unity that overcomes apocalyptic fear. The carnival is a place where the relations of horizontally structured power do not exist. A Union that intertwines otherness and multiplicity becomes a symbol of the new order. Together, in solidarity, the group gains strength thanks to its diverse composition: people of different nationalities, animals, zombies and doubles...

The end... of the world

To conclude this article, it is worth mentioning the definition of burlesque formulated by Petr Kral, for whom burlesque is, among other things, the introduction to general chaos, "thus reinforcing the concrete and erasing it at the same time"⁵⁶. The author emphasizes its moral dimension as well. Our discussion has shown that Bruno Dumont uses burlesque in his series as a tool to describe certain existing phenomena without taking a dominant position on them. Moving away from delivering moral messages, the use of burlesque language is supposed to create chaos that leads to laughter. It is the laughter and fantastic motifs contained in Bruno Dumont's work that implement the sense of meaning, that in turn allow us to take a step back

52 M. Foessel, *Après la fin du monde*, Editions du Seuil, Paris 2012, p. 14.

53 Idem, p. 286.

54 M. Bakhtine, *L'œuvre de François Rabelais et la culture populaire au Moyen Age et sous la Renaissance*, trad.: Andrée Rabel, Gallimard, Paris, 1970, p. 390.

55 G. Deleuze, F. Guattari, *Rhizome : introduction*, Editions de Minuit, Paris 1976, p. 19.

56 P. Kral, *Le Burlesque ou Morale de la tarte à la crème*, Editions Stock, Paris 1984, p. 189.

from the surrounding world. Laughter can direct viewers' attention to certain existing social problems, without judging, by simply pointing out their existence.

Our questioning about the philosophical scope of *CoinCoin et les z'inhumains* leads us, in conclusion, to compare the reflexive approach chosen by the director to awaken the spectator to the act of throwing a cream pie. With the help of irony, laughter and burlesque, which are the ingredients of this pie, the viewer's senses sober up and push him or her to raise his or her head to look up. Thinking about the hit of the ironic pie, the viewer is forced to focus on the cause of the laughter. It can therefore be said that the television essay offered to the viewer creates space for expressing one's own thoughts, posits the viewer as a subject who co-creates meaning. We have also observed that the motif of the end of the world, present in the series, draws attention to a new paradigm, which is embodied by the catastrophe or the Apocalypse, the fear of contemporary human reason. *CoinCoin et les z'inhumains* is therefore a television essay that can be qualified as philosophical, in that it raises existential issues and moves us to think, criticizing our attitudes towards each other.

Finally, our analysis revealed the communicative dimension of *CoinCoin et les z'inhumains* through the study of its narrative and aesthetics tools. Among many themes, the series presents the science that seems powerless against chaos. Our reflection is open to other research on the representation of science in television series. One of the very current scientific topics that could be questioned by the series in the context of education seems the artificial intelligence. Many series feature this theme: *Westworld* (2016), *Real Humans* (2012) and *Black Mirror* (2011). The series seems to be a relevant way for introduces, through the worlds its represent, to the issues of the progress of science, humanity and transhumanism in the context of education.

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"CoinCoin et les Z'inhumains": Creative thought of Bruno Dumont

Abstract

Our article aims to analyze the essayistic and philosophical posture of Bruno Dumont, through the study of his latest series in four episodes, *CoinCoin and Z'inhumains*, broadcast in September 2018 by the French channel ARTE. Our questioning about the philosophical scope of *CoinCoin et les z'inhumains* leaded us to compare the reflexive approach chosen by the director to awaken the spectator to the act of throwing a cream pie. With the help of irony, laughter, carnival characters and burlesque, which are the ingredients of this pie, the viewer's senses sober up and push him or her to raise his or her head to look up.

Keywords: burlesque, televised carnival, audiovisual essay, Bruno Dumont, *CoinCoin and les Z'inhumains*

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Albert Wołkiewicz

Soroban – a road sign for future education

Introduction

Perspicacious observers of contemporary reality keep repeating that we do not only live in 'the epoch of changes' but that we are participating in a true 'change of epochs'. This transformation does not make it possible to perceive clearly the future of our world, the community in which contemporary children and youth will have to live. The situation of accelerated and continuous changes makes the task of passing on knowledge, skills and educational attitudes to new generations extremely complicated. The development of modern technologies offers every inhabitant of cyberspace a wide access to information (information is commonly available yet it is not equivalent to knowledge). The contemporary teacher is no longer the only source of information for the student and school is not just a place for acquiring knowledge any more (students do not come to school just to acquire knowledge). The status of communications models has also been transformed. In view of the excess of information the communication of scientific issues is becoming a very complex question. The attitude to school curricula is also changing. Instead of the approach from the teacher, a more and more frequently suggested one is that from the student (Wołkiewicz, 2019). There appear certain road signs on the road aiming at searching for future models of education. They can hardly be seen from the perspective of formal education. They are much more visible from the level of informal or incidental education.

Alternative education in the 21st century

Alternative education brings about numerous dilemmas both in theory and in practice. The reasons for such a situation can be found in many areas. Beginning with educational and pedagogical ones, through social and cultural ones and finishing with the politics. For some people it will be a struggle for the basic human right to be themselves in any situation, to be an individual. For others, it may be screaming for the return to the sources and tradition of education.

For methodology reasons we should quote a sentence by Zbyszko Melosik and Bogusław Śliwerski: "alternative education signifies such a type of education or upbringing which is different in some way from the one that is commonly offered by educational institutions. Alternative schools are also known as free, open, independent, nontraditional, private, innovative, experimental or reform schools..." (Melosik, Śliwerski, 2010). It is worth mentioning that today's student more and

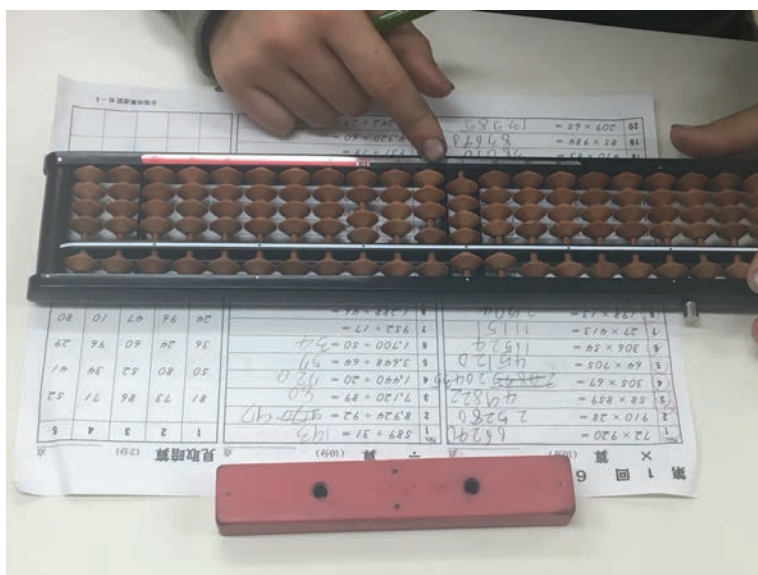


Photo 1. The Japanese abacus – “Soroban”

more often uses not only the state-run, traditional educational offer but they also take advantage of numerous forms of non-formal education. Living in constant on-line contact with peers and the Internet reality, they also frequently undergo the processes of incidental education unconsciously. There appears a question if a contemporary student still needs the teacher – master and if so, what kind of teacher and what for? Soroban is a still little popular form of effective teaching and education in Europe. It seems that theoretical scientific reflection on this phenomenon could make the encounter with this medium a more creative one.

Soroban – old media

Although the contemporary human does not imagine life without the use of new media, the rediscovery of ancient methods of transferring information and knowledge popularization may turn out to be creative even for a digital user.

Soroban is an old Japanese abacus for performing mathematical calculations (photo 1).

According to Ewa Puchalska and Zbigniew Samedeni the abacus is any device allowing us to represent numbers using stones in the form of spheres, knobs, beads or pawns which enables us to add and subtract numbers through appropriate manipulation of the stones. (Puchalska, Samedeni, 1985). They allow performing many activities which facilitate the formation of mathematical notions, offer the opportunity for a great number of simple memory-based counting, which make calculations simpler and also, by enabling a more comprehensive consideration of arithmetical problems, deepen their comprehension. They were already used in ancient Rome. They also got to Asia. In China during the Ming dynasty abacuses became popular under the name of suanpan (photos 2 and 3). Via Korea, they reached Japan in



Photo 2. Old Chinese abacus (1)



Photo 3. Old Chinese abacus (2)

the 15th century. Inhabitants of the country of Cherry Blossom improved the invention and called it soroban. In the Edo period (1603–1868), despite the fact that Japan was a closed country (sakoku), traditional system of education allowed the application of soroban. At that time, particular hans, that is provinces governed by feudal lords, kept their own schools where mostly samurais' children were educated. Private schools and academies had a major participation in education (Hałasa, 2004). The most important educational center was Edo, as Tokyo was called back

then. During the rule of Emperor Meiji (1868–1912) there occurred a rapid change resulting from the violent process of modernization and absorbing Western notions (Pałasz-Rutkowska, 2019). It also regarded the ways of educating. It turned out that soroban was still useful and students still had to learn to master it. In 1938 calculation techniques using the abacus were included in the Mathematics textbooks developed by Ministry of Education (Cusick, 2010). After World War II, the fast process of development in Japan, as well as general computerization led to giving up traditional values including the soroban calculations. The problems resulting from that decision made the Japanese aware of the imminent dangers and in recent decades there occurred a return to teaching the rudiments in all the fields. In 1989 Ministry of Education recognized the necessity of broadening the education by teaching students to use soroban as the basis for Mathematics teaching in elementary schools (Soroban in Education and Modern Japanese Society, 2014).

At present in Japan soroban is used not only in public elementary schools but also in many so-called afternoon schools. One of the most perfect techniques of using this abacus is called ISHIDO-SHIKI and was developed in 1973 by master Kenichi Ishido, the President of Soroban Foudation of Japan (photo 4). The organization comprises of various schools in Japan, working with the ISHIDO method (photo 5). Leading promotional activities, it points out the importance and advantages of learning to count on soroban. At present in Poland there are two private schools educating children, youth and adults according to the ISHIDO method. Completing particular stages of learning is followed by an examination, and in the event of passing it, the Japanese certificate is awarded. There have been organized Championships of Poland in Soroban Counting (Championships 2014, 2014). The first teacher in Poland who passed the examination successfully and was awarded the certificate of the Japanese Soroban Association authorizing to teach this method is Karol Sieńkowski, the founder of the Soroban Academy in Siedlce.



Photo 4. Mr Kenichi Ishido, The President of Soroban Foundation of Japan



Photo 5. A student at ISHIDO-SHIKI school in Shiroy (Japan)

Soroban – how does it work?

The construction of soroban is slightly different from the construction of rod abacus used in Europe. The European version of abacus usually has ten horizontally oriented rods with ten beads on each of them. Soroban is built in the following way: all the rods are divided into two parts. In the upper part, called in Japan 'heaven', there is one bead, whereas in the lower one, called 'the earth', there are four beads. Each lower bead has the values of 1, the upper bead equals 5. The Japanese solution is much more advanced than the European version as any number can be represented in one way only.

With the use of soroban all the basic calculations can be done: addition, subtraction, multiplication, division, square rooting of integers, negative numbers and fractions (Mączka, 2012). The calculations are done with the help of moving the beads with one's fingers. The aim of such training is leading to performing all the calculations in your mind, due to the visualization of soroban. It is the so-called *anzan* method (Bernazzani, 2005; Markarian, 2011). In the ISHIDO method the degrees of students' skills have been developed from 10 kyu to 1 kyu and from 1 dan to 10 dan at the master's level.

Soroban – it is something more than just an abacus

The soroban abacus allows the child to undergo the difficult stage of getting rid of the physical interpretation of a number as a number of items in a stressless way. Through visual representation of a number in a specific system of beads, after years of practice, numbers stop being an abstract notion and appear as a specific image generated in the right hemisphere. The beginners, playing and moving the beads are not aware of the fact that they are learning Mathematics in this way. Students using soroban understand the structure of the decimal system as well as the numbers'

values, they have a possibility to perform difficult arithmetical operations ‘step by step’ which is conducive to better understanding of the calculations.

The abacus is one of the most effective methods making work more efficient. It turns out that during performing the operations on soroban the activity of the brain’s right hemisphere increases significantly, the neural connections between both hemispheres are strengthened and the new ones are built. It has significant influence not only on Mathematics teaching but on teaching any other subject as well. A strong connection between the finger movement while performing the calculation on soroban and the development of the brain was confirmed as a result of neurological research. Soroban requires from the user visual observation, thinking and providing the answer through moving the beads. Therefore calculation is not the only skill which is acquired by the student due to the efficient use of the abacus. The capacity for concentration, memory and the ability to assess the situation are clearly improved (Miur, 2018). Soroban stimulates the willingness for development in children while positively shaping their psyche and improving the sense of self-confidence.

As Karol Sieńkowski points out “The child focused on calculation forgets about the whole world, he or she only sees the abacus and the beads. It is a therapeutic effect hard to overestimate, leading to calming down of the mind attacked by numerous stimuli. Hence the person practicing the soroban calculations learns self-discipline, concentration, patience and being systematic. They grasp that the success can be achieved through hard work only. And at the same time – they develop their minds” (Mazurek, 2018). The foregoing theses are confirmed by the results of the research carried out by Shizuko Amaiwa from Shinshu University (Amaiwa, 1987; Amaiwa, Hatano, 1989). Using soroban on a regular basis improves memory span of the users, improves problem solving skills and understanding spatial systems.

The mind that acts efficiently carries out quick analysis and correct synthesis is creative and helps to function in the society creatively. The children who carry out calculations on soroban achieve success at school more easily during other scientific activities than just Mathematics. Yet it is not only about children. Calculations on soroban decrease the risk of the occurrence of dementia and Alzheimer’s disease. That is why in Japan many centers for the elderly organize soroban calculation activities. It not only trains the memory considerably but it stimulates the brain operations in elderly people (Takahashi, 2018).

There has also been noticed a certain danger connected with using soroban, especially by children. The unchangeability of the methods in the performed calculations may bring about lack of flexibility in behavior, which may cause little innovativeness in problem solving, in particular those mathematical ones. A similar threat is also noticed by Karol Sieńkowski who remarked that after reaching a certain proficiency, soroban stops being a tool for mathematical development and becomes “a machine for calculating, not requiring almost any intellectual effort on my part” (Sieńkowski, 2011). The solution to this problem is still an open perspective both in the practical and scientific aspect. However, measurable benefits resulting from fluent use of the abacus outweigh significantly the perceived danger.

Summary

Soroban is an educational road sign for those who take the future education seriously. It is an effective tool for knowledge popularization, not only Mathematics. It develops the awareness of numbers and arithmetical skills. It is a good means for developing the ability to perform quick memory calculations. It strengthens and builds neural connections between the brain hemispheres. It develops manual skills and hand-eye coordination. It teaches self-discipline and concentration. It plays the motivating role in the process of teaching at every stage. In adults it helps prevent senile dementia and Alzheimer's disease.

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Soroban – a road sign for future education**Abstract**

At the time of dynamic development of new technologies and easy access to varied tools facilitating the solving of complex mathematical and IT problems, one may notice a discreet and timid comeback to old and often forgotten educational tools. The author, asking about the shape of the future education remarks that formal education is often replaced by new examples of non-formal and incidental education. This manner of learning, different from the one commonly offered by educational institutions, turns out not to be less effective.

A perfect example here is the skill of using soroban – a Japanese abacus. At the beginning the author presents history of abacus which dates back to Ancient Rome. In 15th century it travels from China, via Korea to Japan. In modern times, when computational technique using soroban was permanently included in Mathematics textbooks, developed by Ministry of Education in Japan, it is constantly being improved. This technique and culture arrived in Poland where the Polish Championships in Sorban Calculations have been held since 2014.

The author defends his thesis that soroban is something more than just an abacus. Basing on research results he point out to the relationship between the finger movement during the calculations on soroban and brain development in students. A considerable increase in the activity of the right hemisphere and new connections between both hemispheres affect the improvement of concentration, memory and evaluation of the situation. The capacity for solving complex problems and understanding spatial systems is improved. Skillful soroban use decreases the risk of dementia and Alzheimer's disease.

Keywords: abacus, soroban, education for tomorrow, mathematical education

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Małgorzata Nodzyńska

Comparison of different forms of informal education... in terms of teacher's work input and achieved results

Teaching and learning does not apply to a man and modern times. Animals also learn through exposure, stimulus recognition, reproduction, and imitation (Tomasello, 2002). Initially, also in hominid groups, children gained knowledge by analogous methods directly from adult members of the tribe. This type of informal education still applies to our human young children. When specialized professions (e.g., blacksmithing, quackery) began to appear with the development of civilization, their rules were secretly passed from master to student. In this case, we can talk about the beginnings of formal education. The invention of writing created schools. Scribes were educated in ancient Egypt and Mesopotamia, and in ancient China, there were schools that educate children who were at least 12 years old. Private teachers taught in ancient Greek city-states. In Rome, the educational system changed as the state changed. Ultimately, however, four-level paid education developed. Religious orders and monasteries played a major role in medieval education. Towards the end of the 17th century, a new cultural and mental current (Enlightenment) began to emerge in Europe, which changed the approach to science, knowledge, and education. The current education system was created at the beginning of the 19th century in a militarized Prussian state, on the wave of industrialization. The aim of such education was to create a citizen for the needs of the administration and an obedient factory worker working an assembly line, whose rhythm of work was regulated by the sound of the bell. In schools discipline was in force – there was no room for individualism, developing a sense of autonomy or creativity. Over 200 years have passed, the world has changed and industrialization has a completely different face today and the nineteenth-century model of education centrally controlled by officials who decide about school-age of students and curricula, with annual classes, in which children run the same program at the same time, with bells every 45 minutes, is still functioning. This happens even though developmental psychology and neuroscience talk about the ineffectiveness and even harmfulness of the current model. As an alternative to formal education that does not meet today's expectations, informal education is promoted in many countries.

Informal education is defined as institutionally organized learning, but outside the education and training programs leading to qualifications entered in the Integrated Qualifications Register (Eurostat, 2016).

Informal education has many advantages. A very important element of informal education are teachers/educators who are highly valued specialists (in their field) and at the same time passionate about education. They willingly share their knowledge with children and young people and, by their very nature, use the research method in education. Another advantage of informal education is the technical background in the form of well-equipped studios and laboratories that are not available in a typical school. Outdoor education conducted as part of informal education allows the use of valuable natural resources – both in museum halls and in the field. In informal education, it is also possible to use time other than at school. Therefore, the student can not only conduct an experiment or observation but also plan, analyze the results, formulate and discuss conclusions, which is often impossible in a Polish school due to the system of 45-minute lessons preferred by the school administration. In informal education, laboratory and project methods are used more often than at school.

It could therefore be concluded that informal education is an ideal solution. Is this really the case?

First of all, observation of students' behavior in informal classes shows their great interest - it can be stated that students' motivation increases. However, is it motivation to learn? It seems to me that in informal education, misconceptions of students about education arise – students think that any learning is fun. There is a misconception that learning is nice, easy and fun (it can be but it is not always the case). In Polish, we speak of “conquering knowledge” – just like conquering the mountain! Is climbing pleasant for everyone?

The second problem that appears in informal education is the ratio of the costs involved in the results achieved. Therefore, it was decided to examine the costs of individual types of informal education and compare them to the results obtained.

Research

In the years 2016–2018, an experiment was conducted on the effectiveness of various techniques (types) of teaching science subjects in informal education and attempts to estimate the input of the teachers' work in individual types of education.

The aim of the study was to compare the effectiveness of various types of laboratory classes in informal education with the work time invested by those conducting the classes.

For 4 semesters, students participated in 1.5 hour long weekly classes at the Pedagogical University of Krakow. Each stage had a slightly different form – from forms requiring the greatest involvement of the teachers to the total minimization of their work.

1st stage

In the first stage, classes began with a short lecture using multimedia, which was the theoretical introduction to the classes. Then the students worked with a work card that contained:

- a detailed description of the activities to be performed,

- space for observations and conclusions,
- and again, the theoretical explanation of the issues raised on class lecture.

Classes were conducted by 2–3 teachers (for about 12 students). Classes were conducted on an “equal front” (all students performed the same experiment at the same time) and the student workstations were fully prepared (they contained everything that was necessary for the student to complete the task). Before and immediately after class pre- and post-test were carried out.

2nd stage

In the second stage, the only change (compared to the first stage) was the change in the form of conducting classes – instead of classes conducted on an “equal front”, where each student performs the same task at the moment, these classes were



Fig. 1. Students at a multimedia lecture (photo by M. Nodzyńska)



Fig. 2. Fully prepared workplaces for students – before classes (photo by M. Nodzyńska)

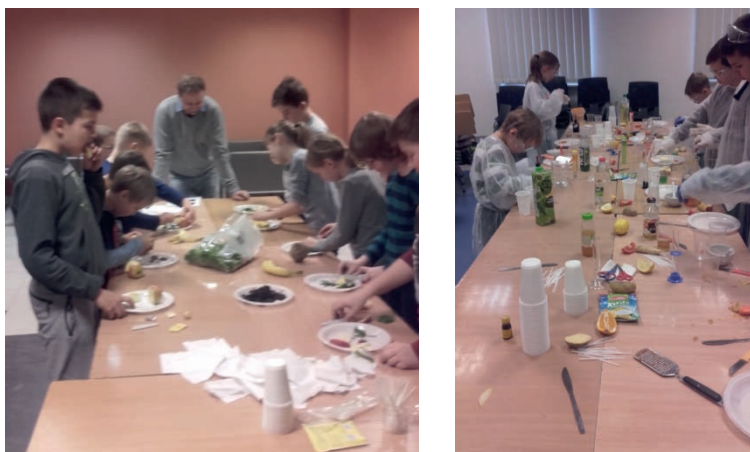


Fig. 3. 'Equal front' work under the supervision of teachers conducting the classes (photo by M. Nodzyńska)

conducted using the "circus" method. About 8 workplaces were prepared for students (arranged in a circle, hence the name "circus"). At each position, students had the opportunity to perform a different experiment – students worked in pairs. They were moving from one workplace to another workplace. The students were worked at their own pace and they freely chose the order of experiments. Teachers had a supervisory role (they did not show how to perform the experiment) and answered students' questions.





Fig. 4. Workstations where students work in pairs. There were instructions for students at workstations (photo by M. Nodzyńska)

3rd stage

Three changes have been made:

- The initial theoretical lecture was abandoned (only theoretical information on the worksheet remained). Students were encouraged to ask questions about theories when something was not clear to them.
- Workstation preparation was limited (some of the equipment needed, laboratory glassware and reagents students had to find themselves in the laboratory room).
- Classes were run by 1 or 2 teachers.

Similarly to the second stage – in the third stage the classes were conducted using the same technique as in the second stage (“circus”).



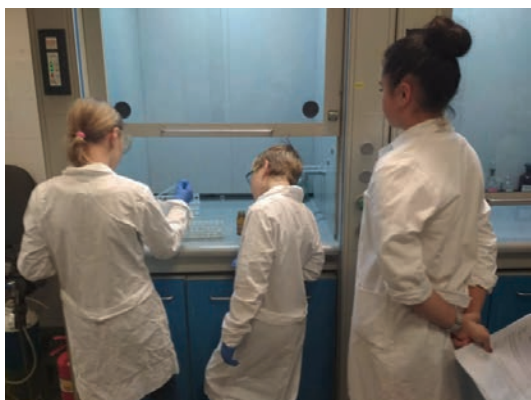


Fig. 5. Reagents and glass needed for classroom activities and instruction with theoretical material for students (photo by M. Nodzyńska)

4th stage

In the fourth stage, instead of the work cards dedicated to them, students were given a chemistry script for 1-year non-chemical students (Nodzyńska, 2016), with theoretical information and descriptions of experiments. The students had no prepared workstations (they had to find all the equipment, laboratory glass and reagents they needed in the laboratory room). The students worked independently, each of them performed any experiments (from a given department) in any order. Only one person supervised the students' work and answered their questions. Pre- and post-tests were also abandoned in favor of self-evaluation carried out by the students.

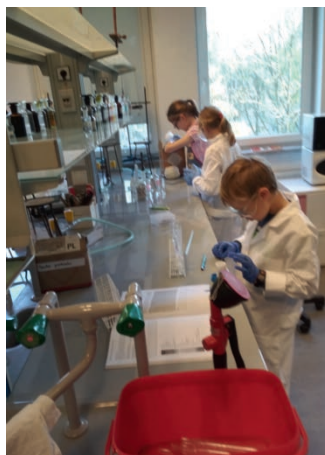
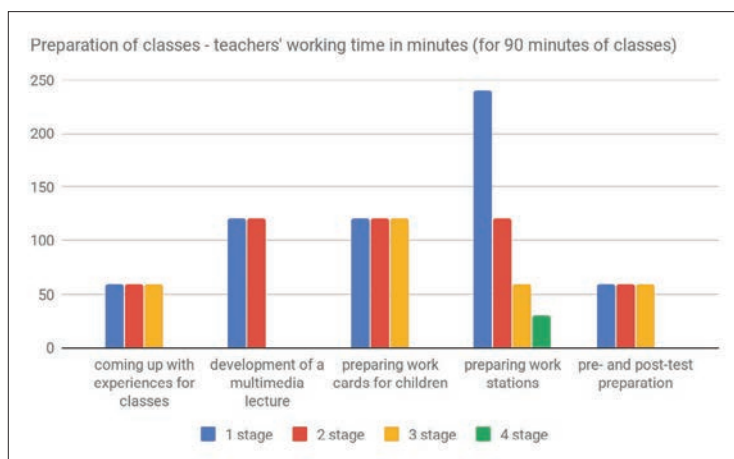


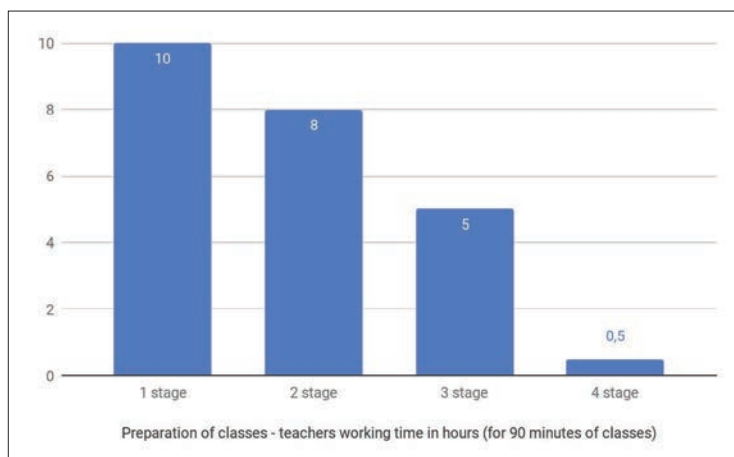
Fig. 6. Laboratory glassware and reagents on laboratory trolleys, students work independently with the script (photo by M. Nodzyńska)

The subjects of the classes in stages 1–3 were partially elicited with the students, while in stage 4 imposed by the script (Nodzyńska, 2016).

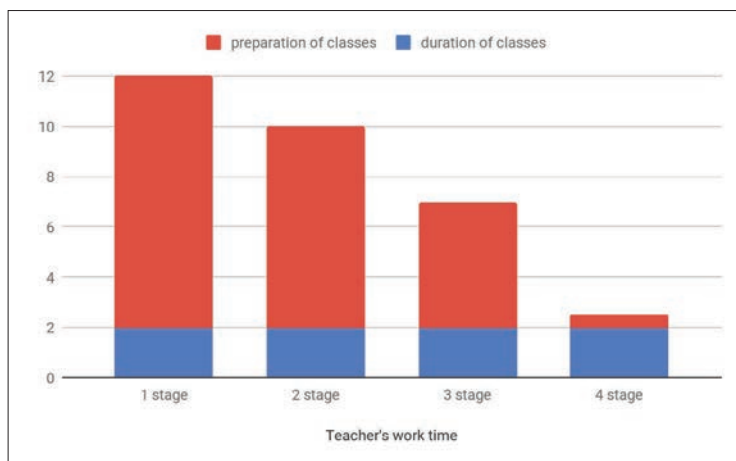
The graphs below show the average working time of a teacher who prepares classes of a given type (Graph 1 broken down into individual activities).



Graph 1. Preparation of classes – teacher's working time (in minutes) needed to prepare 90 minutes of classes with students (broken down into various activities; "Job preparation" also includes the time needed to buy the right ingredients and clean up after classes)



Graph 2. Total teacher's working time in minutes needed to prepare 90 minutes of classes with students



Graph 3. Total teacher's working time – preparation and conducting of classes

If we compare the time of class preparation in this way, it turns out that the costs of the teacher's work, in particular types of classes, change radically. Preparing and conducting 2 hours of classes for students, the topic of which was discussed with students, containing a mini-lecture, together with work cards, pre- and post-tests, purchases and preparation of the room (and then cleaning it) is about 12 hours, i.e. 1.5 days of teacher's work.

Preparing classes in informal education in this way seems ineffective. It is true that students get "tailor-made" classes and the teacher has the opportunity to go beyond beaten paths, but if you count the actual working time of the teacher, the cost of preparing and conducting the classes alone is about PLN 1,500 for one class. If we add the costs of chemical reagents, laboratory glassware, teaching aids or laboratory rental – we can see that the cost of such prepared activities is unacceptable.

If we compare these costs with the costs of stage 4, we can see a radical reduction in the costs associated with conducting classes. This type of activity, i.e. conducting previously prepared topics several times for subsequent groups of students, can often be observed on the private education market. These are both activities of private language schools, education schools, and museums. However, the question arises whether this type of education is still informal education? Often, the child/student is forced to participate in this type of activity, whether by parents or school (mandatory attendance during the so-called museum lessons). The educator's passion is also lost in such classes.

However, the issue of interest to us was not only to examine the contribution of the educator's work but also contribution to the increase in students' knowledge in particular types of classes.

The results of the study on the increase in knowledge

Although:

- topics implemented in stages 1 and 2 were selected by students,
- teachers conducting the classes were very involved in the clarification and explanation of the phenomena studied,
- students themselves did their own experiments and completed work cards,

the results regarding the increase in students' knowledge in stages 1 and 2 were not satisfactory (depending on the topic, they fluctuated between 20–30%). It can be stated that the increase in students' knowledge was inadequate to the funds invested.

In stage 3, an increase in knowledge was definitely greater (30–50%) but still lower than expected. However, in stage 4, an increase in knowledge exceeding the expected (45–60%) was observed. So definitely 'profits' were higher than the time spent and resources.

Summary

The obtained results show that the best results (taking into account the teachers' working time in relation to the obtained results) were obtained in activities that most closely resembled formal education. The students did not choose the topics of the laboratory themselves, they worked with the textbook, the classes did not have the form of games, there were no motivating elements, students themselves had to look for chemical reagents and laboratory glass in the laboratory. The question then arises: What is the purpose of informal education? This question should be asked by all participants in such activities: parents, teachers, children but also authorities. Popularizing science can be based on spectacular shows, but without pretending that this type of activity is science. It seems that effective educational activities in informal education require long-term learning and should not be based on spectacular actions. In informal education, emphasis should be placed on educating students' independence and subsequent tasks for students arranged in accordance with Bloom's taxonomy.

Therefore, it seems that in informal education it is a mistake to pay attention to a measurable increase in students' knowledge. Its main goal should be the motivation of students, their activation and the increase of so-called soft skills. With these objectives, the teacher's work input and the costs of this type of task are acceptable.

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Comparison of different forms of informal education in terms of teacher's work input and achieved results

Abstract

Nowadays, informal education is an integral part of children's education. Its undoubted advantage is arousing emotions and motivation to Science. However, is such education effective? Is the contribution of teachers/educators adequate to the increase of students' knowledge? The article describes research on four forms of science classes – from classes that require a very large amount of teacher work, to classes that do not require so much. Teachers' work time and the effects of their work were compared.

Keywords: informal education, time, commitment, effects

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Implementation of digital technologies in training the vocational education pedagogues as a modern strategy for modernization of professional education

Introduction

Political, social and economic changes that have recently taken place in Europe have led to a number of transformations and changes in the educational sphere. Since Ukrainian education is on its way to entering the European educational space, there is a need for significant changes in the whole system of vocational education and its substantial updating (Sheludko, 2015).

The present stage of the development of world pedagogical science is characterized by the approval of innovations as an important factor of social reproduction that can provide sustainable economic development on the basis of achieving the country's competitiveness. Therefore, the main task of state policy in Ukraine is the formation of institutional mechanisms and infrastructures of innovative ways of strategic modernization of vocational education. Implementation of the strategic tasks of professional training of future vocational training teachers requires new approaches to the transition of quantitative level indicators to qualitative. Of particular importance is the use of appropriate strategies for training teachers of vocational training of competitive labor market, based on the principles of information and computer technology (ICT). Problems of training vocational education teachers are relevant both in Ukraine and abroad (Sheludko, 2017).

Rapid political, economic and social changes in the society have gained such a pace that a system that trains professionals has faced difficulties in meeting the demands of an ever changing environment. The transition from a planned economy, in which the state-owned enterprises dominated, to the economy with market mechanisms also created specific obstacles for higher education institutions as to training and employing the would-be specialists.

The impact of globalization processes and the rapid development of technologies require an instant reaction from education system in order to train a competitive graduate of higher education. The traditional role of the scientific and pedagogical worker (broadcasting and reproduction of educational materials) is replaced by a number of new roles. A modern teacher should be able to choose and use electronic resources for student training; to organize cooperation and communication between participants in the educational process; to design electronic

resources and educational electronic environment, to be a facilitator and assistant for students, to understand and take into account their needs and features in the process of education, cognitive learning styles, new services and tools for effective cooperation, communication, and skills in the 21st century. Consequently, it should meet a certain level of his/her information and communication competence (Morse, Kocharyan, 2015).

Formulation of the problem

The determinants of positive changes in vocational education are the development of technologies and urbanization, which outline the “rules of the game” for all participants in the educational market, inducing them to implement the latest educational models, techniques, technologies, etc.

New technologies determine the civilizational development of humanity affecting the quality of life of people around the world, whether it is a big city or a remote rural settlement. At the same time, the development of digital technologies modernizes approaches to education. At the moment, people are learning a wealth of skills through on-line learning.

In view of this, the general purpose of education is changing. The main task of educational processes in modern institutions of higher education is to develop the ability to think, independently acquire information and evaluate it critically, apart from accumulating and remembering it (Kovalchuk, 2016).

In its study *Future Work Skills 2020*, the Institute for the Future identifies 10 important skills for success in the future: understanding the meanings; social intelligence; ability to think outside the framework and rules; adaptive thinking; intercultural competence; computational thinking; media literacy; inter-discipline approach; design thinking; information management; ability to work remotely. At the end of last year, the Institute for the Future complemented its list with three other essential skills: self-motivation, time management in managing one’s income sources, and management of online recruitment (Key competencies for lifelong learning, 2018). This will help graduates of higher education institutions to get adapted both to the domestic, and the world labor market.

The purpose of the article is to highlight the issue of introducing digital technologies into the educational training of vocational education teachers as a modern strategy for modernizing the vocational education.

Study method

During the study we used the following methods: survey, testing, conversation, dialogue, observation, questioning.

Research results

In recent years, general trends in the development of technology and techniques, which provides for the restructuring of all spheres of human activity, have been

shaped. These trends were called the fourth industrial revolution. This name was given to the current era of innovation, when advanced technologies radically change the entire industries of the economy at an amazingly fast pace.

In the near future there will be a completely new type of industrial production, which will be based on the so-called large data and their analysis, complete automation of production, technologies of complemented reality and the Internet of things.

From the point of view of history, after the invention of machines one of the permanent directions of human activity was the development of machine-guns, and robotic systems – in the future. All this led to the emergence of a new “revolutionary situation” in the technical arena (Industrial Revolution 4.0. On the eve of a new era, 2018).

The rapid development of artificial intelligence in all spheres of human life determines the use of digital technologies in the educational process of higher education institutions. Taking into account the results of previous studies, we can state that digital competence is a key in the 21st century.

Digital competence involves confident, critical, responsible use, and engagement with digital technology for learning, work and community participation. It includes information literacy and data literacy, communication and collaboration, creation of digital content (including programming), security (including digital welfare and competence related to cybersecurity), and problem solving (Key competences for lifelong learning, 2018).

Information and communication technologies actively influence the learning process of future teachers of vocational training, as they change the scheme of transferring knowledge and teaching methods. Their use in the educational process of higher schools stimulates interest in educational activities, promotes the formation of logical and creative thinking, in general promotes the development of students and their information culture. Technologies allow to change the formats of teaching and educating. Information becomes a connecting link between a student and a teacher in the educational process, including all information or messages transmitted in one or another material form. At the same time education serves as the organizer (method) for transferring information and student development.

Information and communication technologies are, on the one hand, an intermediate link between informatics as a science and production (development) of informatics systems and the construction of communication networks, where the intellectual role is played by the intellectual component – knowledge (meaning) about how the reception, storage, processing, submission and transmission of messages and data, as well as (given that a significant part of such systems and networks is being developed for the purpose of providing human activity) psychological and pedagogical support of the development of informatics is of great importance. On the other hand, it is knowledge (meaning) about how it is worth working with data, alienated in the form of algorithms and procedures that can be used to work with certain data in other subject areas – that is, it also refers to certain intellectual technologies – the techniques of formalization and solving tasks in certain subject areas using informatics systems and networks.

Information and communication technologies are technologies with the help of which it is possible to develop informative systems and to build communication networks. This usually involves psychological and pedagogical support for the design, development and implementation processes, as well as formalization and problem-solving technologies in certain subject areas using such systems and networks (Spirin, 2019).

V.Y. Bykov in his scientific papers argues that the use of information and communication technologies (ICTs) radically changes the role and place of teachers and students in the educational process, promotes the implementation of an individual approach to learning – something that is still lacking. In such a model, the teacher ceases to be simply a “retranslator” of knowledge, but is a co-creator of modern, devoid of instruction and preaching, training technology. Informatization and computerization of the educational sphere is one of the most difficult and most important tasks of the state (Bykov, 2018).

With the adoption of an updated revision of key competencies for lifelong learning (2018), changes in terminology have taken place. Instead of “IST” (Information Society Technologies) and “ICT” (Information and Communication Technologies), used in the definition of 2006, “digital technology” is now considered the most appropriate term for naming a complete set of devices, software, or infrastructure. With the proliferation, diversity and integration of using the mobile devices and applications, links to computers and the Internet have been removed, but they are still classified under the broad concept of “digital technology”.

Future vocational educators should understand how digital technologies can support communication, creativity and innovation, be aware of their capabilities, limitations, implications and risks. They should understand the general principles, mechanisms and logic underlying the emerging digital technologies, as well as know the basics of the operation and use of different devices, programs and networks, to be critical of the accuracy, reliability and impact of digital information and data means and understand the legal and ethical principles associated with the use of digital technologies (Key competencies for lifelong learning, 2018).

The development of innovative processes in general education in recent years has been increasingly linked with changing emphasis in teaching disciplines by transferring knowledge for developing the ability and readiness to use this knowledge in real life situations. The problem of developing the digital competence of future teachers of vocational training remains relevant. In our opinion, the ways of solving it are in active use in the educational process of digital technologies (Pinchuk, 2010).

Working with digital technologies requires a reflexive and critical, at the same time inquisitive, open and perspective attitude to their development. It also requires an ethical, safe and responsible approach to using these tools.

The understanding and the relevance of digital competences has observed a significant growth since 2006. When reviewing the 2006 Recommendation Framework, these changes should be reflected, which results not only in the redefinition of digital competencies, but also in agreement with the Digital Competency Framework related tools such as consumer-oriented frameworks, educators or organizations, as

well as other existing national frameworks. This was a particularly strong argument put forward in the review and consultation process.

The Documents on Higher Education Modernization (2011) “Re-thinking Education: Investing in Skills for Better Socio-Economic Outcomes” (2012) and “Opening Education” (2013) were devoted to digital and innovative education and emphasized the relevance of digital skills and competences, the role of Open Educational Resources (OER). A joint report by the Council and Commission of 2015 on the implementation of the strategic framework for European cooperation in education and training (ET 2020) highlighted the need for digital competence and the positive contribution of digital technologies to teaching and learning as well as education management. Later educational documents, such as the Digital Single Market for Europe (2015) and Improvement and Modernization of Education (2016), emphasized the importance of developing digital competences and noted the potential for innovation in education through digital tools.

“The New Skills for Europe” (2016) program identified the need to ensure digital competence as a priority, and called on Member States to provide comprehensive strategies to improve the digital competence of people. Outside the European level, a number of national coalitions have been created, and although the structure and activities vary depending on a country, some are closely linked to national educational policies.

The widespread digital competency framework was first published in 2013 and has been updated since then. It contains 21 learning outcomes in 5 areas:

1. information literacy and data, including content management;
2. communication and cooperation, and participation in society;
3. creation of digital content, including ethical principles;
4. safety;
5. solving problems.

Harmonizing the definition of digital competences in the European Qualifications Framework reflects these five areas, while retaining the basic format for knowledge, skills and attitudes (Malykhin, Kovalchuk, Aristova, Hrytsenko, 2017).

The revised description (competencies) tries to be flexible enough to be relevant in today’s society and in the future, recognizing the integration of social media and the emergence of technologies such as artificial intelligence, robotics, virtual and augmented reality. It is necessary to strengthen the link to digital security, embracing the management of its own digital identity, so as to positively encourage responsible and critical engagement. The phrase “digital identity” has two meanings in this context: one concerns the protection of data (e.g., e-mail accounts); the other is self-perception in online environments (e.g., behavior in social networks) (Kovalchuk, 2016).

Today a number of educational concepts related to information technologies have appeared. The Educational Technology and Mobile Learning Edition provides 14 strategies that are relevant to today’s learning and will be prioritized in the years to come: adaptive virtual classroom, MOOCs, synchronous and asynchronous learning, mixed learning, “inverted” class (inverted learning), self-directed learning, learning management system, “cloud” learning, mobile learning, course

management system (CMS), e-Learning, technology 1:1, gamification. Among the list of technologies that implement the strategy for modernizing vocational education, we have chosen the following: synchronous and asynchronous learning, mobile learning, “cloud” learning, and mixed learning (Malykhin, Kovalchuk, Aristova, Hrytsenko, 2017).

Synchronous learning involves the simultaneous participation of a teacher and a student in the educational process, that is, they are separated only territorially. Communication is done via Internet – through Skype or other communication programs. In this form, the usual educational process is practically simulated, since both audio and video are transmitted from the teacher to the student and from the student to the teacher and communication is carried out in real time. Lectures, discussions and presentations take place at a certain time. All students who want to participate in them should be online at this time.

Asynchronous training takes place when the teacher and student work at different times – for example, when they are in different time zones, etc. In this connection, for the communication of the student and the teacher and the transmission of information using e-mail, audio and video, etc., the direct contact between the teacher and the student online is unstable due to the difference in time.

Mobile learning is a learning technology based on the intensive use of modern mobile devices and technologies. Mobile learning is closely linked to learning mobility in the sense that students should be able to participate in educational activities without time and space constraints. Using mobile technologies opens up new learning opportunities, especially for those who live isolated or in remote locations or experience difficulty in learning. The opportunity to study at any time, which is inherent in mobile learning, is today a general tendency for intensification of life in the information society.

We distinguish:

- Web-model of mobile learning.
- Applied model of mobile learning.
- Cellular mobile learning model.

Due to the growing popularity of Internet and multimedia education in recent years, there is a need to standardize approaches to creating training courses using the Internet and multimedia (Malykhin Kovalchuk, Aristova, Hrytsenko, 2017).

The vast majority of practicing teachers point out that the systematic use of digital technologies in the educational process should contribute to:

- raising the cognitive interest of future teachers of vocational training;
- the quality of knowledge;
- expanding the range of teachers involved in the introduction of digital technologies;
- improving the methods of using digital technologies in the class.

Cloud technologies are technologies that enable Internet users to access server computer resources and use software as an online service.

Examples of using cloud technologies in our study: the use of electronic journals and diaries, communication, testing, remote learning systems, library, mediatec, file storage, sharing (Dropbox, SkyDrive), collaborative work, video conferencing,

college domain e-mail, Google Sites services – free hosting using wiki-technology, Google Translate, translator, YouTube, video hosting, Google Drive – integrated space to store files and work with them.

Combined learning is a combination of online and offline learning in one thread that creates the student's "learning experience" and a self-sufficient logical course or subject. When mixed learning instruction/theory, which the student is mastering online (either in the form of self-reading materials, when viewing demo videos, or when watching a video recording of a teacher's lecture, or in the form of a game), find their application offline (that is, in educational institution during classes) all activities and classes taking place in an educational institution should be combined and, in practice, consolidate the knowledge gained by the student when doing an online job.

Online learning is a format for student training at a computer, when he/she chooses a place for training, controls the time, rhythm and sequence of tasks performed.

Offline learning is the interaction of a student with a teacher and teammates/colleagues on the project.

The mechanism of realization of the concept of mixed learning as a process involves the creation of a comfortable educational informational environment, a system of communications, representing all the necessary training information.

In mixed learning, students are encouraged to watch videos at home and read theoretical material; discussions and practical tasks are discussed at the lecture. At home he completes his paper and sends to the teacher's e-mail. Discussion of problem issues begins by e-mail or in social networks and ends at the seminar, or vice versa. The student activity in this format is increasing. Traditionally, mixed learning takes place in three stages: independent study of material, classroom interactive training, continuing interactive learning and support in the workplace. Combined learning can be seen as integration of formal and informal learning in the workplace.

The necessity of introducing in educational process the strategies of modernization of vocational education offered and considered by us provided the basis for conducting pedagogical research on the use of digital technologies in educational process, the final result of which was the increase of the level of developing the digital competence of future teachers of vocational training of the Oleksandr Dovzhenko Hlukhiv National Pedagogical University and organization and support for the continuity and availability of learning.

Organization of educational activities in the context of the introduction of digital technologies is aimed at optimal solution of fundamental didactic tasks with the most necessary coverage of the whole range of digital technology advantages. The conditions of the digital environment allowed developing a certain electronic basis for supporting the continuous dynamic development of the knowledge system, which is the basis of management and quality assurance of the educational process, the development of cognitive and creative activity of students (Kovalchuk, 2016).

In order to trace the direction in which the "movement" in relation to the introduction of digital technologies in the educational process of institutions of higher education should be carried out, we conducted a questionnaire. The survey was

attended by two groups of respondents. The first one is teachers with a pedagogical experience of at least 5 years, 80% of them have a degree, and their average age is 44 years old. In the second group we included students of specialization 015.17 Vocational education (Technology of products of light industry), 015.18 Vocational education (Technology of production and processing of agricultural products), 015.01 Vocational education (Construction), full-time and part-time study. Experimental basis for conducting questionnaires: the Oleksandr Dovzhenko Glukhiv National Pedagogical University. The subject of questioning is the peculiarities of developing the digital competence of future vocational training teachers in the process of training.

In the development of the questionnaire, we used the experience of Ukrainian researchers (Artiushyna, 2018) regarding the development of information and digital competence of future teachers of vocational training.

According to the results of the questionnaire, we received information on the frequency of use by teachers and students of synchronous and asynchronous learning, mobile, cloud and mixed learning, self-assessment of their digital competences, ability to use digital technologies in educational and professional activities, assessment of the degree of inclusion in a professional network community, etc.

By analyzing the questionnaire for teachers on the question *“Do you know the notion of ‘digital technologies’ and use them in classes?”* most respondents answered “yes” (75%), others said no (25%). Consequently, most respondents use digital technologies in their classes. To the question: *“Which of the following technologies are known to you: adaptive learning, virtual classroom, MOOCs, synchronous and asynchronous learning, mixed learning, ‘inverted’ class (inverted learning), self-directed learning, learning management system, ‘Cloud learning’, mobile learning, Course Management System (CMS), e-Learning, Technology 1:1, gamification?”* we received the following responses: *adaptive learning (12%), virtual classroom (9%), MOOCs (4%), synchronous and asynchronous training (15%), mixed learning (7%), inverted class (inverted learning) (3%), self-directed learning (5%), learning management system (11%), cloud learning (16%), mobile learning (8%), course management system (CMS) (2%), e-Learning (3%), technology 1:1 (1%), gamification (4%)* (Fig. 3).

Thus, we can say that teachers know modern digital technologies. To the question *“List the technologies that you use in the classroom: adaptive learning, virtual classroom, MOOCs, synchronous and asynchronous learning, mixed learning, ‘inverted class’ (inverted learning), self-directed learning, learning management system, ‘Cloud learning’, mobile learning, Course Management System (CMS), e-Learning, Technology 1:1, Gamification”*, we have obtained the following results: *adaptive learning (3%), virtual classroom (5%), MOOCs (1%), synchronous and asynchronous learning (15%), mixed learning (13%), ‘inverted’ class (inverted learning) (8%), self-directed learning (1%), learning management system (2%), ‘Cloud’ learning (19%), mobile learning (13%), course management system (CMS) (13%), e-Learning (4%), technology 1:1 (1%), gamification (2%)*. Therefore, digital technologies are generally known to teachers, but not all of them are used in their professional activities (Fig. 1).

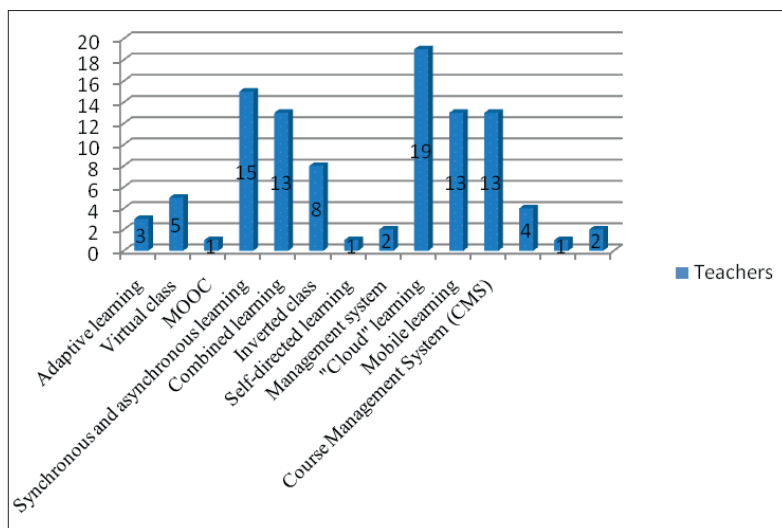


Fig. 1. Distribution of teachers' answers to the use of digital technologies in classes

To the question: *"How often do you use electronic gadgets (computer, smart-phone, tablet)?"* the majority of respondents answered: "every hour" (55%), others – "every day" (28%), and the rest – "once a week" (17%). Thus, electronic media play an important role in the life of teachers of higher education institutions.

To the question: *"For what purpose do you use the Internet more often?"*, in which it was possible to select up to 3 responses, most often the respondents chose the option "communication in social networks", in the second place was the answer "search information", the third – "teaching". Consequently, it is these resources (as well as their combination) that are of the greatest importance today for use in education. In the question, *"Which of the following computer Microsoft programs do you master and to what extent?"*, the teachers were asked to evaluate the degree of mastering the Office 365 applications: Word, Excel, Power Point, OneNote, Forms, Sway, OneDrive. As a result, it was found that teachers master Forms the best – 42% and Sway worst – 10%. Therefore, we believe that attention should be paid to these programs. To the question: *"What computer programs do you still own?"*, The teachers pointed out, basically, programs for working out photo images and text information. In the question, *"How do you rate your IT skills?"* the teachers rated their ability to create presentations, social networking, work on the Internet, email and text editor; the lowest – the ability to create a web site and blogging To the question: *"What can promote the involvement of students in the classroom using computer technology?"* the teachers highlighted the new interesting projects, the development of occupations, which use digital technology, high-quality and modern equipment. To the question *"Can you create (capture, voice, edit) a short video educational program"* 32% answered "yes", 10% need extra help, 58% answered "no" (Fig. 2).

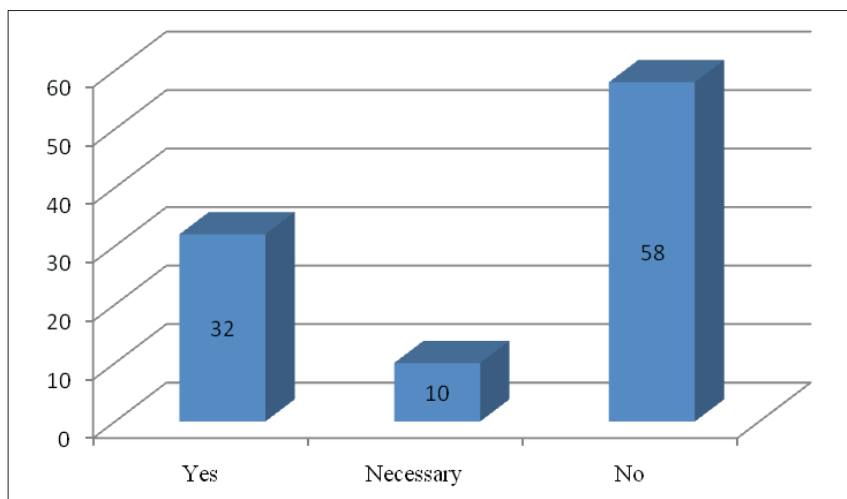


Fig. 2. Distribution of teachers' answers to the skills to create (capture, voice, edit) a short video for educational purposes

Consequently, teachers generally better understand software for image and text information processing, and knowledge of programs for creating and processing video fragments is medium and low. To the question *"Do you have the experience of creating electronic teaching aids"*, 74% answered "yes" and 26% said "no". So, in general, teachers have the experience of creating electronic learning tools, but a significant part of them do not have such experience.

Having conducted surveys among students, we can draw the following conclusions. To the question *"Do you know the concept of 'digital technology'?"*, 82% said "yes" and 18% answered "no". It has been stated that most students understand the meaning of "digital technology" and only a small part of them do not understand this concept. To the question: *"Which of the following technologies are known to you: adaptive learning, virtual classroom, MOOCs, synchronous and asynchronous learning, mixed learning, 'inverted' class (inverted learning), self-directed learning, learning management system, 'Cloud' learning, mobile learning, Course Management System (CMS), e-Learning, Technology 1:1, Gamification?"*, the respondents responded as follows: adaptive learning (10%), virtual class (11%), MOOCs (8%), synchronous and asynchronous training (14%), combined learning (10%), 'inverted' class (inverted learning) (2%), self-directed learning (5%), learning management system (8%), 'Cloud' learning (11%), mobile learning (9%), course management system (CMS) (3%), e-Learning (4%), technology 1:1 (3%), gamification (2%) (Fig. 3).

To the question *"Do you use multimedia equipment for training?"* 58% answered "yes", 19% said that "sometimes" and 23% – "no". Consequently, most students said that they use multimedia equipment, but a large part of them use it sometimes or not at all (Fig. 4).

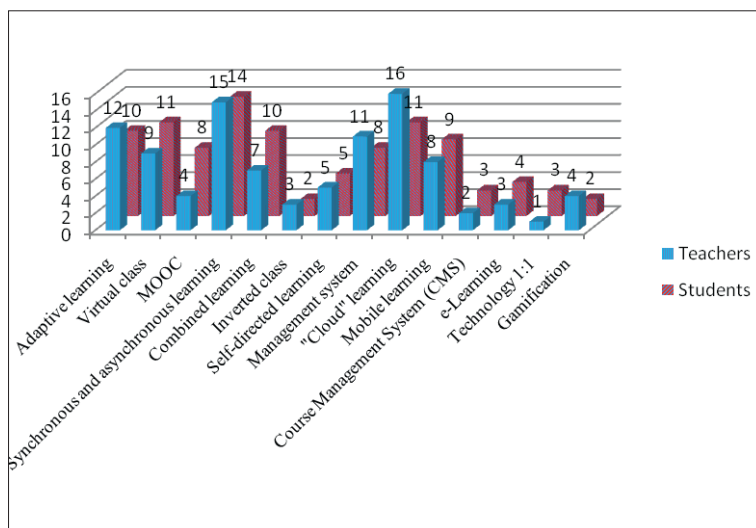


Fig. 3. Distribution of teachers' and students' answers as to knowledge of digital technologies

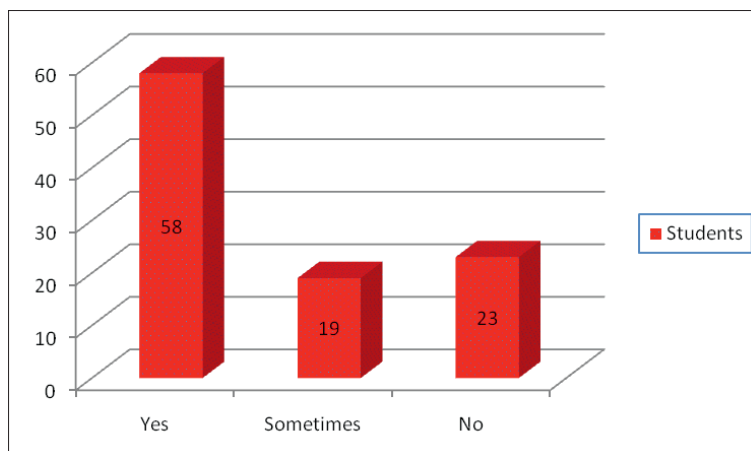


Fig. 4. Distribution of responses of teachers and students regarding the use of multimedia equipment to get prepared for classes

To the question *"How often do you use social networks for communication?"* 54% said that "every hour", 21% – "every day" and 25% answered "once a week". Thus, students often use messengers for communication (Fig. 5).

To the question *"Do you have 24-hour access to the Internet"*, 87% answered "yes" and 13% answered "no". In this regard, we can assert that most students have 24-hour access to the Internet, which enables them to communicate with peers and teachers and perform tasks remotely.

To the question *"Do you constantly use digital technologies in everyday activities to establish communication with other people?"* 89% answered "yes", 11% said "no".

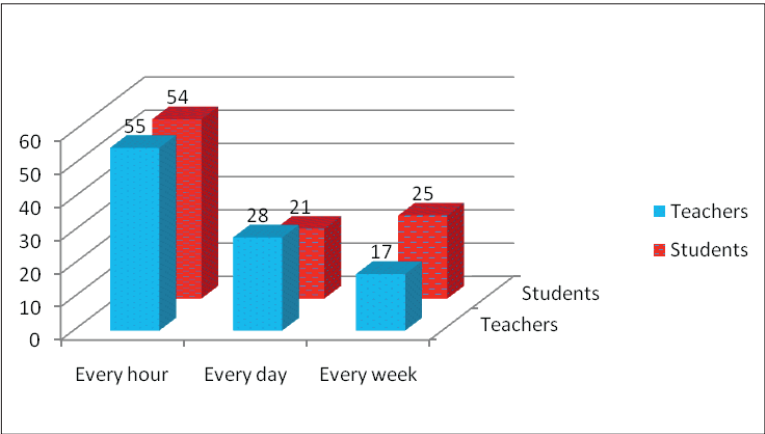


Fig. 5. Histogram of the comparative distribution of responses of teachers and students regarding the frequency of using social networks for communication

This result suggests that students often use digital technology in their daily activities (Fig. 6).

To the question “Where do you find the basic professional information?” 83% chose Internet resources, 17% chose printed works.

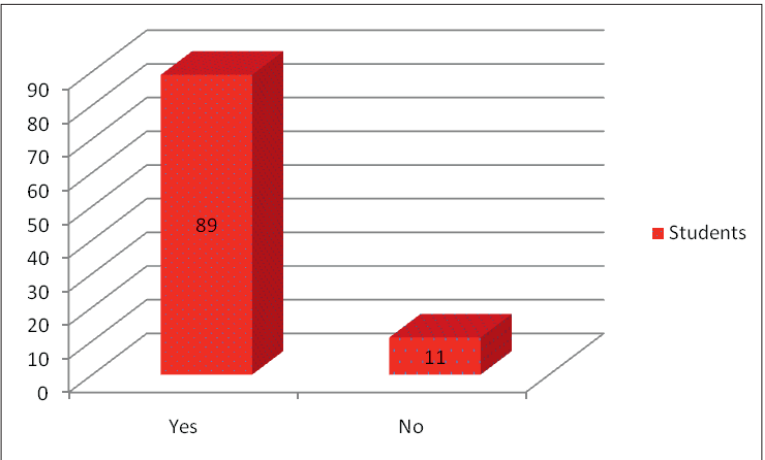


Fig. 6. Distribution of students’ answers on the use of digital technologies in their daily activities in order to establish communication with other people

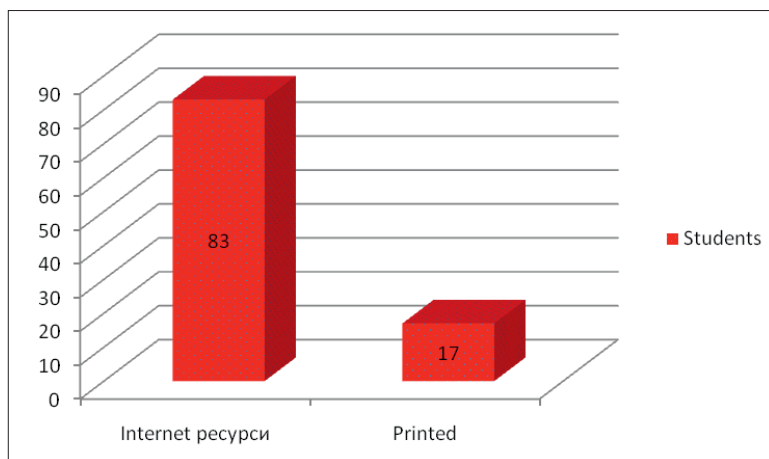


Fig. 7. Distribution of students' answers on how to find information for study

To the question *“Are you a registered user of a professionally oriented Internet resource (service)”* 91% chose the answer “yes” and 9% said “no”.

The obtained results of the research demonstrated the necessity of developing the digital competence of students in terms of using modern strategies for the development of vocational education. Synchronous and asynchronous learning, mobile learning, “Cloud” learning, and combined learning are a very convenient tool for organizing the educational process. An important role in studying the professional disciplines is played by the project activity, which enables the development of a set of skills for using digital technologies: information search, communication, synchronous and asynchronous communication, organization of joint activities, exchange of information and materials, conducting an online survey, creating a web portfolio of results, project, multimedia presentation of project results, creation of electronic educational resource as a product of project activity.

In general, the data of the conducted questionnaires show that teachers positively evaluate the possibilities of using digital technologies in education: both for the organization of their own activities and for the educational activity of students. Currently, a significant number of teachers use digital technologies to create various types of individual information banks aimed at supporting and developing their professional activities (methodologies, control tasks for students, etc.). The effectiveness of using digital technologies in the educational process depends fundamentally on the level of the digital competence of teachers themselves (Motylkova, 2014).

In this regard, the data presented quite convincingly show that teachers with a high level of development of digital competence in a fundamentally different way use digital technologies in educational activities, referring to them not only as a means for submitting educational material, but also as a means of objective control of student knowledge (development of educational and methodical electronic tools, their use in educational process, the development of electronic tests, the addition

of home electronic tasks, the filling of an electronic journal (Kartashova, Bakhmat, Bakhmat, Plish, 2019).

In other words, teachers use digital technologies at all stages of educational activity.

Results of introducing digital technologies, indicate their advantages:

- accessibility, understandability and visualization of tools – it is possible to work for users with a low level of digital competence (with its subsequent continuous gradual increase);
- multifunctional toolkit – the ability to organize and implement the educational process, create content,
- availability of a management training system;
- continuous online and offline support – providing educators with advice, training, content training, functional support training, and upgrade versions.

Conclusions and perspectives for further studies

Continuous improvement of the education system in Ukraine, transition to the New Ukrainian school are factors that indicate the need for a new pedagogical thinking. Seeking to meet the needs and conditions of Nurses, creative, highly intellectually and comprehensively educated teachers are looking for ways, methods and means of developing these qualities (Kovalchuk, 2016).

In addition to the positive results in the area of development of digital competency of participants in the educational process (according to the described levels), there is a social effect, which is as follows:

- ensuring the continuity of the educational process (full-time distance learning);
- ensuring free access to education for all and everyone, as well as for those who need inclusive education;
- possibility of involving people from remote and depressed areas in the educational process of the educational institution;
- provision of free access to education for persons residing in uncontrolled territories of Ukraine. It should be noted that the teachers who indicated in the questionnaires that they are able to use the computer vary widely in terms of user skills.

In the course of the research to identify the level of minimum user skills we used: surveys, monitoring the work of teachers in the computer class, analysis of the quality of the electronic documentation of teachers. The following skills were chosen: general (working with a file system), working with a word processor, working with spreadsheets, creating presentations, searching the Internet, acquisition of e-mail.

As it turned out, in their work, teachers use the simplest of the available features of the program. Often tutors are fond of presentations, which is reduced to compulsory accompaniment of classes or extracurricular events with pictures – slides, often even unformatted, of poor quality, overwhelming animations or sound effects. They could well be replaced and were truly earlier replaced by tables and other visual aids.

The work of adherents of traditional technology, who do not use computers at all, is much more effective than similar “innovations”. Teachers need the ability to “change”, “correct”, “rearrange” the existing product, or even create their own, author’s. And then, the use of digital technology opens up unlimited opportunities.

This suggests that many teachers have already understood the benefits of digital technology, felt the need to translate their ideas into specific teaching aids and developments, as well as their helplessness, lack of competence, and lack of knowledge and skills in digital technology.

The results obtained in our study allow us to outline three circles of problems related to the possibilities of using digital technologies in education. The first is due to insufficient development of techniques for using digital technologies in specific educational areas. The second concerns the use of digital technologies in non-auditing and distance education. The third is associated with a fairly consistent opinion amongst the teachers about the negative effects of the impact of digital technologies on the health and cultural development of young people.

The directions of further exploration include the study of scientific and methodological foundations of the development of digital competence of teachers in order to develop integrated lessons and sessions, and in the future – integrated disciplines, in the ability to organize cognitive activity of students, to develop their autonomy and creativity through the use of modern digital technologies. That is why the issue of continuous increase of their level of digital competence – quality, the formation of which allows the teacher to use high-professional level digital technology to search, logical selection, systematization, use of educational material and organization of a successful educational process.

Now, in the context of education informatization, only continuous increase of the level of digital competence of future vocational training teachers would allow them to respond promptly and adequately to all variables of progressive conditions of their professional activity.

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Implementation of digital technologies in training the vocational education pedagogues as a modern strategy for modernization of professional education

Abstract

The article presents the results of the theoretical analysis of digitization in vocational education. The possibilities of digitization in the practice of higher education institutions as a mean of developing students' digital competencies are analyzed. The essence of the concept of 'digital' is examined. It is clarified that the rapid development of artificial intelligence in all spheres of human life determines the use of digital technologies in the educational process of higher education institutions. Based on the analysis of the literary sources and educational

practice, the methodical features of applying the strategies for the vocational education modernization are outlined: synchronous and asynchronous learning, mobile learning, 'cloud-based machine learning', and blended learning in the educational process, in particular during the general questioning of teachers and students. By changing the format of teaching and learning, the digital technologies make information a link between the teacher and the student in the educational process. Working with digital technologies requires a reflexive and critical, yet inquisitive, open and future-oriented attitude to their development. The technologies we have identified stimulate students' interest in educational activities, develop their logical and creative thinking, and their digital competence. The digital technologies presented fully perform the tasks, which help to make the vocational education specialists competitive in the labor market. According to the results of the survey of teachers and students, the main shortcomings in digitization in the educational process have been revealed. In particular, the lack of students' training in using digital technologies in self study is confirmed. It is clarified that the low level of digitization is due to insufficient methodological support and improper description of ways of using such technologies in particular didactic situations. It is emphasized that the rapid development of digital technologies and their widespread use in educational activities in recent years provide reasons to forecast optimistically the rapid digitization in higher education institutions.

Keywords: digital technologies, digital competence, the fourth industrial revolution, strategies, vocational education, modernization of vocational education, higher education institution

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STRATEGIES, METHODS AND DIGITAL ENVIRONMENT OF TEACHING AND LEARNING

Anna Michniewska

Khan Academy in biological education

Social changes that have occurred in recent years, and in particular the need to acquire knowledge throughout life, show the role of distance education with particular emphasis on lifelong education, independent of age, place of origin or stage of education (Potyrała, Michniewska, 2015). The development of modern technologies enables us to provide education at the highest level without leaving home in the form of e-learning courses, virtual universities or open education (Bednarek, 2008). New media are conducive to learning based on interaction and participation rather than passive learning (Musiał, 2015). One example of distance learning is MOOCs, which are becoming increasingly popular all over the world. According to Grażyna Penkowska, MOOCs are based on the belief that everyone has the right to lifelong learning (Penkowska, 2015). Characteristic for MOOCs is, in addition to traditional training materials such as instructional videos, articles, exercises, providing a place for social learning through interactive forums, group tasks, projects, and mutual evaluation. Remote learning systems offer a wide range of education using information systems that enable them to acquire knowledge that goes beyond school education (Barczak, et al., 2006).

Khan Academy is one of the examples of Massive Open Online Courses. It is a free educational tool that participants can use anywhere and at any time. Salman Khan founded the Khan Academy organization in 2006, and his slogan was: "ensuring high quality education for everyone and everywhere" (Khan, 2013). Initially, the courses mainly covered mathematical issues, and only later more subjects were added (Gurba, 2015). Most of the materials are prepared for students, starting from elementary school (introductory materials in mathematics), secondary education (e.g. mathematics, biology, physics, etc.), students and adults (films and scientific articles that go far beyond material implemented in high school (e.g., materials prepared at the academic level in organic chemistry.) Khan Academy is a non-profit organization whose goal is to provide open education and access to reliable information (Plebańska, 2015). Khan Academy offers a huge amount of educational materials and other forms of support in the teaching and learning process that give allow students to work at their own pace, in and outside the classroom. The Polish and foreign Khan Academy platform is not only a tool for students, but also for teachers and parents who can monitor progress in the work of their children's progress.

Elements of the Khan Academy

- Videos with explanations related to specific issues.

Each film presents a short piece of knowledge enabling an in-depth understanding of the topic. The authors of the Khan Academy citing research conducted in 1996 by professors of the University of Indiana – Joan Middendorf and Alan Kalish – about the optimal concentration time of students assumed that films should last an average of ten minutes (Khan, 2013: 39). Most of the films are shown in the form of a blackboard on which the teacher draws with colored pens. The videos in their form are to remind the teachers explaining new issues and their detailed notes on the board. The films form a coherent whole. When discussing new topics, the lector refers to previously presented content and previous materials. Besides, some materials have been expanded to include colorful Crash Course videos that were created as part of an educational YouTube channel started by the Green brothers, John Green and Hank Green, who are notable for their VlogBrothers channel.

Since joining YouTube in 2006, Khan Academy has a wide audience. Data from August 2019 indicate almost 5 million subscriptions and over 1,677,982,668 views worldwide for the Khan Academy channel (<https://www.youtube.com/user/khanacademy>) where 7447 educational films are placed. “KhanAcademyPolski” (<https://www.youtube.com/user/KhanAcademyPolski>) is subscribed by over 56,000 users of the portal and has 16 million views, where users have at their disposal 4004 films prepared in the Polish language.

- Articles

Khan academy has in its resources a huge amount of texts prepared based on scientific articles. Each of the texts has a rich References and references to other articles to expand the content. The content of the articles can provide separate learning content as well as support in the assimilation of information from the films on the platform. The authors of the articles made sure that they were understandable to all users, by using illustrations and pictures, as well as by hyperlinking with other materials discussed on the platform.

- Exercises and tests

Most of the topics were equipped with additional exercises and tests to check and consolidate the acquired knowledge. Students can register on the portal to save the points scored and the results of individual exercises. In addition, IT projects have been prepared for participants, requiring the use of acquired skills in practice to engage students in active participation in the learning process using the Academy, elements of gamification are used through the use of badges, awards and the ability to monitor their progress in learning (Potyrała, Michniewska, 2017). Teachers can also access the results after setting up an account and assigning students to their class. Also, teachers and parents receive reports on the work of their pupils, e.g. the Coach Reports, which describes in detail the messages and skills acquired by students, as well as information about completed tasks and their level of difficulty (<https://pl.khanacademy.org/resources>).

- Discussion forums

Khan Academy enables interaction between participants by asking questions, commenting on other statements, rating comments, giving tips and thanks. Students from around the world can exchange comments after each batch of material.

Bricken points out that Khan Academy uses technology to create a new dimension in education, but a base of passive video content is not enough to create the future of science. In his report, he points out the great importance of teacher influence and feedback, providing student support and creating a sense of community among users (Bricken et al., 2019).

Analysis of Khan Academy platform resources

Khan Academy is a tool offering educational materials in 5 fields: mathematics, natural sciences, humanities and arts, computer science, economics and finance.

An analysis of the Polish and international Khan Academy platform in terms of issues related to science subjects provided information on what subjects can be taught with the help of the Khan Academy, what topics are included in individual courses, what amount and quality of materials have been prepared so far, and how many exercises and tests can be carried out by the student to check his knowledge. Information on this subject is collected in Table 1 and Table 2.

Table 1. Content analysis of Khan academy from the Science department in Polish Platform pl.khanacademy.org (Potyrała, Michniewska, 2017).

	Subjects	Modules	Topics	Materials (films, articles, exercises)	Exercises
Science	Biology	31	106	592	69
	Physics	20	76	601	11
	Chemistry	17	52	420 *(plus 14 AP® chemistry)	18
	Cosmology and astrology	4	15	90	-
	Health and medicine	22	149	892	16
	Organic chemistry	14	57	310	-

Table 2. Analysis of material content available from biology in Khan Academy.org

Modules	Topics	Movies	Articles	Exercises	Quizzes and tests
Intro to biology	2	2	4	1	0
Chemistry of life	3	11	5	1	0
Water, acids, and bases	4	14	5	4	3
Properties of carbon	2	6	3	1	0
Macromolecules	5	16	5	4	3
Energy and enzymes	6	17	8	5	1
Structure of a cell	4	11	11	5	3
Membranes and transport	5	13	5	4	3
Cellular respiration	6	12	9	5	3
Photosynthesis	4	11	6	4	1
Cell signaling	2	3	5	1	0
Cell division	4	12	9	5	3
Classical and molecular genetics	5	9	14	6	2

DNA as the genetic material	3	10	7	3	1
Central dogma (DNA to RNA to protein)	3	7	10	3	1
Gene regulation	2	3	6	2	0
Biotechnology	4	4	7	2	0
Developmental biology	3	4	4	0	0
Bacteria and archaea	2	2	6	1	0
Viruses	1	1	5	0	0
Evolution and the tree of life	3	20	9	4	1
History of life on Earth	3	12	2	0	0
Ecology	8	22	20	8	4
Biodiversity and conservation	5	16	0	2	0
Behavioral biology	1	2	4	0	0
Principles of physiology	2	0	5	2	0
Human biology	5	25	6	0	0
Plant biology	1	3	1	0	0
Crash Course: Biology and Ecology	2	51	0	0	0
Meet the biology professional	1	0	8	0	0

Also, the quantitative analysis of materials from the subject biology shows a variety of materials that enable learning this subject. The data summarized in Table 2. show that students and teachers can use 391 educational films, 189 articles, 73 exercises and 29 tests available. The analyzed materials showed that from the content of the biology subject they are most often presented in the form of short films, but not from every topic the student has the opportunity to test his knowledge or expand in the form of articles. An interesting offer is materials prepared in a form other than a blackboard (Crash Course: Biology and Ecology), and in the form of colorful and funny videos where students can see the teacher's face. These materials are a separate element of the course, they complement the materials presented on the platform, they do not have any checking.

Particularly noteworthy is the fact that on the platform in the science, biology section, there are several modules in chemistry, e.g. Chemistry of life, Water, acids, and bases, Properties of carbon, Macromolecules. The material described in the following modules repeatedly goes beyond the material students use in biology lessons.

The material from Khan Academy is adapted to American teaching systems and prepares for American end-of-year exams. Mostly the subjects and content of educational materials do not coincide with the Polish Core Curriculum. The knowledge and skills that can be acquired by taking courses on the Khan Academy platform are often not even in the Core curriculum for high school, but they can serve as a tool for lifelong education. Biology materials are a good source of acquiring or expanding their knowledge for students who pass the matriculation examination in biology or science students.

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Khan Academy in biological education

Abstract

The Khan Academy platform is one example of Massive Open Online Courses that are used in distance learning. The Khan Academy contains a large number of materials that provide education without leaving home or help to prepare the lesson with the flipped learning method. The author of the article analyzed materials on science subjects with particular emphasis on biology issues. A wide range of movies, articles, exercises, and tests available on the Khan Academy website as well as YouTube can be used in teaching and learning for people of all ages.

Keywords: Khan Academy, MOOC, distance learning, flipped education

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Róża Laskowska

Multimedia information flow among students

"Internet: absolute communication, absolute isolation."

Paul Carvel

Introduction

For over 20 years, multimedia have been a very important source of information for pupils, students, and lecturers. This applies to both information regarding the organization of the teaching process (Sakkopoulos, Lytras, Tsakalidis, 2006) and directly – to the very process of acquiring knowledge (Li, Sun, Jee, 2019; Wang, Kao, Dai, 2019). Laptops and smartphones often take the place of books, which could suggest that in this case, traditional libraries and bookstores are becoming useless. But is this really true? Are multimedia and social networks gaining an ever-increasing amount of backers? This is why an attempt was made to study the ways contemporary students acquire knowledge and to what extent they use multimedia in their studying process. The research hypothesis assumed high use of multimedia by contemporary students.

Literature review

Research on the use of multimedia in education focuses on a variety of elements. In his article entitled "Secure communication on the Internet – Retroshare" on the Superbelfrzy RP website, Adam Jurkiewicz describes the Retroshare program, i.e. a network of trusted contacts between people, which make it possible to create social networks, and at the same time, acquire knowledge in both computer science and mathematics. Efficient information flow was a topic explored in the doctoral thesis written by Michał Olędzki, MA, who attempted to prove that thanks to search engines, the flow of information is smooth. Jacek Uroda (2014) put the main focus in his publication on the use of multimedia in information management at universities, whereas Kulczycki (2012) describes research on the use of social media by academic universities in Poland. Aillerie (2019) describes how students manage information individually and collectively, with all the media and tools available nowadays, and academic requirements and support.

Research methods

In order to test the hypothesis, the decision was made to conduct a survey among students at a university in Krakow. The research tool was an online survey. The research was conducted in the period from March 13, 2019 to March 20, 2019. Potential respondents were informed about the survey via messages on a popular social networking site. A total of 53 persons completed the survey. The respondents were asked to answer several questions about the ways they acquire knowledge and prepare for classes. The survey consisted of three introductory questions, including those regarding their age, gender, and field of study, as well as 11 questions related to the purpose of the conducted research. These questions were open.

Research results and discussion

Discussion of the surveyed population

I. Gender of the respondents

The first question concerned the gender of the surveyed persons – the results shown in Figure 1 indicate that the respondents were predominantly women (75.5%), whereas men constituted only 24.5% of the surveyed population.

II. Age of the respondents

The age of the surveyed persons varied. The youngest surveyed person was 19 years old, whereas the oldest respondent was 35 years old, however, most were around 20–25 years old (Fig. 2). The age range of the surveyed persons demonstrates that the respondents were people who are currently studying, therefore, methods of acquiring knowledge are no mystery to them.

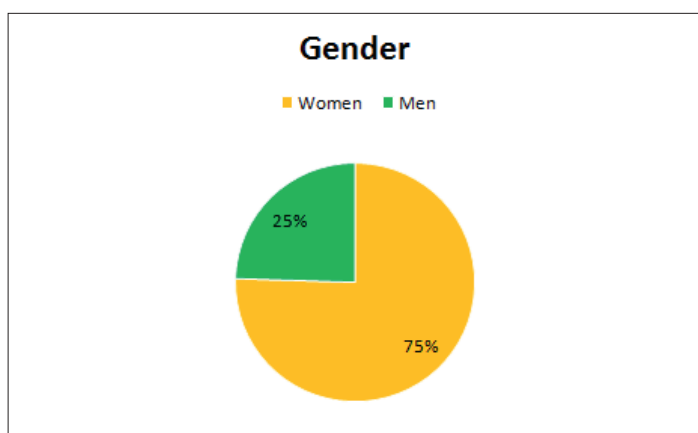


Fig. 1 Gender of the surveyed population

Number of values in the Gender column

Male 24.5%

Female 75.5%

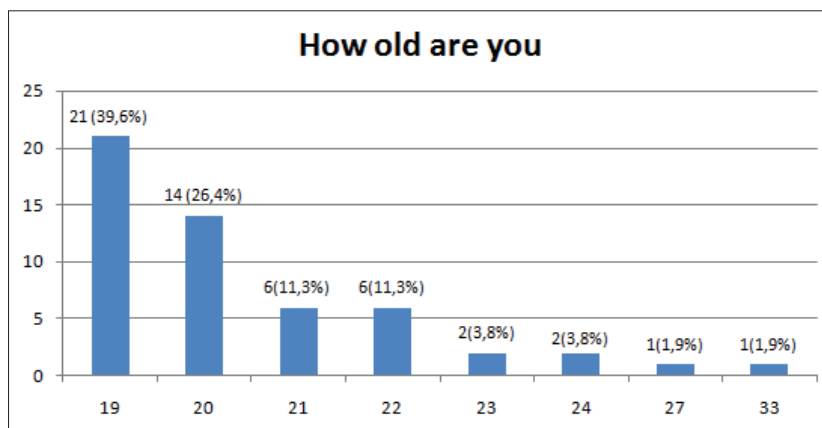


Fig. 2 Age of the respondents
53 responses

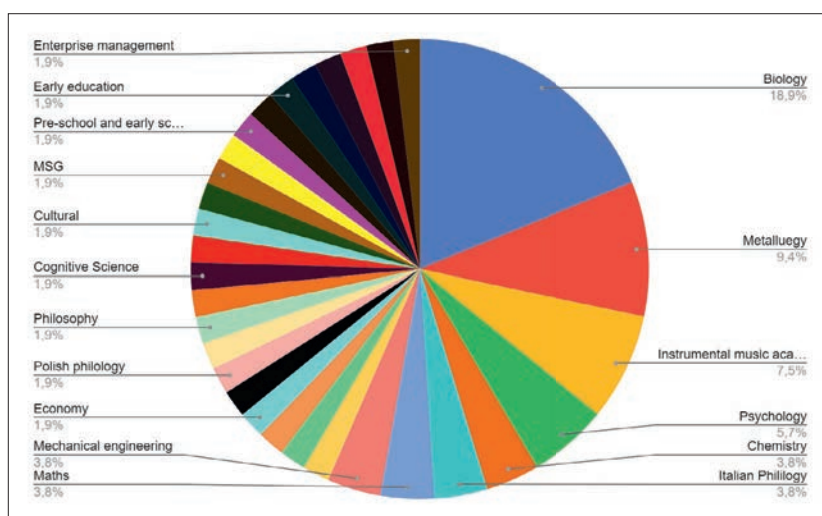


Fig. 3 Field of study

III. Field of study

The diversity of fields of study among the surveyed persons was very large – the respondents listed as many as 17 faculties (Fig. 3), including humanistic studies, through natural and exact science. The most responses were given by persons at the faculty of biology (18.9%)¹, the next largest population of respondents studied metallurgy (9.4%), and instrumental studies came in third (7.5%). Such diversity among respondents allows for a broader interpretation of the obtained results.

¹ The author of this article studies at the Faculty of Biology.

Discussion of the survey results

Question no. 1: What sources of information have you heard of?

This question may seem too general, however, it was very important for understanding the essence of the entire problem. The respondents mainly mentioned the Internet (47.16%) and television (30.18%), i.e. the ubiquitous multimedia, whereas the third most frequent response was radio (20.75%) and media, and only after that were literature and press mentioned. This demonstrates that the young generation of learners prefers easier ways of obtaining information as opposed to traditional methods. Multimedia not only accompany them in their free time, but are also increasingly often used by learners in order to acquire knowledge.

Question no. 2: Which source of information do you use most often?

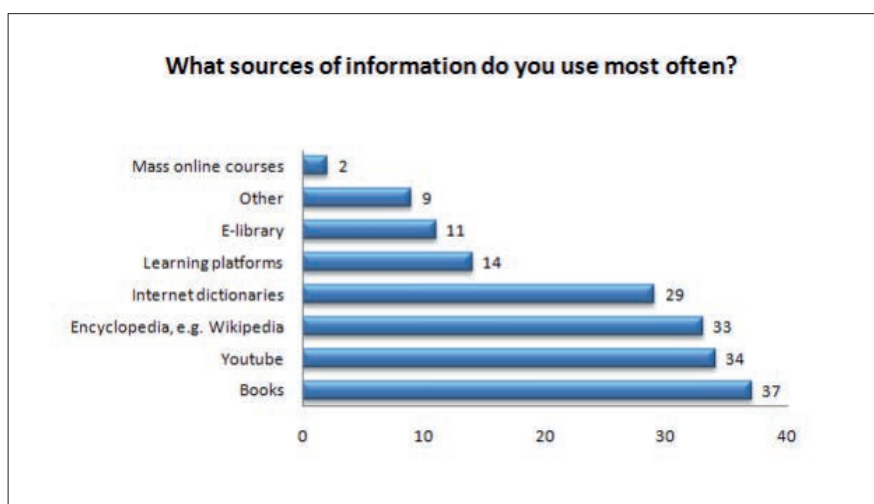


Fig. 4 Which source of information do you use most often?

The analysis of this question provides some food for thought, as the decisive lead among the respondents belonged to books (69.8%) (Fig. 4), which is quite surprising since young people are seen with phones in their hands much more often than with books. However, their responses give hope that the classic ways of acquiring knowledge are not losing their relevance. The second most frequent response was a website generally associated with music videos and less educational films – YouTube (64.2%), but as it turns out, some of the content that can be found there is educational indeed, and helps to easily acquire knowledge. Third place went to the notorious “Auntie” Wikipedia (62.3%). There are many myths about this website’s good fame, but it is widely known that not only school and university students obtain information from its articles, but also lecturers often supplement their knowledge with that content.

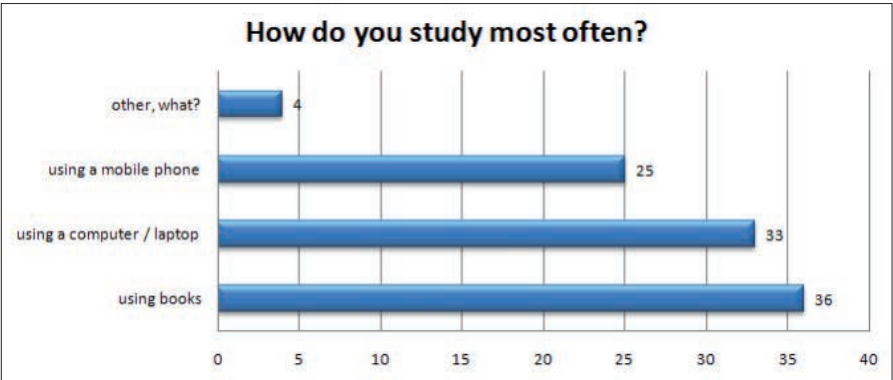


Fig. 5 What is your most frequently used studying method?

Question no. 3: What is your most frequently used studying method?

Thanks to this question, it was possible to obtain information on where students most frequently acquire the knowledge they need in order to study. Books took the first place ahead of computers and laptops – despite the fact that acquiring knowledge from traditional books often takes longer, as it requires more time, students trust this source of information. It is quite popular among young people to use their phones to search for knowledge, and it is a well-known fact that it is a very convenient and quick solution.

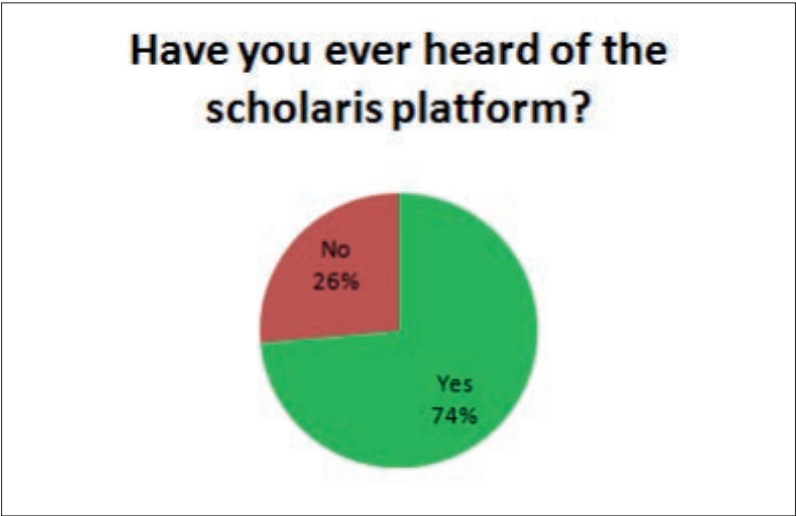


Fig.6 Have you ever heard about the Scholaris platform?

Question no. 4: Have you ever heard about the Scholaris platform?

In order to gather more information on the subject of acquiring knowledge, the graduates were asked if they had ever heard about the Scholaris learning platform. As demonstrated by the results (Fig.6), as much as 73.6% of the respondents had never come in contact with this portal, and only 26.4% had ever heard about it. It is a website where people can find many useful teaching aids from various fields of knowledge, from pre-kindergarten to upper secondary school level learning. These are multimedia lectures from a given field given by qualified individuals who present the specific topics in a clear and simple way. Therefore, knowing this portal was very important when conducting the research.

Question no. 5: Have you ever heard about the Khan Academy platform?

The next question was similar, but related to another learning platform – Khan Academy, which was set up in keeping with the motto that everyone has the right to acquire knowledge everywhere. Slightly more responders had heard about this portal compared to the one from the previous question – 30.2% – while for 69.8% of them (Fig.7), this was the first mention of Khan Academy they had come across. Students, teachers, and even parents can find helpful information on this website. It contains both basic, simple content, as well as more developed and complex information, which is why everyone who searches for answers to burning questions can count on finding an answer there.

Questions 4 and 5 were designed to examine whether learning platforms are popular among students. Unfortunately not many of the responders recognized these portals, which shows that such reliable websites are not known to them, and they acquire knowledge in different ways.

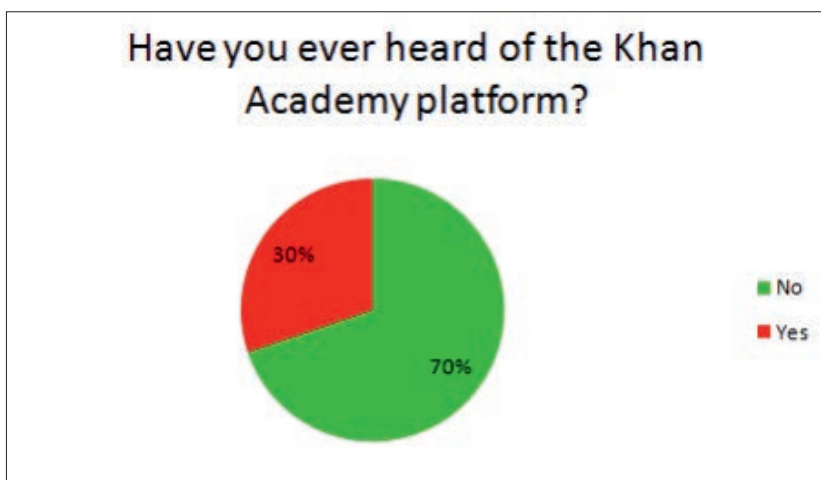


Fig. 7 Have you ever heard about the Khan Academy platform?

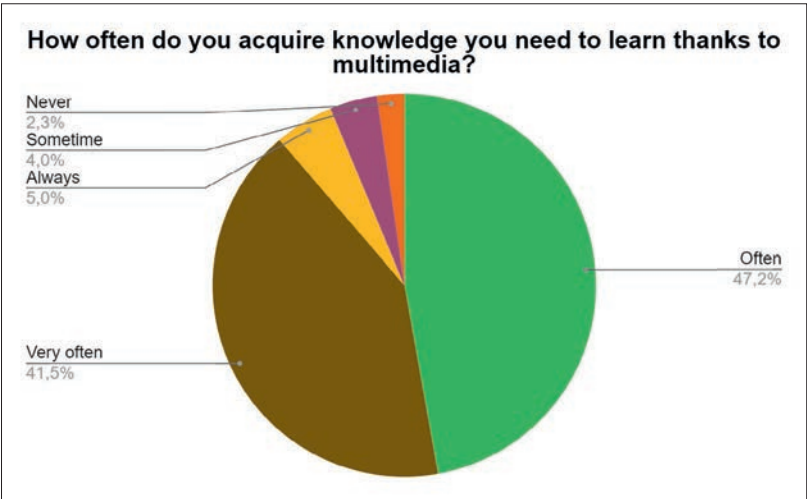


Fig. 8 How often do you acquire the knowledge required for studying via multimedia?

Question no. 6: How often do you acquire the knowledge required for studying via multimedia?

This was a multiple-choice question, in which the responders could determine how often they use multimedia to acquire the knowledge they need.

Most of the respondents replied that they often use multimedia to acquire knowledge – this reply accounted for as much as 47.2% (Fig. 8) of the total responses to this question. A large part of the surveyed persons – 41.5% – admitted to using this form of learning help very often. Few people replied that they always use multimedia. The responses to this question clearly show how important multimedia are for many young people in acquiring the necessary knowledge. There was also

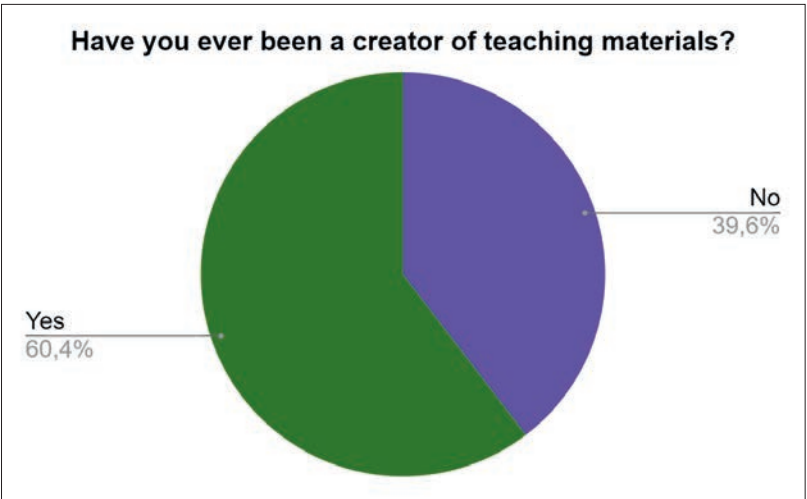


Fig. 9 Have you ever created teaching materials?

a small percentage of respondents who never use the Internet to acquire knowledge, but there were very few people who replied this way.

Question no. 7: Have you ever created teaching materials?

This question was asked in order to determine if students not only use learning aids created by others, or if they also create such materials. The responses were quite surprising because only 39.6% (Fig. 9) of the surveyed persons answered yes to this question, whereas the remaining respondents (60.4%) stated that they had never created any teaching materials themselves, which could also be used by someone else. This is quite surprising because students are quite often associated with piles of their own hand-made notes, but as it turns out, this is a rather misleading picture. One can draw a fairly simple conclusion from this question – that students prefer to acquire knowledge from ready-made sources, rather than take notes or create learning aids themselves.

Question no. 8: Have you ever answered questions posted on online forums?

This question was aimed at obtaining information on whether students share their knowledge and provide answers to questions asked by other people. As much as 58.5% of the respondents answered yes to this question, whereas only 41.5% said no (Fig. 10). This suggests that thanks to knowledge they have already acquired, students create some kinds of teaching materials via multimedia, which can be used by others. This shows that students do not only passively use the Internet, but also actively create its content.

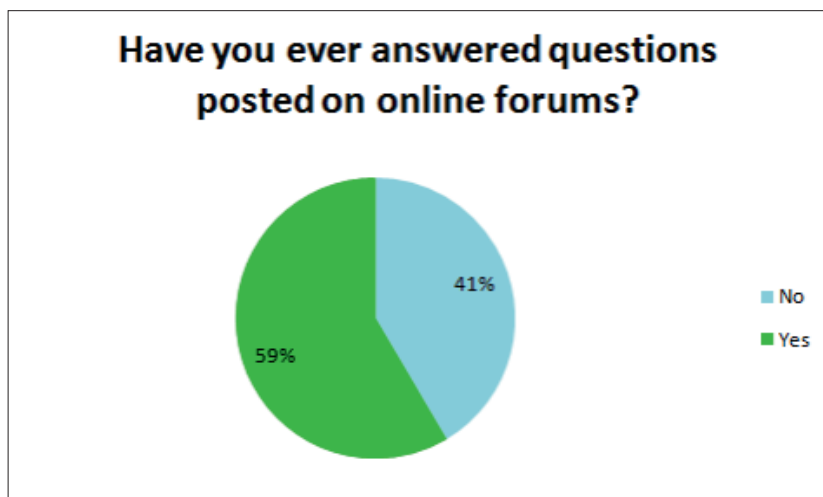


Fig. 10 Have you ever answered questions posted on online forums?

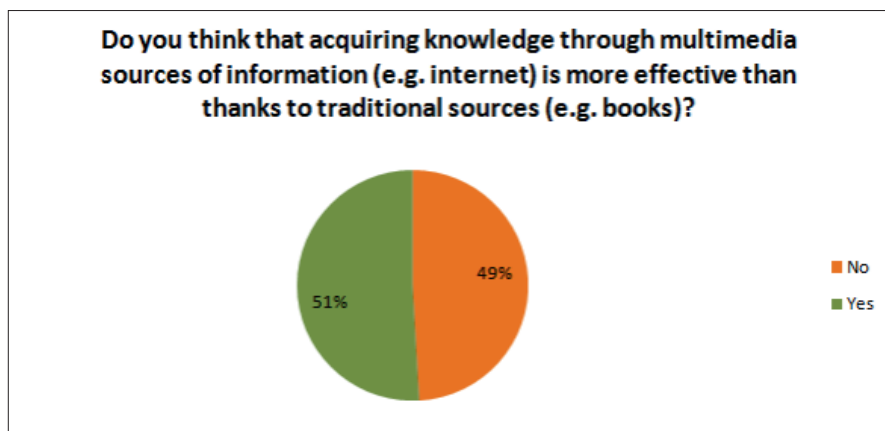


Fig. 11 Do you think that acquiring knowledge via multimedia sources of information (e.g. the Internet) is more effective than acquiring it using traditional sources (e.g. books)?

Question no. 9: Do you think that acquiring knowledge via multimedia sources of information (e.g. the Internet) is more effective than acquiring it using traditional sources (e.g. books)?

This question was most divisive for the respondents, as the replies were divided into two nearly equal halves. Only 1.8% (Fig. 11) more respondents think that acquiring the information necessary to gain knowledge is easier and more effective using multimedia sources than traditional sources. This shows that despite the immense popularity of smartphones and laptops, traditional books are by no means a thing of the past and are still popular among students, even though finding specific information often requires more time than entering the same content in a search engine. There may be many reasons for this situation; perhaps young people still do not quite believe that the content found on the Internet is completely trustworthy and they prefer a reliable source of information.

Question no. 10: Do you use online tests while studying?

This question was included in the survey to determine whether students use popular online tests while studying. The answer to this question proved to be surprising as 31 of the respondents, i.e. 58.5%, said that they do not use this method of checking their knowledge. It is widely known that such tests allow students to easily determine whether the studied material has been assimilated well by them. Only 41.5% of the surveyed persons check their knowledge using online tests (Fig. 12)

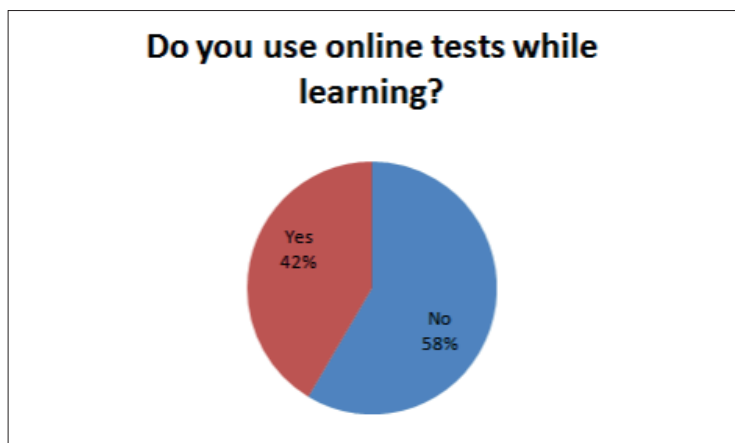


Fig. 12 Do you use online tests while studying?

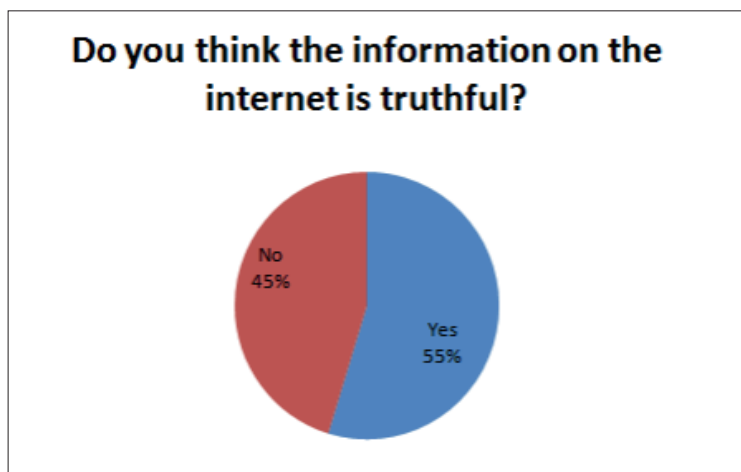


Fig. 13 Do you think the information on the Internet is true?

Question no. 11: Do you think the information on the Internet is true?

This question was asked as part of the survey in order to determine the students' confidence in the reliability of content found online. The responses were rather skeptical as 54.7% of the respondents replied that they do not trust and do not believe the content they find online. Their fears are justified because one can never be certain who published the content or if it is consistent with reality. Only 45.3% of respondents (Fig. 13) believe that what they find on the Internet on various websites and portals is true. Perhaps they check this content in literature at a later time, and after checking, the content proves to be true, and based on this, they are able to trust what they find on the Internet.

Debate

The results of this research were presented at the Scientific and Training Seminar for Directors and Teachers of the Regional Cooperation Network of Exercise Schools of the Pedagogical University of Krakow from the series “Science – Society – Teaching” which took place on April 11–12, 2019 at the Pedagogical University. The title of the presented paper was “Multimedia information flow, social networks and learning communication”. This led to broadening the knowledge of many people about how students acquire knowledge. The obtained results made it possible to confirm the hypothesis about the growing popularity of multimedia in students’ lives. The discussed topic of the influence of the Internet and social networks on the methods of studying and acquiring knowledge by students showed the Seminar attendees how important multimedia are in the lives of young people, and that they are not always used by them for the purpose of enjoyment in their free time, but as our study has shown, they can take advantage of the true potential and possibilities that multimedia bring.

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Multimedia information flow among students

Abstract

The purpose of the article is to discuss the issues of multimedia information flow among students and how expanding social networks affects their knowledge. In order to investigate the problem, students were asked to complete a questionnaire that was supposed to answer the question whether Multimedia is becoming more popular when acquiring knowledge than classic books? The problem is important and very interesting because social networks are

growing at a dizzying pace. The analysis of the main results allowed to state that despite the growing popularity of the network, young people are still trying to obtain information from books, considering this source to be more reliable and precise.

Keywords: multimedia, social networks, multimedia information flow, research

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Elżbieta Buchcic

The use of constructivist pedagogy in science education

"Each educational system is based on a particular theory of human mental development. In recent years, we have been observing a renaissance of the constructivist theory of mental development of an individual which says that the individual has an impact on their cognitive development, structuring understanding of the world during their activity"

Władysław Puślecki

Science education should be introduced since childhood and become one of the important missions of the modern school (Cichy, 2002). It is due to the fact that its main goal is shaping high level of awareness, that is, the responsible approach towards the environment. The aim of this education is to teach a new view on the environment and its qualities, and to prepare to undertake proper endeavors for environmental protection and rational use of its resources. Therefore, maybe premises of the constructivist pedagogy that enrich endeavors aiming at shaping environmental awareness are worth using in a wider aspect.

Constructivism is a theory that supports activating approach to teaching. It treats the learning one as an active individual and the teaching one as a guide – a person whose role is to organize a learning environment. It derives from works of J. Piaget, M. Montessori, J. Korczak, J. Dewey, A. Leontiew and L. Wygotski, while J. Bruner developed the theory.

Analyzing the literature, one may conclude that constructivism is a view which postulates that people (actively discovering reality they function in) acquire knowledge while interacting with the surroundings. At the same time, it is a theory of learning, gaining knowledge, and teaching.

According to the aforementioned premises, currently the following methods are being rejected:

- Traditional copying of ready-made patterns,
- Learning set instructions in order to search,
- Modification,
- Interpretation,
- Checking information by the learning one.

According to the constructivist pedagogy, studying means building own knowledge structures by a thinking person, not acquiring prepared contents or patterns. It is because human mind is not a camera that records or reflects reality; it creates knowledge in a form of pictures, concepts, and emotions.

Basing on the neurobiological approach to the way the brain functions, constructivism postulates that:

- We learn by interacting with the surrounding,
- Our knowledge is an individual CONSTRUCTION,
- It is broaden by adding new elements to the elements we already have, according to the rules of assimilation and accommodation (ORKE, 2019).

Representatives of this current claim that people learn through interaction with their surrounding, actively construct their own knowledge by using knowledge they already possess. Effects of cognition depend not only on the maturity level and a system of direct external influences (teaching) but, first of all, on the scale of activity of the learning one. The learning one does not register incoming information as much as they build knowledge structures from available data. That is why it brings a pedagogical postulate for the learning ones to be active and creative, because attempts of passive acquiring of knowledge provided by the teaching one and books will not result in satisfying effects, in terms of both quantity and quality.

Foregoing thoughts on constructivist pedagogy and a role of environment as a content and value carrier may be applied in regard to science education. Considering the fact that the environment teaches and rears, it becomes a perfect “tool” in the educational process as it creates ideal conditions to gain knowledge, to experience and observe various phenomena within it. It applies to formal education at educational establishments as well as to informal education associated with the process of shaping our approaches, values, skills and knowledge, based on various experiences and influence of the surrounding. It has been long since known that that in science education (both descriptive and expository), ability of direct (or indirect) observation, perceptiveness and independent judgment should be at the first place (Niewinowski, 2012).

For more effective teaching in terms of science on every level of education, it is important so that students are allowed to:

- explore their surroundings unassisted,
- use tools designed for this purpose,
- analyze changes in the environment,
- describe and explain phenomena in nature,
- and to predict effects of human activity on the environment.

Those goals can be achieved mostly through field classes where students have a direct contact with nature.

It needs to be kept in mind that learning environment is not limited to educational system but is created also by:

- everything that takes part in constructing new knowledge about the world,
- prior knowledge,
- cognitive style of the learning one,
- relations between the learning one and subject of cognition.

Giving meaning to incoming stimuli always takes place in context of previously possessed information and experiences, because constructing of knowledge requires:

- interpretation,
- re-organization,
- transformation,
- generalization of incoming information.

Constructivism proposes education based on:

- experimenting,
- searching directed by ideas of the learning ones,
- presenting problems interesting to the learning ones,
- creating new models and hypotheses.

At the same time, it is advised to handle everyday life issues, treated holistically, with their level of knowledge and experiences in mind. The role of the teaching one should be only creating convenient opportunities to undertake cognitive activities, and building bridges between shallow understanding and more complex understanding of a problem.

According to Wiktorja Sobczyk (2001), people explore nature through:

- exploring their own personality,
- using imagination and intellectual capabilities,
- boosting creativity,
- respecting nature,
- personal involvement into environmental issues.

Nature teaches us to be humble and guarded in our judgments. As Ryszard Kulik (2003) claims, while observing natural processes, we may get revolted, we may not like something, or we may be amazed, but nature does not care. It is the way it is. Fish swim in the sea, birds fly in the sky, and earthworms tunnel through soil. Everyone and everything has its place and does what it does. Taking part in classes where nature is a teacher, we come to a conclusion that in fact, there is no difference between a student and a teacher. We are a part of nature and fall within the same transition processes as it does.

Nature has been a perfect information and value carrier. It is also still an underestimated educator. When people lived closer to wild nature, deep knowledge about interdependence of all living creatures was the most important. Just like animals, young people were gradually learning how to handle nature around them, because they gained knowledge about other creatures living in the same environment, about their habits and characteristics. Experiencing danger, searching for warm shelter and nutritious food were everyday issues of human existence. Secrets and laws of nature were a part of life. A modern man treats nature as a private factory which can be used to get everything necessary for living without any limits. Focusing on our own needs and expectations, we often forget that each organism has the same right to live as we do, and natural resources are not limitless.

Currently, the role of science teachers is to enable students direct contact with nature because, as Jan Frątczak (1990) observes, the best way of learning about the surrounding environment is the direct encounter. In order to do that, one needs to give a correct example through their own everyday attitude. Effective teaching means, first of all, to provoke cognitive curiosity and to create situations when the student is directly engaged and active. It is not information reproduction but processing and drawing conclusions, and it is saved enduringly in the memory structures.

Anita Ganowicz-Bączyk (2003) claims that the issue of education about nature has recently been discussed quite often. It is related to the problem of a man in the

modern civilization gradually wandering off farther and farther from natural space, in favour of artificially created anthropocenes. Therefore, in order to understand nature and its phenomena, it is necessary to realize that we are a part of it, not beside or above it. Due to the fact that school education has a great impact on shaping our thinking, constructivist pedagogy gives us a chance to explore secrets of nature.

According to constructivism, the learning one:

- is a nature observer themselves,
- studies dependencies taking place in nature,
- discovers sense of its existence,
- constructs knowledge about nature on their own,
- realizes that encounters with nature has a positive influence on their physical, mental and emotional development.

It is worth to remember that constructivist education changes the relation between the teacher and the student essentially. The role of the teacher is planning and organizing a proper educational environment, whereas the student is in the centre of the educational process and creates their knowledge actively.

Bożena Śniadek (1997) claims that the following premises are basis of the constructivist theory of education:

- learning depends on the knowledge and perceptions of a child,
- students possess wide basic knowledge gained through encounters with nature, society, and mass media,
- each student creates their knowledge individually,
- construction of concepts and meanings is a continuous and active process that is connected with starting knowledge,
- teaching causes changes in concepts,
- re-organization of the current knowledge,
- students are responsible for their own knowledge.

As mentioned before, in case of science education, field classes play a great role. They are not only an attractive form of teaching and learning in the process of noticing, shaping, realizing particular practical tasks, but also make it possible for students to use nature as a source of “living” knowledge. What is more, such endeavors are a chance for unassisted observations carried out by students and for taking part in the idea of beauty (as Plato tended to say) which can be approached through concretization (e.g. beautiful trees in a park), and as a proportional system of elements of a certain whole (park). Success of such classes depends on many variables but the main mean leading to achieving this goal is exploring and stimulation when both students and a teacher are actively involved, and the students try to observe and follow their teacher. One can get closer to nature through a direct encounter, not through a technique.

Teaching process based on premises of constructivism should follow these stages:

- identification of knowledge and its exposure,
- construction of new knowledge and its restructuring,
- comparing new theories to the old ones,
- implementing new knowledge (Wynne, 1996).

Presented teaching model is universal (general) enough that it can be used at different levels of school education in case of various fields, and at university or college as well. Stanisław Dylak (2000) on the other hand, notices the necessity of implementing this theory also in the process of educating teachers in training, including science teachers.

There are still issues which have not been discussed here yet. For example, an important for the constructivists issue of objectivity of the knowledge explored by the students. Dorota Klus-Stańska (2000) is afraid of the narrow science approach to teaching presented by science teachers, including requirements that a student should closely follow the stages of exploring given by a methodology of a particular scientific field. The author appreciates a significant role of an experiment in science education but suggests to create environment where students frame concepts and laws as a result of comparing their meaning with personal and general knowledge, and where the teacher would not impose the only correct, scientific solutions.

Constructivism is currently a very popular baseline for thinking of education based on child's creative, cognitive activity and on starting with child's knowledge and opinions. Stanisław Dylak (2000) claims that constructivism (as a theory of knowledge) has actually two strong points of support: the neurobiological theory of functioning of the brain and pedagogical concepts showing effectiveness of the pedagogical activity based on constructivism. Constructivism finds creating new knowledge and adopting exploratory approach by the students important. The core of constructivism is the premise that a student is a researcher inspired by the teacher. Using various sources of information, they create new knowledge (Śniadek, 2008).

As Bogusław Śliwerski points out, in the light of constructivism, the educational process must provide students with such conditions so that they are able to create and develop their knowledge. It will allow them to understand it better which will result in better understanding of the world to which it applies. The fundamental rule of constructivism is active and subjective constructing of knowledge by the exploring one.

In case of school education, a student builds their own knowledge and the role of a teacher is only to support them, not to impose their own way of thinking and understanding. That is why, according to Stanisław Dylak (2000), constructivism brings hope for teaching of reasoning. It is most probably connected with the development of reflexivity which becomes essential during learning new content and constructing own premises and theories based on that content.

The modern role of a teacher is only to motivate and create research questions for students to find solutions. It needs to be kept in mind, though, that nature can be explored not only at school for compulsory education, while learning about its characteristics through the prism of definitions from the core curriculum and textbooks. Nature is a part of our everyday life, it surrounds us, and we can observe how it changes all the time. Every second it sends us a lot of information which we often ignore. It teaches us love, humility, tolerance, thrift and other values (Buchcic, 2017).

To sum up, upbringing requires constant educational activities which should start during childhood and last for the entire life. According to the premises of constructivist pedagogy, learning and using the gained knowledge in practice is not

merely storing knowledge within a particular scientific field. It is due to the fact that cognitive process implies the need to modify learning mechanism themselves and is supposed to lead to gain competences in using certain actions taking place spontaneously and aim at improvement of acquiring information and skills in terms of quality, and cause change of cognitive structures. That is why various endeavors within formal and informal education should be undertaken in order to make nature a value for us. For this purpose, it would be worth it to use premises of constructivist pedagogy in terms of passing on information, shaping skills and environmental attitudes as a responsible approach towards environment which is a value itself.

The life of a human being is a process of realizing values through making selection and hierarchization. The right system influences our personality and makes the existence meaningful. This is why cultivation of desired sequence of values should be noticeable in a process of becoming better. It is values that stimulate and cultivate our consciousness, motivate to being active, mark the goals out, integrate people and unite societies, stimulate, orientate and stabilize development; they are an important part of a culture.

The dimension and the meaning of the concept of a value is the object of interest of many researchers representing various fields of studies. It generates pluralism in interpretation and classification of the term. The environment as a value is a very present-day issue as well as a subject area of research.

Nature as a value has been appreciated in various branches of industry and in politics; it has also been popularized in a formal and informal education. Nowadays, there are a lot of enterprises being undertaken which make it possible to emphasize this ineffable treasure that nature is. All actions that the people undertake in order to save the beauty of nature testify that nature itself may be a value. Thanks to involvement of many institutions and organizations, numerous projects are being realized. These projects concern protection of environment, preservation and enrichment of biodiversity, and formal and informal education.

Richard Louv (2014) claims that we should aim at making nature a passion for people but it is necessary to realize that a passion does not come from watching a videotape and is not recorded on a CD. Passion is based on personal experience. It comes from the ground, dug out with hands of a child. It travels from the dirty sleeves straight to the heart.

Science education according to the constructivist pedagogy may be an answer to challenges brought by globalization. However, it has to be treated by the society as a priority having a great impact on the future of all people.

It is worth remembering that knowledge consists not only of facts, rules and theories drawn from observation of phenomena and occurrences, but it is also the ability to use it rationally and to interpret those information in an everyday life.

"Nature has always been a realm and an observation field of both science and art, it was as important for a painter and a poet as for a biologist."

Przemysław Trzeciak

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The use of constructivist pedagogy in science education

Abstract

In the contemporary Polish pedagogy, in the era of changes, upbringing of the youth and the need to create a new system of education become a subject of discussion. Groundbreaking systems and pedagogic methods are being searched for; the new ones are being created but at the same time, the proven ones which have a permanent place in the educational process, in case of both formal and non-formal education, are used as well.

The author notices the fact that nature is part and parcel of life and constitutes a value for a man. A human being, as the nature's building block, has a direct influence on the course of its development and therefore on its protection, which should be a priority in our everyday lives. This is why we must not forget that the process of science education is an active and continuous process which changes when new information appear – it not only complements the knowledge but also restructures it. It is worth mentioning that despite the fact that the educational process is a social and a group process, each individual explores knowledge by themselves and restructures it. In this sense, they are responsible for it.

Keywords: value, nature, axiology, formal education, informal education, constructivism, constructivist pedagogy, ecological consciousness, ecological culture

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Development and evaluation of methodological measures related to teachers' digital competence

Introduction

Learning and skills are key contributors to society and the economy. As modern societies and economies are changing due to, amongst others, globalization and technological progress, a fundamental transformation of education and training (E&T) throughout Europe is required to deliver the knowledge and skills needed for growth, employment and participation in society. Those forms are an important part of the Europe 2020 agenda and its various flagships and policy initiatives (Learning and Skills for the Digital Era, 2018). Special attention of EU policy and research in this area started in 2005 and is focused on how to make better use of ICT for rethinking learning, for innovating education and training and for addressing new skills requirements (e.g. digital competence) to generate growth, employment and social inclusion.

This article is an attempt to analyze theoretical grounding and methodological issues for conducting a study of levels of teachers' digital competences and ways for their improving.

The European Commission emphasized the potential of ICT to encourage innovation in approaches to teaching and learning. The opportunities provided by ICT (e.g. networking, interaction, information retrieval, presentation and analysis) are seen as core elements in honing 21st century skills. This also required a more comprehensive embedding of ICT and its pedagogical use in the curriculum for students as well as in teacher training. Teaching staff are the key players in strengthening and fostering the new digital environment in schools.

Digital competence of educators

Innovating and modernizing education and training are key priorities in several flagship initiatives of the Europe 2020 strategy, in particular Agenda for New Skills and Jobs, Youth on the Move, the Digital Agenda and the Innovation Union. The key challenge for research and policy is to make sure that the full potential of digital technologies is used for learning and that effective digital-age learning is made possible through systemic and holistic change (Digital Competence Framework for Educators, 2018).

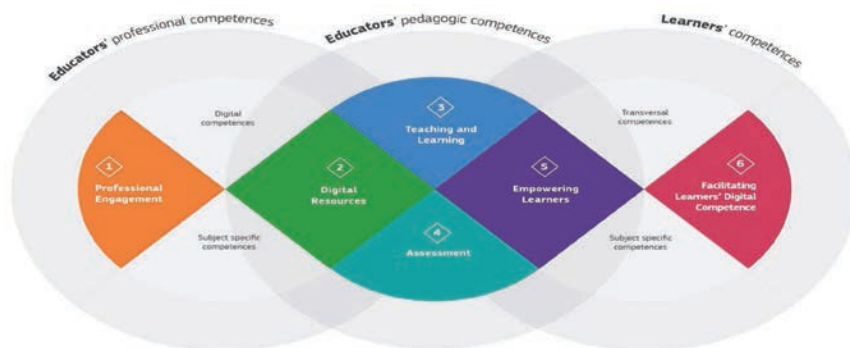


Fig. 1 Digicompedu in a nutshell (according to European Framework for the Digital Competence of Educators, 2018)

The ubiquity of digital devices and applications, in particular, requires educators to develop their digital competence (Fig. 1).

Strengthening education systems through the use of new ICT tools and teacher training is one of the priority areas for the first cycle of the Strategic Framework for education and Training ('ET 2020') (Key Data on Learning ..., 2011). In addition, the Digital Agenda for Europe initiative defines the enhancement of digital literacy and skills as one of its main pillars and promotes the implementation of long-term e-skills and digital literacy policies (Digital Agenda for Europe, 2018).

According to the study conducted recently by Polish scientists (The digitalization of Polish Education Vision and Proposals, 2018) there are three areas of professional pedagogical digital competence of teachers that should be developed for making progress with digitalization in Polish education/school: subject-matter, methodological and technological competences. These digital key competences become a new fourth cultural technique, alongside writing, reading and arithmetic (Landesregierung NRW, 2016).

Effective science and practical communication, which ensures an efficient flow of information about new in the area of teacher training, using of the new teaching and learning digital techniques, has a direct impact on the development of each scientific direction, practical introduction of the scientific results and to improve teacher professional development.

For promoting economic competitiveness and social cohesion European society needs an educational infrastructure that provides all learners with opportunities to obtain an education at the highest level commensurate with their own growth and growth potential (Niemi, 2007). The European Commission emphasized the potential of ICT to encourage innovation in approaches to teaching and learning (European Commission, 2008). The opportunities provided by ICT (e.g. networking, interaction, information retrieval, presentation and analysis) are seen as core elements in honing 21st century skills. This also required a more comprehensive embedding of ICT and its pedagogical use in the curriculum for students as well as in teacher training (Key Data on Learning..., 2011).

Teaching staff are the key players in strengthening and fostering the new digital environment in schools. It is vital that the European Union needs well-trained teachers, able to incorporate ICT into education in a way that leads to change from the old to the new paradigms of learning which are much more student-centered than before (Learnovation Consortium, 2008). European Member States have recognized the importance of teacher education in this context. They have committed themselves to developing ICT skills during initial teacher education and to continue to encourage this through early career support and continuing professional development.

It is evident that there is an urgent need for action regarding the professionalization of teachers for digitization (Zimmermann et al, 2019). This goal can only be achieved by systematically building up or broadening media-didactic competences in continuing education and training programs (Bastian et al., 2016; Insteftjord, 2015). Therefore, it is also of great importance to identify and formulate the exact mechanisms for changing teachers' attitudes towards digital teaching techniques and ways of their motivation for the professional development especially in area of technological and pedagogical competences in the context of the required digitization in schools.

Overview of underpinning theories for theoretical backgrounding of the study concerning development of teachers' digital competences

The gap between theory and practice in teacher education is widely discussed (Korshagen et al., 1999; Shulman, 1998). Evidence suggests that teachers competences interventions guided by relevant theory (e.g. the concept of individual technology acceptance (Davis, 1986), the theory of reasoned action (Fishbein et al., 1975), the unified theory of acceptance and use of technology (Venkatesh, 2003) are more effective in changing teachers' attitudes towards using new technologies and improving their pedagogical competences including digital skills.

These theories hypothesize that there are four core constructs which direct determinate behavioral intention (performance expectancy, effort expectancy, social influence and facilitating. in turn, these constructs are moderated by gender, age, experience and voluntariness of use (Venkatesh et al., 2003).

Badura's social cognitive theory (Badura, 1986) and Self-efficacy theory (Badura, 1997) as well as Theory of Planned Behaviour (Ajzen, 1985) also look useful for the study of ways for changing teachers' motivation for professional development.

Social cognitive theory is concerned with the process of knowledge acquisition or learning. This theory is based on the idea that people learn by observing others, with the environment, behavior and cognition as the chief factors influencing development in a reciprocal triadic relationship.

According to the Self-efficacy theory observed behavior of an individual is influenced by three basic determinants, which are personal, behavioral and environmental. Badura names four sources of efficacy beliefs:

1. Mastery experiences. However nothing is more powerful than having a direct experience of mastery to increase self-efficacy. Having success, for example in mastering a task or controlling an environment, will build self-belief in that area whereas a failure will undermine that efficacy belief. To have a resilient sense of self-efficacy requires experience in overcoming obstacles through effort and perseverance.

2. Vicarious Experiences. Seeing people similar to ourselves succeed by their unstained effort raises people beliefs that they too possess the capabilities to master the activities needed for success in that area.

3. Verbal Persuasion. Influential people such as colleagues, teachers, managers or coaches can strengthen people beliefs that they have what it takes to succeed.

4. Emotional and Physiological States. The state person is in will influence how he or she judges his or hers self-efficacy. Stress reactions or tension are interpreted as signs of vulnerability to poor performance whereas positive emotions can boost people confidence in their skills.

5. Imaginal Experiences. The art of visualizing yourself behaving effectively or successfully in a given situation.

Self-efficacy is the belief in one's ability to influence events that effect one's life and control over the way these events are experienced (Bandura, 1994).

According to the Theory of Planned Behavior (Ajzen, 1985), an intention to a behavior depends on one's attitude, normative beliefs, and control beliefs about that behavior. These include beliefs about perceived consequences, others' expectations and resources or barriers for that behavior. How much each of these beliefs affect the intention towards the behavior, depends on their power in any individual's case. An estimate of whether a perceived consequence is good or bad amplifies the attitude component. Similarly, motivation to comply with a certain group puts gain on the belief about the expectations of that group. Each resource required by, or barrier against, a behavior needs to be multiplied by an estimation of one's potential to overcome these. Multiplying the strength of each salient belief by its estimated individual power can be then determine the direct variables for the attitude, subjective norm and perceived behavioral control as averages. The behavior depends on the intention to the behavior, which in turn, is dependent on these direct variables. Further, the weight of each of these is still dependent on external variables of demography, general attitudes and personal traits, for example.

Other group of the theories grounded the necessary professional knowledge of teachers for the use of technologies in teaching. The most appropriate are Shulman's pedagogical content knowledge (PCK) model (Shulman, 1986) and Mishra's and Koehler's Technological pedagogical content knowledge (TPACK) model (Mishra et al., 2006).

Shulman's model is based on two main dimensions: pedagogical knowledge (PK) and content knowledge (CK). According to this model, teachers' subject matter knowledge and pedagogy were being treated as mutually exclusive. Pedagogical content knowledge includes pedagogical knowledge and content knowledge, among other categories. Initial Shulman's description of teacher knowledge included curriculum knowledge, and knowledge of educational contexts.

Extending PCK model to the phenomenon of teachers integrating technology into their pedagogy allowed Mishra and Koehler to frame Technological pedagogical content knowledge (TPACK) model, which focuses on technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) and offers a productive approach to many of the dilemmas that teachers face in implementing educational technology in their classrooms. By differentiating among these three types of knowledge, the TPACK framework outlines how content (what is being taught) and pedagogy (how the teacher imparts that content) must form the foundation for any effective edtech integration (Kurt, 2018). This order is important because the technology being implemented must communicate the content and support the pedagogy in order to enhance students' learning experience. The professional knowledge of teachers includes content knowledge (CK): knowledge about facts, concepts or structures of a specific subject and in the same time it comprises pedagogical knowledge (PK), which describes the knowledge for teaching and learning (Fig. 2).

These different forms of knowledge areas could be additionally linked to the respective context, i.e. the situational conditions, such as the interior design, the classroom climate or the school concept (Mishra et al., 2006). Some studies concluded that the number and the type of TPACK factors depend on the investigated population (Cubelles et al., 2018).

Testing the validity of theoretical models applied to educational interventions allows for the development and refinement of theory, which can support the design and delivery of more effective interventions. However, interventions targeting digital competences in teachers and students of Polish educational institutions rarely assess the theoretical mechanisms of behavioral changes in relation to motivation for professional development.

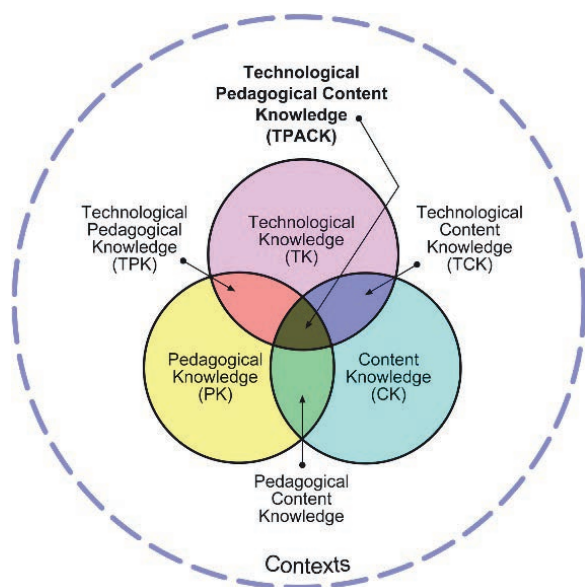


Figure 2. Structure of the TPACK model (image ©2012 by tpack.org)

Methodology

The study survey was designed using the questionnaire for self-reflection, based on European competence framework for the digital competence of educators (Digital competence framework for educators, 2018). According to the Digcompedu framework there are 22 educator-specific digital competences organized in 6 areas which are focused on different aspects of educators’ professional activities (table 1).

Table 1. Areas of educator-specific digital competences

Area	Description
I. Professional Engagement	Using digital technologies for communication, collaboration and professional development
II. Digital Resources	Sourcing, creating and sharing digital resources
III. Teaching and Learning	Managing and orchestrating the use of digital technologies in teaching and learning
IV. Assessment	Using digital technologies and strategies to enhance assessment
V. Empowering Learners	Using digital technologies to enhance inclusion, personalization and learners’ active engagement
VI. Facilitating Learners’ Digital Competence	Enabling learners to creatively and responsibly use digital technologies for information, communication, content creation, wellbeing and problem-solving

Source: European Framework for the Digital Competence of Educators, 2018.

The questions from original questionnaire will be used for composing of different sections of TPACK model (Mishra and Koehler 2006): TK, PK, CK, TPK, TCK, PCK, and TPCK. In the same time the questions could be categorized in four sources of efficacy beliefs: mastery and vicarious experiences; verbal persuasion; emotional and physiological states and imaginal experiences. The categorizing allows to explain teachers motivation for improving their competences including digital skills.

Conclusion

Analyzes of the most known theories and models for the investigation teachers’ competences with emphasis on digital skills as well as changes in teachers attitude towards professional development, have shown a wide methodological grounding for further studies in area of teacher training and retraining. The TPACK model is the most appropriate one for creating the studies tool and for the analyzing of the obtained results. These endings can be used as a methodological approach for more accurate conceptualization in upcoming research. The paper may inform future researchers seeking to understand how to conduct the complex research connected with teachers development in TPACK knowledge on the levels of self-efficacy, lesson planning and practical implementation. The challenge for the future steps in conducting of the research is to define modeling experimental target group to be

able disseminate the further study results on the wider teachers' groups through the relevant training courses and recommendations.

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Development and evaluation of methodological measures related to teachers' digital competence

Abstract

The paper presents an analysis of theoretical grounding and methodological issues for working out relevant tool possible for conducting of the complex study of teachers' competences with highlighting on the digital one. This kind of competences is highly required because of the great potential of innovative information and communication technologies regarding teaching and learning. In the 21st century, an effective teacher needs to know how to integrate technology into teaching and to be motivated for the permanent professional development in this case. The article analyzes the most known theories and models for the investigation teachers' competences with emphasis on digital skills as well as changes in teachers attitude towards professional development. Conclusions allow to work out and scientifically justify methodology and research tools for further study issues related to teachers digital competences as a part of their professional development.

Keywords: teachers, theories, competences, digital skills, behavioral changes

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CONTEMPORARY APPROACH IN PEDAGOGICAL RESEARCH

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Ecological pedagogy vs. ecological approach in pedagogical research – selected aspects

Introduction

Admittedly, terms 'ecology' and 'ecosystem' coming from biology have been lent to many disciplines and, therefore, are used in contexts different from the original ones. The term *Ökologie* was introduced in 1866 by Ernst Haeckel – a German zoologist and philosopher, who defined it as the knowledge of relationships between the organism and the environment. This was because Haeckel understood ecology as the whole knowledge regarding the economics of nature, the examination of all relations between the animal and its non-organic and organic environment, including its friendly and hostile reactions with the animals and plants that it contacts indirectly or directly (McIntosh, 1985). In 1935, an English botanist Arthur G. Tansley used the term 'ecosystem' for defining the whole system containing not only a set of organisms, but also a full set of physical factors being a specific life environment for these organisms. Such systems where mutual dependencies between living organisms – biotic elements (plants, animals, people) and the entire inanimate nature – abiotic elements (water, soil, air, wind, mineral elements, non-organic elements, etc.) are primary units of nature on the surface of the Earth in ecology (understood as one of biological sciences).

While the development of biological sciences continued to progress at the beginning of the 20th century, and the tradition of nature writing related, among others, to the 19th century New English transcendentalism still developed in the United States, the anthropocentric attitude to nature developed under the influence of modern thought continued to dominate in society. It was accompanied by the conviction of the ultimate subordination of nature to the human being. As a result of this, issues of relations and interdependencies between society and nature were not reflected broadly in social and human sciences until the middle of the 20th century. Only the publication of U Thant Report (1969) and Roman Club reports (1972, 1979) was the turning point in this approach.

In social sciences, particularly sociology, the environment was treated as a human environment forced by various social entities and their actions. This began to change, consequently leading to the formation of environmental sociology, where research focused on interactions occurring between the natural environment and society in conditions of the increasing risk of ecological catastrophe (Trempała,

2016). Before this occurred, society had exerted an impact on the formation of ecological pedagogy developing within the scope of social pedagogy.

Background for ecological pedagogy

It was social pedagogy that developed interest in the upbringing of the human being for natural environment protection and the formation of ecological awareness and culture. This is how, on the basis of social pedagogy, ecological pedagogy has developed as one of its specific disciplines since the 1980s. The first works in the field of ecological pedagogy concerned mainly upbringing for environmental protection, with particular regard to individual responsibility for the natural environment. An outline of the idea of ecopedagogy was formed by Gerhard de Haan (1985). It was also developed by E. W. Kleber, who tried to combine planetary, biocentric and anthropocentric perspectives (1993).

Ecological school was formed much earlier, in the 1920s, as a result of the search for the relationship between human development and environmental factors. The ecological trend in social research has its long history. It developed within the conception of Chicago human ecology developed by Robert E. Park, Ernest W. Burgess and Rodrick D. McKenzie (Krüger, 2005; Trempała, 2016; Wroczyński, 1979). One of the creators of Chicago school was also Florian Znaniecki. By referring to ecological concepts and ideas, representatives of Chicago school tried to explain the characteristics of the spatial division and arrangement of urban communities, taking various factors into account. They treated urban space as an ecosystem that must be learned with the use of concepts and principles known from ecology, physiology or biology. Research on population movement processes and their ecological conditions developed within the scope of human ecology (the concept that was introduced by American sociologists at that time) helped to plan and organize the life of urban communities and intended educational activity. Although theoretical assumptions of the ecological trend (particularly conceptions of social Darwinism and geographical determinism) were criticized, ecological school in sociology undoubtedly contributed to the development of environmental pedagogical research and its methodology. With regard to human ecology, human sociology represented by F. Znaniecki indicates the need to consider the world of human meanings and values as elements regulating human behavior, not only the determination of development by means of biological factors (Kalinowska, 1994). From the perspective of human sciences, human ecology focuses on all elements of the environment, which are closely interconnected and form the natural, social & cultural and psychological sphere of human existence. This is reflected in the presence and determination of environmental education on the basis of education sciences and social sciences.

In natural sciences, environmental education is sometimes associated with ecological education or is treated as a superior concept towards ecological education. As regards social education, the perception of environmental education has been dual since the late 1990s. Firstly, in a narrower sense, it is referred to the acquisition, teaching and popularization of knowledge of the local environment, its social, cultural and natural life in school work. In a broader sense, environmental education

is treated as the process of forming and developing one's own environment-related competences, the conduct that is combined with the fulfillment of a range of local needs, such as economic, educational, cultural or political needs (Theiss, 1999).

Environment in social pedagogy

Starting with the understanding of the concept of environment in social pedagogy, we must refer to the findings of its creator Helena Radlińska, who perceived the environment as a set of conditions among which the individual lives and factors determining his/her personality with a permanent or long-term impact (Radlińska, 1935). It is worth mentioning that the first works referring to the environment as a set of conditions for educational behaviours and socialization processes were undertaken in pedagogy in the 1920s and 1930s (Krúger, 2005). Ryszard Wroczyński also defines the environment as elements of the structure surrounding the individual that function as a set of stimuli and cause specific mental reactions (experiences) (1979). Depending on the type of environmental stimuli, we can distinguish between natural, social and cultural environments.

The natural environment is considered to include these elements of the background that form the physical environment of the Earth (e.g., the surface, climate, waters, natural resources), flora and fauna (Wroczyński, 1979). The natural environment initially understood as a product of nature and existing without human intervention actually does not exist on the globe any more. Only the areas in which elements of original nature prevail have remained. Although the human being can transform and interfere in the natural environment to a large extent (and does this), it is reasonable to subject his/her attitude to the world of nature to education.

On the other hand, the social environment includes people and social relations surrounding the individual, whereas the cultural environment encompasses elements of the output of historical human activity affecting the individual (Wroczyński, 1979). The aforementioned three types of environments: natural, social and cultural are not isolated – they are strongly interconnected. The natural environment forms a kind of basis for social life and the creation of cultural property whose direction it usually determines. All three types of environments are combined with educational activity, because they release specific human mental experiences, which forms a basis for processes of intentional educational activity.

The ground for scholarly deliberations of social pedagogy in the aforementioned aspect is ecosphere, which is closely related to other spheres of human life, such as biosphere, psychosphere, sociosphere and technosphere. Understood in such a broad sense, the environment of human life will significantly determine the quality of individual life and, vice versa, can be largely changed by rightly or wrongly thought-out human activity. Therefore, results of research conducted in an interdisciplinary manner and educational practice connected with ecological education can serve as primary sources for the development of ecological pedagogy as a discipline (Gola, 2018). The latter encompasses studies and research on the preparation of the human being for participation in social life through the formation of behaviors and values referring positively to the natural environment (Albińska, 2005;

Gromkowska-Melosik, 2004). The quoted understanding of ecological pedagogy has little in common with the ecological approach in pedagogical research.

Ecological approach in social research

It must be stressed that ecological approaches are often developed in research on the basis of social sciences, which goes for pedagogy, too. From among relatively recent pedagogical works, it is worth mentioning two significant research papers in this aspect: Zbigniew Kwieciński's work on the reactivation of pedagogical ecology (2013) and a new interpretation of Helena Radlińska's works by Lech Witkowski (2014). By introducing the term 'pedagogical ecology', Kwieciński treats it as studies and research on the entirety of educational relations in the life environment of individuals, where 'life environment' means both the 'world experienced' by the individual as processes and relations and objective 'conditions' of individual life. Pioneer research in Polish pedagogy within the scope of 'ecological monograph research' was conducted in the Ciche Górne village at Podhale – an economically retarded region, with school as a centre and object of influence (Kwieciński, 1968). In spite of the collapse of this research program after a few years, Kwieciński advocates the performance of comprehensive studies on education in its broad sense as pedagogical ecology and ecological pedagogy, because today we have studies at our disposal that largely broaden the understanding of the life environment and the world experienced as an educational environment.

As he suggests, inspirations for practicing pedagogical ecology and ecological pedagogy came, e.g., from works by H. Radlińska, from the reading of *Młode pokolenie chłopów* [*The Young Generation of Peasants*] by J. Chałasiński, from experiments of L. Bandura's "Bydgoszcz school", from the conception of Chicago human ecology of R.E. Park, E.W. Burgess and R.D. McKenzie, from the principle of interparadigmatic tolerance, from Dewey's progressivism, works of School 203 in Warsaw under the supervision of Prof. B. Suchowolski and the ethos and methodology of scouting (the School in Mikołów under the supervision of Prof. A. Kamiński).

Kwieciński notes that H. Radlińska stressed the ecological perspective of her approach to research on the educational environment, seeing school as a potentially inspiring institution in its centre (2013). School could also arouse social forces of the environment, among which the author counted also spiritual forces, "invisible environments". As she wrote, education is largely a contribution to the inscrutable result of experiences and creative activity (Radlińska, 1961).

In his articles devoted to the reactivation of pedagogical ecology in Poland, Z. Kwieciński presents a rich choice of works that he locates within its scope, at the same time admitting that pedagogical ecology extends its scope onto new problems, trends or other disciplines. These are, among others, studies concerning the spaces and places of school; the development of local education systems; environments on the organic, mezo- and macro- level; the pathology of a selected urban area; the socialization and inculturation of small-town young people migrating to a big city; educational environments of our migrants among others, the possibilities and limitations of their growing into accepting cultures; identities of ethnic minorities,

stereotypes towards them, hostility and colonization. The part of works significant for pedagogical ecology is devoted to place-based pedagogy, children's research on the history of their own family on the tales of grandparents relocated to new areas; intra-family relations in the contexts of everyday mutual learning; the importance of the internal culture of school for aggression and violence in it, the educational understanding of popular media culture as the life environment of individuals and generations; educational research in actions relating to engaged anthropology, the community of young people outside science and outside work. On the other hand, being distinguished from pedagogical ecology, ecological pedagogy is developed in an original manner thanks to such ecological education programs that confront children with the civilization crisis through the use of artistic means of expression offered by theatre, pantomime and painting (Łukaszewicz, 1996; Łukaszewicz, 2012; Łukaszewicz, Leksicka, 2018).

The conception of holon introduced by Arthur Koestler (1967) and subsequently developed by Ken Wilber (2007) turned out to be an innovative solution in ecological approach. A holon is treated as a system (phenomenon) being a whole in itself and a part of a larger system – other holons; it is treated as the primary substance of reality. Holons are grouped into a network of systems nested inside one another; each “smaller” holon is situated “inside” a larger holon (Wilber, 2007). Each system can be a holon, starting from a molecule to the universe as a whole. Holons have a tendency to self-transcendence – going beyond themselves and entering a higher level – and to self-dissolution (disintegration, descending to a lower level). A holon can be any identifiable thing – e.g., word, sound, emotions. In simple terms, holons can be this “invisible life environment” and an educational environment. This is everything that can be found outside the traditionally perceived educational environment and refers, e.g., to human spirituality, however, without limiting it to the sphere of religious experiences, but connecting the human intellect with his/her corporal, cultural, social and natural environment. Therefore, various experienced emotions and feelings, aesthetic experiences, bonds, self-experiences, longings and fulfillments can be treated as the life environment of educational importance for the individual. Today, high educational importance is attributed to this “invisible environment”.

Another interesting environmental approach related to visual perception is the ecological theory of perception (known as the theory of affordance) that was introduced to psychology in 1979 (Gibson, 1986). Affordances were defined by Gibson as all opportunities for action present in the environment that remain related to individuals and depend on their capabilities, e.g., a car in which it is possible to turn the key and ride (however, it will not be an affordance if the person is invisible). The ecological theory of perception in Gibson's interpretation encompasses a system of functional relationships with the environment, perception and action (Bańka, 2002).

Altogether ten years later, Donald Norman contextualized the term ‘affordances’ on the basis of the theory of interaction between the human being and the computer (1999). Norman ascertained that these are conscious (i.e., perceived by the individual) opportunities for action and impact on objects of the environment related to their properties as well as individual perceptual abilities and skills of action

(e.g., a chair on which it is possible to sit down, or a handle designed in such a way that it can be grasped and pressed). Affordance was not associated with individual physical capabilities; it was referred to his/her plans, dreams, views, goals, values, beliefs, etc. The term ‘affordances’ began to be used in various scientific theories and disciplines, among others, in cognitive psychology, psychology of perception, environmental psychology, the design of interactions, research on artificial intelligence, architecture or industrial design. In Poland, the conception of affordances is used in Augustyn Bańka’s works in the field of environmental psychology.

In the field of pedagogy, an example of such affordance can be a public library quoted by Kwiecińska, which is a dead pile of books until it begins to be used consciously as a rich learning offer (2013). School can also be an institution where books are physically collected (e.g., in a library or pupils’ lockers), thus providing the individual with inspiration for change and development. Kwieciński aptly remarks that people’s living environments can be equipped in such a way that its objects become affordances (2013).

G. Bateson’s works as inspirations for pedagogical ecology and humanities

A new interpretation of Helena Radlińska’s thoughts by L. Witkowski, undertaken through the prism of George Bateson’s approach, becomes an important inspiration for pedagogical ecology. In his book *Niewidzialne środowisko* [*The Unseen Environment*], Witkowski explores H. Radlińska’s works in the context of ecological references as a paradigm for the humanities (2014). Thus, he refers to a range of environmental, ecological or cultural conceptions – among others, from the works of Gregory Bateson, Kurt Lewin, Urie Bronfenbrenner, Geoffrey Vickers, Michael Winkler or Lew S. Wygotski. Witkowski interprets Radlińska’s complete pedagogy through the prism of Gregory Bateson’s approach as a critical ecology of idea, mind and education. At the same time, he acknowledges the author’s achievement in social pedagogy as fundamental and universal, in contrast to the narrowly perceived viewpoint of social pedagogy. He also admits that Radlińska instinctively perceives many intellectual motifs that are only emerging around the world between the 1920s and the 1940s, such as cybernetic thinking, ecological interpretation, social reflections on culture and cultural reflections on social phenomena. Reconstructing Helena Radlińska’s social pedagogy, L. Witkowski applies methodological suggestions inscribed into the “Ecology of Mind” by Bateson.

Monika Jaworska-Witkowska recognizes that the extensive reception of Bateson’s idea in Poland, referred to the practice of “ecological humanities”, cannot be reduced to associations with natural environment protection (2016). Here I mean works where the ecological approach has become a way or culture of practicing human sciences along with the inclusion of the “ecological turn” (Domańska, 2013). Obviously, this does not apply to works in the field of humanities that refer to the human being’s life environment in consideration of the protection of natural life conditions of individuals and societies, but those with such understanding of ecology that also changes the approach to all humanities. This would be a question

of another position of the human being in relation to culture and nature and of the human mind towards the space of ideas and values.

Bateson thought that the theory of mind presented by him is holistic and, like all serious holisms, assumes the differentiation of parts and interaction between them. When formulating the fundamentals of the ecology of mind, the British anthropologist treated mental phenomena as cognitive processes in the broadest sense of the word that are characteristic of the entire world of living creatures (Skibiński, 2012). Thus, he proposes the “global understanding of cognitive processes as characteristics of ecosystems” instead of the “anthropocentric understanding of the mind”. Bateson wanted to develop the epistemology that would unite the areas of genetics, morphogenesis and learning – these three fields were clearly only one area for him. In Bateson’s interpretation, ecological humanities refer to his treatment of reason as a systemic phenomenon that is characteristic of living organisms, societies and ecological systems. Systems have to meet certain conditions for reason to emerge in them. Every system endowed with reason will process information and develop in itself such intellectual phenomena as memory, thinking and learning. Reason is the highest quality of living systems; it forms the essence of everything that lives. Therefore, in light of the systemic conception of reason, mentation characterizes individual organisms as well as social and ecological systems (Skibiński, 2016).

Bateson’s ideas, particularly the idea of double bind, allows us to develop a new epistemology explaining two turning points that occurred in humanities at the end of the 20th century. Witkowski draws attention to them, writing about one turning point opening up to the internal structural complexity of processes and phenomena, which brings at least bilateral and bipolar tensions that he defines as the level of duality (2016). He calls the second turning point in humanities “ecological” with regard to the strategy of human reflection showing mutual determinants and entanglements of influence in areas where separate disciplinary worlds used to be perceived. This leads towards ecology as a paradigm for the entire humanities from an epistemological perspective.

Conclusion

It must be said that ecological interpretations existing in pedagogy refer to two theoretical and practical approaches that do not have much in common. The trend related directly to the ‘human – natural environment’ relationship, created in response to ecological crisis and undertaken in practice in the form of ecological education, concerns ecological pedagogy as a discipline developing since the 1980s. In this case the starting point was an observation of the intensifying anthropopressure on the natural environment and its consequences in the form of: biodiversity loss, climate change, water contamination, desertification of soil, deforestation, depletion of natural resources and many other environmental problems on which the increase in world’s population, and – to a greater extent – the consumer lifestyle of people, is leaving its imprint. Indicated problems, being a kind of environmental challenges of the 21st century, make ecological issues extremely important in the context of education.

The second interpretation originating from socio-ecological tradition – called “Chicago school” – refers to the conception of human ecology. The ecological approach in social sciences refers to the analysis of educational relations in the broadly understood life environment of individuals, incorporating the “world experienced” by the individual into them: emotions and feelings, aesthetic experiences, bonds, self-experiences, longings and fulfillments. The great attention currently paid in pedagogy to ecological approach in research finds its reflection in the works of Z. Kwieciński (2013), L. Witkowski (2014, 2016), M. Jaworska-Witkowska (2016) inspired by H. Radlińska, G. Batesone (1996), the holon concept of A. Koestler (1967) and K. Wilber (2007); affordances of J. Gibson (1986) and D. Norman (1999). This approach, used to practice the ecological humanities, cannot be reduced to the associations with the protection of natural environment.

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Abstract

The article shows in how many different contexts the term 'ecology' originating from biology is used. This was done on the basis of the characteristics of ecological pedagogy and ecological approaches in social and humanistic research. The understanding of the term 'environment' in social pedagogy, including the natural environment, is shown. The formation of ecological pedagogy as a subdiscipline within the scope of social pedagogy has also been presented. When discussing the ecological approach in social research (also in pedagogy), the author referred to the conception of holon and the theory of affordances that could be used in education through the world of feelings, desires, longings and emotions creating the life environment of the individual. To conclude, it was stated that inspirations from the field of ecological humanities – found also in G. Bateson's works – are not limited to the protection of the natural environment of human life. This means that ecological pedagogy examining the preparation of the human being for participation in social life through the formation of behaviors and values referring positively to the natural environment is not identical to the ecological approach in pedagogical research.

Keywords: ecological pedagogy, social pedagogy, ecological approach in research, ecological education, environmental education, Gregory Bateson

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Do qualitative researchers know what they see and the respondents know what they say? On the quality of qualitative data

Introduction

Analyzing social phenomena, qualitative researchers – also educators – collect empirical material using specific methods and strategies. The most popular are non-standardized participant observation (Lichtman, 2013; Lofland et al., 2005) and in-depth qualitative interviews (Kvale, 1996; Rubin, Rubin, 2012). These methods are characterized by a high flexibility of research procedures (Hammersley, Atkinson, 2007).

Paying attention to contextual factors, e.g. unexpected presence of third parties, clearly affecting the behavior of the observed persons/respondents, the researcher may spontaneously modify the procedures of obtaining information, e.g. by abandoning selected categories of behavior or conversation topics for others – adequate from the point of view of the emotional state and needs of subjects. In other words, advocates of qualitative orientation in social sciences, in contrast to quantitative researchers, adapt their behavior to the ongoing action/events like on the film set (Lofland et al., 2005; Silverman, 2009).

The freedom of action partly results from the postulate of playing the role of a “naive co-participant in the analyzed events”. Undertaking the tasks characteristic for the members of the investigated community, the qualitative researcher observes and talks with the interaction partners without making any preliminary assumptions about the character of the analyzed phenomena (Anderson-Levitt, 2006).

Using non-standardized research methods and strategies makes it possible to realize objectives specific for the qualitative orientation, i.e. to discover meanings/senses given by people to personal experiences, and then to present them in cognitive and linguistic categories characteristic for observation/interview participants. Clifford Geertz (1973), an eminent cultural anthropologist, emphasizes: “believing, with Max Weber, that man is an animal suspended in webs of significance he himself has spun, I take culture to be those webs, and the analysis of it to be therefore not an experimental science in search of law but an interpretive one in search of meaning” (ibid: 5).

Indeed, in contrast to idiographic studies, in quantitative (nomothetic) ones, the accent is placed on discovering objective – i.e. investigator-independent

– regularities. Experimental research is organized according to strictly defined scenarios, the course of which is determined by the tested causal relations (Coleman, 2018). The basic rule of experimental research is that “their author is not important, but how the research is conducted”. The strictly described course of the study allows to repeat it, and the results of the replications can be summarized in a meta-analysis (quantitative synthesis of the results of research on similar topics and with a similar methodology, based on which the average effect size of specific factors for selected outcome variables is quantified) (Glass, 2006; Schoenfeld, 2006).

The problem of data reliability and validity in quantitative vs. qualitative research

The control of measurement error and attempts to minimize it cause that in quantitative studies the reliability of results, and consequently – the credibility of the proposed conclusions is high. On the other hand, as the precision of measurement increases, the ecological validity of the results decreases. It means that the subjects’ behaviors in experiments, meticulously recorded in artificial laboratory conditions, may not be repeated in everyday life situations (Nestor, Schutt, 2012). For example, pressing selected computer keyboard buttons in the Implicit Association Test as fast as possible, despite flawless control of response times, often is not related with actual decisions made by the subjects to help others or, on the contrary, their negative treatment (Hofmann et al., 2005).

The problem of reliability and validity of measurement in quantitative research is well recognized and discussed in the professional literature (Coleman, 2018; Weathington et al., 2010). On the contrary, in qualitative research, intentional elimination of standardization of research procedures and mathematizing the variables, and consequently – non-quantitative, often unique nature of the collected empirical material, causes that the discussed problem is still a source of numerous polemics and controversies (Kirk, Miller, 1986; Baumgarten, 2010).

Avoiding, for the reasons given above, statistical interpretation, the reliability of qualitative analyses, can be defined as the precision of the prepared descriptions, and the validity as the accuracy of the interpretations/conclusions proposed by the researcher (Flick, 2008). Together, the validity and reliability of analyses determine the quality of qualitative research.

In this light, the descriptions of high school students’ behaviors, which show that Bob was the only teenager drinking alcohol, should be regarded as unreliable (imprecise), even though all the boys observed during the school event drank beer. Similarly, transcriptions of interviews in which selected phrases were omitted, e.g. statements of respondents indicating their negative attitude towards ethnic or sexual minorities, may be regarded as unreliable. On the other hand, the interpretations that drinking alcohol at school events is a marginal phenomenon, concerning only students from working-class families represented by Bob, should be regarded as inaccurate (unjustified). The analysis shows that interviewers are mostly people who are tolerant and open to differences may be considered similarly incorrect. Indeed, qualitative research carried out in this way would be of dubious quality.

Taking into account the given definitions of reliability and validity of the qualitative analyses, it is worth to point out and discuss the significant limitations of empirical material collected using basic methods/strategies of idiographic research, i.e. non-standardized participant observation and free-form interview. To a great extent, they result from cognitive and personality limitations typical for people, which makes them universal. It is worthwhile for researchers to be aware of their potential impact while they discuss the obtained results.

Do qualitative researchers know what they see? The change blindness phenomenon

The abovementioned limitations can be illustrated by the results of intriguing experiments by Daniel Simons and his colleagues on change blindness phenomenon (Chabris, Simons, 2011). Demonstrating its massive impact, the authors have published research materials on the web.

In the first movie (<https://youtu.be/vJG698U2Mvo>), a group of students, dressed in white or black T-shirts, pass the ball to each other. The task of a person watching the video (an unbiased observer) is to determine the number of passes made by students dressed in white T-shirts. During the recording, a person wearing a gorilla suit passes through the middle of the corridor. The "Gorilla" stops among the players and ostentatiously hits the chest with his fists. About 50% of observers do not notice the gorilla, focusing on counting passes made by people dressed in white T-shirts.

In the second video (<https://youtu.be/1nL5ulsWMYc>), the observer's task is to determine which element of the scene presented in the movie changes. Most people are not able to point out even the slightest change when they watch the video the first time. In fact, the change occurs – in the lower left corner of the screen, slowly, second by second, a stone emerges from the background. During the second presentation, most observers easily identify the place where the change occurs – perhaps because the stone flickers in the replay.

Indeed, it is extremely difficult for people to register gradual, not rapid changes. A good example is the long-term weight loss process, e.g. 10 kg per 1 year. People who have managed to lose unnecessary weight may not notice these changes. However, the same change will be noticed immediately, if the observer has not had contact with the person for a year, and judged as a clear, but not gradual one.

In the third video (<https://youtu.be/ubNF9QNEQLA>), the observer's task is to record the changes in the movie set that happen during the film. Noting the behavior of actors – individuals suspected of the murder of Lord Smithe and an officer conducting the investigation, observers usually notice to five changes. In fact, there are 21 modifications – virtually all the elements of the frame are changed, even Lord Smithe's corpse.

The consequences of limitations of non-standardized observation

Omitting relevant data

Considering the results of Simons and his colleagues' experiments, it is worth asking whether a non-standardized observation (free, without a plan, in other words – preliminary assumptions about its course and recorded content) is possible? Undoubtedly yes, but one should remember about the consequences, i.e. omitting the mass of relevant data for the analyzed problems and, as a result, reducing the reliability and validity of qualitative analyses and proposed conclusions.

The observer can easily answer the question whether in the first video, a man dressed as a gorilla walks in the middle of the corridor while students are passing the balls?, or whether in the fourth video, the officer is dressed in a light or rather dark coat?, if he/she knows what details of the movies should be recorded. In other words, it is possible if he/she has some assumptions about the object/content of the observation.

Analogously, in the case of the second video, the purposeless observation does not allow recording of gradual changes typical for processes analyzed in social sciences, e.g. developmental ones. This implies that only planned observation – with a set goal and course – allows focusing on these elements of the dynamic reality that indicate a change within the tested process (Chabris, Simons, 2011).

Generating pseudo-data

Moreover, the lack of an observation plan, arising from the goals or research problems, may encourage observers to construct non-existent facts (pseudo-data). The source of such pseudo-data is cognitive schemas, e.g. researcher's social stereotypes, scripts and feature schemas (Darley, Fazio, 1980; Neuberg, 1994).

Research shows that after inducing a cognitive schema, e.g. an aggressive Negro, a cunning Jew, a wise four-eyes, etc., the observers are sensitive to information consistent with the previously aroused stereotype (Fiske, Taylor, 2009). Moreover, it happens that in fact, the neutral behavior of individuals is recorded, remembered, and then interpreted according to their cognitive schema (Fiske, Taylor, 2009).

Non-standardized interview – limitations and consequences of using the method

Using a non-directive interview (Kvale, 1996), the researcher establishes topics regularly, i.e. during the conversation, he/she, with great freedom, asks the respondents detailed questions. However, analyzed topics should arise from previously defined objectives or research problems. It is impossible to conduct reasonable conversations with the partners without even a preliminary outline of the main topic of the interview. Therefore, despite the enormous freedom in choosing topics and asking more or less detailed questions to respondents, one can claim about the so-called hidden structure of the interview or the interview plan hidden in the researcher's head.

Some authors argue that "a free-form interview also has a structure, but it is defined at an abstract (theoretical and/or methodological), not a specific level (i.e. questions and answers applied in the interview). Therefore, describing it

as ‘unstructured’, although applied in literature, is misleading” (Stemplewska-Żakowicz, 2009: 55). Therefore, if the researcher “does not have an interview plan and conducts a conversation ‘following the subject’ without any goal or idea, and if his/her questions arise from what just came to his mind, and after the conversation he/she does not know what to do with the obtained data and bases conclusions on what made a special impression on him/her during the interview or what he/she remembers from it – this is a truly unstructured interview. It can be a very pleasant experience for both sides (...) one can enjoy such a conversation in various ways and probably derive various benefits from it, except for one thing – research benefit” (ibid: 55).

This implies that an interview without structure and plan (i.e. assumptions) is malpractice. The extreme freedom of research procedures can transform an interview into a noncommittal conversation between a researcher and respondents about “everything and nothing”. In extreme cases, the conversation may resemble a game of free associations led by the subject – a social exchange of opinions between alleged friends over coffee or cake, not a conversation of a well-qualified researcher with selected respondents, under a defined goal or research problems.

Furthermore, when a researcher intentionally resigns from managing of the interview, the direction of conversation may be defined by respondents, according to their own needs or goals of self-presentation (“see the researcher, how smart, happy, miserable, etc. I am”) or other, more or less clear for the subjects – and even more unclear for the researcher – motives (Cialdini, 2009). In conclusion, the assumed lack of control over the course of the conversation may transform the interview into a caricature of the scientific research method.

Regardless of the type of conducted research – quantitative or qualitative – the researcher should respect the universal GIGO rule (garbage in, garbage out, cf. Dunbar, 1996). Using low-quality data, e.g. collected during conversations without any structure (garbage in), the researcher, willy-nilly, has to formulate worthless conclusions about the analyzed phenomena (garbage out). Briefly, the plan of conversation hidden in the researcher’s head is also recommended for qualitative interviews.

Questionable quality of interview data. Do the subjects know what they are saying?

The basic source of data collected in interviews is the respondents’ declarations (Oppenheim, 2000). Interlocutors can answer questions honestly or intentionally/unintentionally depart from the truth. This means that the reliability and validity of data gathered during the interview may be lower than the information collected under observation (Figure 1).

As the number of paths (mediators) increases, information can turn into gossip, losing credibility. A researcher using an interview does not reach the facts (observable data), but rather their subjective interpretations, given by more or less reliable informants.

Figure 1. Assessment of the reliability of empirical data collected under observation and survey studies

1. The data collected under observation (zero number of mediators)
BEHAVIOR/EVENT (B/E) ← observation : the researcher notices B/E.
E.g. Mary hits Joseph in the head ← observation : the researcher notices that Mary hits Joseph in the head
2. The data collected under interview (1., 2., n mediators)
BEHAVIOR/EVENT (B/E) ← observation : someone (informant) notices B/E ← interview : the researcher hears from the informant that B/E occurred
E.g. Mary hits Joseph in the head ← observation : someone (informant) notices that Mary hits Joseph in the head ← interview : the researcher learns from the informant that “Mary hits Joseph” (reliable informant)
...and even...
BEHAVIOR/EVENT (B/E) ← observation : someone (informant 1.) notices B/E ← story: informant # 1. tells someone (informant # 2., 3., n.) about B/E ← interview : the researcher learns from informant # 2., 3. that B/E occurred
E.g. Mary hits Joseph in the head ← observation : someone (informant # 1.) notices that Mary hits him in the head ← story: informant # 1. tells someone (informant # 2., 3., n.) that “Mary hits Joseph in the head” (reliable informant) ← interview : researcher learns from informant # 2, 3, n., that “someone said that Mary beats Joseph” or “Joseph beats Mary” (informant # 2, 3, n. unbelievable)

It should be explicitly stated that declarations about behavior are not the same as the presented behavior. For example, spectacularly obese people may declare their care for body weight, while pushing another hamburger into their mouths. Similarly, members of neo-Nazi organizations can declare a positive attitude towards racial or sexual minorities, etc., at the same time burning a rainbow at Savior Square in Warsaw and screaming slogans promoting violence against “freaks”.

It turns out that people often say something different about their beliefs and preferences, and then, just after the survey (e.g. an interview), they do something different (Baumaister, 2010).

The indicated inconsistency can be illustrated by the results of the experiment conducted by this paper’s author, where the relationship between the declared readiness to provide selfless help and the provided help was assessed. In the first part of the study the participants (students of the first year of health education) were informed that for taking part in a simple physical exercise, the so-called “chair”, they could earn a certain amount of money, i.e. PLN 2 for every 10 seconds of participation in the task. The experimenter measured the time and then informed

the researched person about the prize. The earned money could be assigned to the participants at their discretion: (1) to oneself, (2) to a close relative or (3) to a public benefit organization.

In the second stage, i.e. one week after the control of altruistic behavior (sharing the earned money), the same participants were asked to complete a questionnaire on their attitudes towards helping others. Examples of items of the tool were as follows: "If I have the opportunity, I try to help others", "Financial support for charity institutions is commendable". The statements were assessed on a scale from 1 (strongly disagree) to 6 (strongly agree).

The subjects earned PLN 19.85 on average, while they attributed PLN 19.15 to themselves, gave PLN 0.69 to their relatives and zero PLN to organizations. On the other hand, the same participants declared a high level of readiness to help others (average rating of the claim: "If I have the opportunity, I try to help others", was 5.31) and they stressed that supporting charity institutions is a noble activity (the average score for the statement "Financial support for charity institutions is commendable", was 5.38), transferring a few days earlier as much as PLN zero for their functioning.

An insightful Reader may provide an alternative interpretation of the obtained results. People may agree with the statement that supporting charities is commendable and at the same time not to do so, e.g. due to lack of sufficient funds. In this light, the result under discussion would indicate that there is a clear discrepancy between the assessment of the respondents' self and the assessment of their obligations towards others. The crucial point is that the participants had at their disposal – modest but nevertheless – financial resources that could be transferred to a selected public benefit organization. However, any amount was PLN zero. This means that if we want to collect reliable data on people's behaviors, we should not ask about them, but rather observe subjects in various types of situations over a longer time (Jussim, 2012).

The only reasonable exception is when the interesting behavior for the researcher is declarations, i.e. respondents' reactions to the asked questions. However, they should not be confused or identified with behaviors treated as real manifestations of the analyzed attitudes/beliefs of the respondents. Why? It is worth remembering – strong acceptance of the statement (and thus improvement of self-esteem) – "If I have the opportunity, I try to help others", cost the experiment's participants about PLN 0.69. The aim of scientific research, however, is not to therapize respondents at an affordable price, but to make sensible conclusions about the analyzed phenomena based on reliable empirical data.

Selected personal factors of the low quality of qualitative data collected in the interview

There is a group of factors that negatively affect the reliability of qualitative data collected under the interview. The most important factors include: (1) intentional lies, (2) gaps in memory and false memories, (3) interpretational bias resulting from beliefs, (4) low motivation, fatigue and, more broadly, bad psychophysical condition

of respondents and (5) the way of conducting a conversation, especially the use of tendentious questions.

Intentional lies

Respondents may cheat, especially when they are asked about uncomfortable, e.g. sensitive, embarrassing, intimate, etc. matters. Briefly, some topics are a social acceptance factor tinged. Questions: "Do you betray your husband?", "Do you share with others the secrets entrusted to you by your friends?" etc. may cause fear of judgment and/or a tendency for positive self-presentation. Therefore, respondents may be afraid of negative opinions from others, but they may miss the truth or intentionally conceal it.

To access the sensitive data, the researcher should not ask about them directly, but rather talk about them in a camouflaged way, e.g. using the so-called projective or hypothetical questions (Ustjan, 2009a, 2009b). For example, instead of asking: "Do you abuse alcohol?", the following introduction can be used during the conversation: "Sometimes people drink alcohol, e.g. in company at parties, and then start to behave characteristically, e.g. their tongue gets tangled, their movements slow down, they speak louder than usual. When was the last time you experienced this state? How often have you experienced this state in the last week/month/year?".

Gaps in memory and false memories

Besides intentional cheating, respondents, describing events from their own lives, may unconsciously miss out on the truth. Autobiographical memory, i.e. the part of memory specifically relates to facts, events, and experiences from the life of people, e.g. poisoning with mayonnaise during the wedding of a beloved aunt, balloon flight with parents, etc. (Bluck, 2003) – is a creative and selective process. Some information is removed, e.g. as a result of childhood or dissociative amnesia, others are added, although they are not related to the experience of individuals. This means that some of the data stored in the autobiographical memory should be considered as confabulations, i.e. false memories of events in the life of the examined person.

It turns out that approx. 20–30% of respondents are susceptible to developing realistic confabulations, although not related to life experiences. For example, do you remember when you fell and hurt your knee painfully in your childhood? Yes? But are you sure that it happened to you, not to your siblings or a close mate? People have great difficulty in recognizing which autobiographical events occurred in their lives and which of them were creatively developed for the needs of the life story (narration) presented in a given moment.

In a spectacular experiment of Loftus and Pickrell (1995), the participants were presented with 4 realistic stories from their early childhood (4–6 years of age). Three of them were true, one was false. The false story concerned the alleged loss in a hypermarket, crying of a child, searching for parents and happy-end, i.e. finding the child. Respondents were asked to reproduce all stories and visualize them as

accurately as possible in their memories if the participant had problems with remembering the events.

After 2 weeks, the experimenter returned to the subjects and again asked them to recall four events and describe them. About 30% of the participants remembered a false memory. Briefly, simple manipulation allowed for the implantation of foreign (!) memories, so-called “memory implants”. One of the participants described the “implant” as follows: “I mean this is very vague, remember the lady helping me and Tim and my mom doing something else, but I don’t remember crying (...). I remember being with the lady. I remember going shopping” (ibid: 723)..

In another, equally intriguing experiment (Wade et al., 2002), participants were presented with 4 photographs from their childhood, and then asked to recall the events that were documented, and describe them as well as possible. One of the photos was prepared and related to a balloon flight, an event that never took place in the lives of the subjects. Then, at weekly intervals, three in-depth interviews were conducted with the participants on the events shown in the photo.

In the last interview, as a result of active recalling of a fictitious event, 50% (!) of the participants declared that they remembered the balloon flight. One of the participants described the experience as follows: “I’m still pretty certain it occurred when I was in form one (6th grade) at um the local school there (...) Um basically for \$10 or something you could go up in a hot air balloon and go up about 20 odd meters ...it would have been a Saturday and I think we went with, yeah, parents and, no it wasn’t, not my grandmother ...not certain who any of the other people are there. Um, and I’m pretty certain that mum is down on the ground taking a photo” (ibid: 600).

During properly conducted interviews, respondents can recall everything – even very painful, but fictional experiences. The results of research on recovered-memory movement (Travis, Aronson, 2014), dynamically developed in the 1980s, provide interesting examples. Using cognitive interviews¹, analytical therapists helped clients to reconstruct traumatic events allegedly repressed from memory – especially incestuous rapes experienced in childhood.

Loftus (1997) describes the story of Beth Rutherford, a woman who, as a result of the active reconstruction of memories (in fact: implanting false memories), remembered that her father, a pastor, together with her mother, raped her regularly for 7 years (from 7 to 14 years of age). During the therapy, Beth developed a memory of her father getting her pregnant twice and having a hanger abortion (sic!). The court found the parents guilty and sent them to prison for many years. Also, the “victim” received \$1 million in compensation for her moral damages.

Most vulnerable to generating false memories are suggestible people with vivid, plastic imagination. Therefore, children very often can confabulate, confusing memories of real events with fiction. Moreover, it is easiest to implant memories

1 i.e. an interview in which the researcher directs the respondent’s attention to small details of the event and its context. Moreover, the interviewer encourages the respondent to describe the events from different points of view, to reproduce them in the mind many times. In this way, the “untruth” repeated many times is transformed in autobiographical memory into “misty truth”, “truth almost clear and at hand” and finally – “subjectively true truth”.

that come from close, important and similar people, such as relatives, and memories concerning family and peer relationships (which is particularly evident in twins whose biographies can strongly intertwine and complement each other. In such conditions, after some time, it is difficult for twins to identify which of the events belong to them in contrast to sibling experiences). Memory implants must also be probable. It seems completely impossible to tell a person with both legs that he/she lost the right one in the mouth of a shark in his/her childhood.

Interpretative bias arising from beliefs

Beliefs about the physical and social world, e.g. the attributes of representatives of various social, racial, age, etc. groups, can be a source of prejudice or inadequate – too high or too low – expectations (Jussim, 2012; Trusz, Bąbel, 2016).

Therefore, judgments about the same object (events, human behavior) made by two independent observers with distinct opinions may differ radically. For example, beating black people on their faces in some circles is seen as a sign of heroism in the fight for a better homeland, while in others it is seen as human baseness and barbarity (Nelson, 2009; Whitley, Kite, 2010).

Low motivation/bad psychophysical condition of the subjects

Respondents may not need to answer interview questions reliably. Low motivation is particularly possible when the respondents' attitude towards the researcher or interview issues is negative, e.g. when the respondents are forced to participate in the survey or when the structure of the asked questions is wrong.

Constructional errors may concern e.g. double or even multiple negations in the content of statements addressed to the respondents ("I never thought it would not happen"), too long statements ("My teachers often repeated during classes that the division of household duties into typically masculine, e.g. car repair or work in a mine, and typically feminine, e.g. preparing meals or feeding children, is natural and should be accepted, even if egalitarian values dominate in society"). Such statements (especially when there are many) may discourage or irritate respondents. This increases the chance of obtaining perfunctory, avoiding, etc. answers.

Moreover, the source of low-quality empirical material may be a bad psychophysical condition of the respondents. Too long or complicated interviewing points may discourage informed, consistent and in-depth speaking on specific topics. Therefore, interviews should be conducted with respondents who are refreshed and interested in the issues discussed in the survey.

Interview conduction – biased questions

The source of low-quality subjects' responses could be inadequately asked questions. Example #1: The question: "Do you still abuse alcohol?", cannot be answered: "I have not had any problems with alcohol so far". The negative response indicates that the respondent has been abusing alcohol in the past, whereas the positive one

suggests that he or she is still systematically drinking. This is due to biased questions (alternative and suggestive), which the researcher should avoid during the interview.

Example #2: In the Loftus and Palmer (1974) experiment, the participants were shown a film concerning a car accident, and then some people were asked: "About how fast were the cars going when they smashed into each other?" The others were asked: "How fast were the cars going when the collision occurred?" (or bump, hit and contact, depending on the condition). Minor manipulation of the question content had a significant impact on the estimation of the cars speed – smashed cars, according to the participants, were driven at an average speed of 40.5 km/h. The average ratings of people in the "collision", "bump", "hit" and "contact" condition were lower: 39.3; 38.1; 34.0 and 31.8 km/h, respectively.

People think the way of using language, i.e. which words were used in the interview, often affects the verbal subjects' responses. It is worth noting that in the Loftus and Palmer (1974) experiment, the participants did not lie – they answered according to the beliefs concerning the speed of the observed cars. Differences in assessments were imposed by arousing different cognitive patterns related to the term "smash" vs. "collide", "contact", etc.

In summary, each of the discussed factors, i.e.: (1) intentional lies, (2) false memories and confabulations, (3) interpretational bias resulting from beliefs, (4) low motivation and bad psychophysical condition of respondents, and (5) inappropriate way of conducting a conversation, negatively affects the quality of empirical material collected during the interview, undermining the reliability (precision) and validity (sense) of the proposed interpretations, and consequently – the conclusions formulated by the researcher.

How to maintain high quality of qualitative data – practical proposals

For high quality of the qualitative data collected under observation and interview methods/strategies, the following procedures or rules should be recommended to researchers: (1) ensuring research internal validity, (2) triangulation of data sources, methods and investigators, and (3) supportive skepticism.

Research internal validity

Ensuring the internal validity of qualitative research is connected with the rule of the dominance of the subject over the research method. According to this rule, the way of collecting and processing empirical data should be adjusted to the content of analyzed phenomena.

Therefore, in the case of external (observable) verbal and non-verbal behaviors, e.g. kisses and the pace of speaking – considered as the symptoms of falling in love and nervousness, respectively – the more optimal method of data collection is observation rather than interview. Therefore, in the case of external (observable) verbal and non-verbal behaviors, e.g. kisses and the pace of speaking – considered as the symptoms of falling in love and nervousness, respectively – the more optimal method of data collection is observation rather than interview. In contrast, if

the subject of the research is difficult to identify, exceeding the possibility of direct observation, phenomena, e.g. thoughts, personality, etc., or about it, e.g. low self-esteem, could be deduced from the statements of the investigated subjects, such as: "I am nobody... I am useless...", etc., the interview seems to be a more suitable method of data collection than observation (Oppenheim, 2000).

Another important criterion for the selection of the method is the purpose of the research. Analysis of cause-effect relations (explaining and predicting phenomena) is possible if the researcher uses the experimental procedure. For example, assessing the extent to which a self-efficacy affect the self-esteem of people, the researcher may manipulate the level of perceived control throughout events, and then check whether the loss or not of control significantly affects the level of self-esteem of the subjects.

On the other hand, the assessment of the co-occurrence of the phenomena (correlations between variables), with no indication of the direction of dependence, is possible when the investigator uses the method of experiment, survey, and observation. For example, analyzing the relationship between openness to experience and time spent reading travel books, a researcher may assess both variables, using e.g. personality and time spent reading books questionnaires, or measuring time spent by individuals on their favorite activities. In the first case, the researcher would use the survey, and in the second case – the observation method.

Finally, a thick description of the phenomena, specific to qualitative research, is possible when the researcher has data collected under non-standardised participant observation or free-form interview, but not under standardized observation/interview or experiment. For example, analyzing the motives of using drugs by students, the researcher may ask about them, e.g. during an interview, or observe in what circumstances, and with what emotions the subject uses a cigarette, alcohol or other drugs.

In summary, the selection of an appropriate research method is crucial for assessing the reliability of the collected empirical data. Inappropriate methods (not adjusted to the research subject), in comparison to adequate ones, are a source of information of lower quality. A hit on the jaw of a black person is a more accurate and reliable manifestation of racism than a declaration of love and friendship expressed by the skinhead against racial differences. Briefly speaking, the data collected based on direct observation, in comparison to information from self-descriptions, are usually more reliable (i.e.: observation > survey).

However, on the other hand, people may behave in a non-authentic way, e.g. knowing that they are being observed, but speaking honestly and clearly on various topics during the interview (i.e.: interview > observation). Of course, the surveyed person may "seem" to be truthful, although he/she can skillfully manipulate information, e.g. presenting himself or herself in the best light or forgetting about certain events (i.e.: observation > survey).

Triangulation

The reliability and validity of qualitative data and analyses based on them can be assessed using the triangulation procedure (comparison, compilation), and within its framework:

(1) triangulation of data sources. Analyzing a specific phenomenon, e.g. domestic violence, the researcher may analyze the behavior of spouses by asking only their wives, only their husbands, wives, and husbands, or wives, husbands, children, and neighbors. Conclusions drawn from various sources (e.g. wife, husband, children, and neighbors) are usually more reliable than conclusions based solely on information from a single (perhaps biased/prejudiced) source. The similarity of information from different sources (e.g. wife and child) confirms their reliability. Descriptions based on reliable data, their interpretation and, consequently, the proposed theory, are characterized by higher reliability (precision) and validity (reasonable) than those based on unreliable data.

(2) triangulation of methods. The researcher may describe or interpret phenomena using data from the interview only, observation only or both methods at once. For example, analyzing the circumstances in which people most often and willingly lie, one can ask them about it or observe in various situations, asking from time to time questions about selected details. Reliable conclusions about the investigated phenomenon can be formulated using data collected via more than one method (it is more difficult for people to communicate untruth through several independent channels, e.g. words and body language, c.f. Babad et al., 1989).

(3) triangulation of the researchers. Qualitative data can be collected and then processed independently by several researchers. It is worth noting that as the level of compliance of paraphrases, categorization, and coding of a text material of several independent researchers increases, the reliability and validity of proposed descriptions and interpretations increases.

Skepticism

People are susceptible to various types of bias and cognitive limitations. For example, interviewers can create false memories. On the other hand, observers, due to e.g. change blindness phenomenon, may tend to register, remember and then recall some information, omitting other important issues.

Moreover, the researcher in specific for his/her way could interpret statements and behaviors of the subjects, consciously or unconsciously using cognitive schemes, e.g. stereotype of a smart vs. dumb pupil, hard-working vs. lazy employee, responsible vs. aggressive "euro-orphan", etc. Therefore, when analyzing the collected material and then formulating conclusions about the examined phenomena, the researcher should maintain a supportive distance towards himself/herself and his/her own analytical and interpretation skills and data from various sources, remembering about cognitive limitations, personalities, etc., which are characteristic for people.

Conclusions

The author hopes that the presented issues, i.e. limitations of non-standardized research methods in social sciences, as well as strategies for improving the quality of qualitative data, will help readers in planning and conducting their research. Undoubtedly, qualitative research, conducted reflectively, is an equal toward quantitative approach. The combination of the two methodological approaches makes it possible to present the social world in a more complete and therefore more real way than when research is monopolized by only one approach - quantitative or qualitative (Trusz, 2017).

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Do qualitative researchers know what they see and the respondents know what they say? On the quality of qualitative data

Abstract

Empirical data collected under qualitative methods and strategies may be more or less reliable and valid. In the article were discussed cognitive and social factors affecting the credibility of information obtained using non-standardized observation and interview. The abovementioned issue was illustrated by the results of the studies on the change blindness and false memories phenomena. Finally, the procedures for improving the quality of qualitative data and, consequently, the reasonableness of conclusions regarding the analyzed social phenomena were discussed.

Keywords: reliability, validity of qualitative data, non-standardized observation and interview

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Eye fixation and computer mouse cursor movement

The most important source of information for most people is the image in the broad sense of the word received by sight. It will be both a picture in the generally accepted sense, as well as written text. It is estimated that the eyes receive over 80% of all stimuli coming from the environment (Biecek, 2014; Zajac, 2003). The percentage share of individual senses in receiving information is presented in Fig. 1. These are only approximate data because they actually depend on the characteristics of the individual.

Studies show that in the image being viewed not all elements are equally important. This also applies to written texts, including question sheets, proofreading texts and problem solving. The classic methods used so far, e.g. using the question sheet, did not show the weakest link in solving a given task, nor did they simply show that the difficulties occurring at individual stages of solving a task are different and specific for a given student. Attempts to demonstrate these difficulties required specific research and specially prepared measurement methods (Paško, 2005).

Interest in visual attention has been noted for over a hundred years. The research was based on eye observation or introspection. To this end, a system of mirrors was used to observe while reading, magnifying glasses or even a telescope (Erdmann, Dodge, 1898; Newhall, 1928; Ogle et al., 1949). The extreme way was to

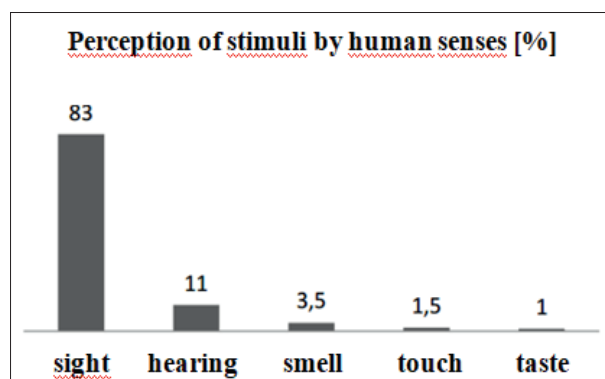


Fig. 1. Perception of the environment by individual human senses. Source: own study based on Biecek, 2014.

attach reflective elements to the eyes and record the reflection of light on the photosensitive tape (Wade, Tatler, 2005). At that time, research focused on eye movements as such, not on fixations (fixation is a relatively stable focus on the element of the image being viewed – the so-called visual scene). Measurement techniques evolved towards recording all types of eye movement. This article presents eye studies, in which modern eyetracker was used.

Until recently, eyetracking was treated as a curiosity or technical novelty, today it is becoming the subject of research in many fields of science. Technical solutions becoming cheaper and, as a result, greater availability and the latest achievements in the field of eye track tracking technology, many more centers around the world are involved in eyetracking research.

Eyetracking, which is a group of research techniques, allows you to reach a wide spectrum of various aspects related to cognitive processes and human behavior. It is possible to register, measure and analyze data on the position and eye movements. Because it provides quantitative measurement data, there is no need to refer to the subjective and verbal comments of the subject, as has been the case so far. Eyetracking uses objective psychophysical and neuropsychic processes that take place during the activation, processing of visual information and during oculo-motor reactions to received stimuli (Szymusiak, 2012). Therefore, eye examination is one of those techniques that has become very popular in recent years.

For eyepiece measurements, two types of eyetrackers are used: mobile (headphone, also called eyeglass) and stationary (in the form of a device integrated with a computer monitor, free-standing, whose position is manipulated by the researcher, or a system that is fully non-portable and also allows the stabilization of a person in relation to the measuring system). Mobile eyetrackers are characterized by the fact that they enable testing in the natural environment of the object, for example, in rooms with control devices (aircraft cockpit, navigation platform) or in shops, on roads, in public facilities. On the other hand, stationary eyetrackers are recommended for testing in laboratories or laboratories, when it is sufficient to register eye movements while watching materials (visual scenes) presented on a computer monitor.



Fig. 2. Pupil with light reflection on the cornea

Source: Sikora, Stolińska, 2016.

During the research procedure described in this work, a remote eyetracker was used, therefore the mechanism of his work will be briefly presented. It works without contact and allows you to study the images that are presented on the computer screen. The examined person sits in front of the computer monitor and the eyetracker camera installed, in which the infrared heater is built in. Infrared rays are reflected from the eyes of the subject, creating reflections (in physics they are called Purkinje reflections), which are reflections clearly visible in the pupils, with the help of which they can identify the spot the examined person is looking at (Schall, Bergstrom, 2014).

When eye movement is recorded by the camera, the software used in the study identifies the pupil along with the reflection of light on the cornea. This is the basis for calculating the distance vector between them and in this way you can determine the focus of sight (Poole, Ball, 2005). In order for this point to be calculated correctly, the device must be properly calibrated, which consists in displaying dots on the screen. The examined person is responsible for following these dots with their eyes, which is later analyzed in terms of the effectiveness with which the eyetracker has been calibrated. Glasses or contact lenses may cause difficulties in proper calibration because they interfere with the proper course of the infrared light beam. Therefore, it is recommended that people included in the eyetracking examination do not wear glasses and do not have eye diseases (Kaczmarek, 2012). After proper calibration, you can proceed to the appropriate tests. During the tests, the main values measured by eyetracker are saccades (saccades are abrupt changes in the position of the eyes, caused intentionally or reflexively, during which visual sensitivity decreases) and fixations, which can be presented in the form of numerical data or visualization (thanks to the processing carried out by special software). Three parameters can be used to describe fixations: time (overall or average), number and frequency. A single fixation is usually from 0.15 to 1.5 seconds (Wątróbski, Witkowska, 2015), however, it is assumed that on average three fixations take place per second, while the total fixation time is about 90% total viewing time. It is assumed that during saccade movement, visual sensitivity decreases (Bałaj, 2011). When analyzing saccadic movement, the following are taken into account: latency (time interval between stimulus presentation and initiation of the saccade in response to this stimulus, lasting about 150–300 ms in a healthy person), amplitude, duration (typically about 40 or 50 ms) and angular velocity, reaching 9,000 per second (Wójcik, 2011). Saccades are interpreted as the fastest movements our body makes and usually last no longer than 80 ms. About 10% of the total image viewing time is the total time of the Sacramento. Among the most commonly used forms of graphic presentation of data obtained by eyetracking are: eye paths, heat maps and analysis of areas of interest (Horsley, 2014).

Eye examinations are used in:

- medicine, including in the diagnosis of diseases such as Parkinson's disease or Alzheimer's disease – mainly in the early stage of disease detection (Kuc et al., 1977; Ober et al., 2009; Anderson, MacAskill, 2013),

- human-computer interaction studies (HCI – Human Computer Interaction). Eyetracking is widely used for research in the field of marketing, especially in advertising ergonomics (Poole, Ball, 2005) and website usability research;
- analysis of consumer decision-making processes (Wedel, Pieters, 2015);
- developmental psychology for the study of sensory-motor development, emotional and cognitive development of a person from infancy to old age, including research on developmental defects, including autism (Pelphrey et al., 2002);
- educational research on:
 - optimization of educational materials presented in a visual form (Nowakowska-Buryła, Joński, 2012),
 - efficiency and learning strategies based on conceptual maps, conceptual diagrams and non-linear text layouts (Amadiou et al., 2015),
 - reading process – the impact of word frequency, their difficulty, semantic meaning or the phenomenon of predicting and scanning content on the process of understanding the text (Hyönä, Lorch, 2004),
 - information processing and processes related to visual attention – how attention is directed during visual scene analysis and differences in content exploration strategies (also illustrated) between novices and experts (Stolińska et al., 2014),
 - adaptive remote education systems (dynamically adapting to users) and intelligent tutorial systems, whose task is, among others, to detect the state of involvement of learners e-learning (in particular, their curiosity and boredom), and as a consequence support for self-regulated learning processes (Jacques, 2014; Gütl, 2005),
 - various aspects of the task solving process (Błasiak et al., 2015).

Eyetracker research is very helpful in understanding perception and information processing processes, which is why they help collect valuable material, among others for scientific considerations. It was only thanks to this technique that some relationships were discovered that previously researchers could only hypothetically assume. Eyetrackers that follow the path of vision show what the subject is looking at and allow identifying the areas in which he focuses. Eyetracking research allows to determine the potential effectiveness of graphical teaching aids (Paško, Stawiarska, 2017).

From the didactic point of view, eyetracking is a very important extension of research methods. It allows you to track and record methods of task analysis, charts, strategies for choosing answers during problem solving and searching for typical errors made at that time.

The increasing availability of technologically advanced devices increases interest in eyetracking methods in research, among others, in general didactics and in subject didactics. The results of previous studies indicate that eye-catching registration methods can be helpful for studying the order of mental operations performed by students while solving tasks.

Previous eyetracking research conducted in the field of didactics (broadly understood) focused around the analysis of the eye movements of potential respondents (Paško, Rosiek, 2014; Błasiak et al., 2013; Rożek, 2014; Eitel, 2013, Ho et al.,

2012; Tsai et al., 2012; Chan et al., 2009). This article presents the results of research on the relationship between eye movement when solving a problem in the field of nature and mouse movement when choosing the right solution.

The subject of the research is the path of sight and computer mouse while students solve a problem task in the area of nature.

The hypothesis is: When solving a problem task using a computer program, students first analyze parts of the task and then move the cursor with the mouse.

Variables and indicators

Independent variable:

- task placed in a computer program

Dependent variables:

- eye movement during task solving
- mouse movement while solving the task

The main indicators of a dependent variable are:

- number of fixations in AOI
- fixation time in AOI
- number of mouse cursor movements in AOI
- residence time of the mice in AOI

The research tool used in the research is eyetracker, a program that records eye and mouse movement – ogama, and a computer program with the task placed in it in nature at primary school level.

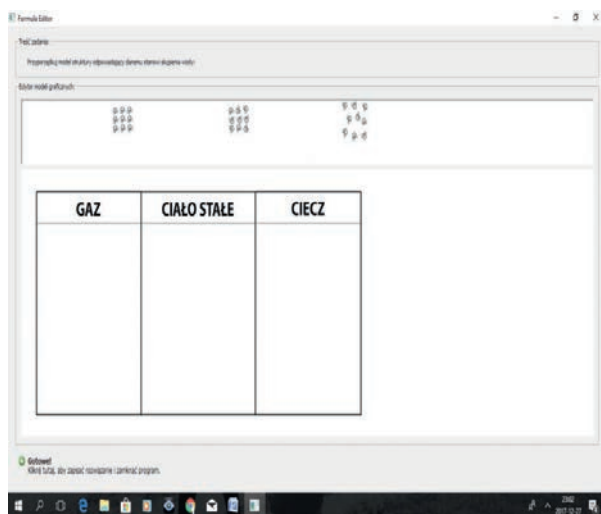


Fig. 3. Task board. Source: own study

Course of research

The students examined were at the age of 13 and attended the sixth grade of primary school in the Nowy Sącz powiat. The research was completely anonymous and participation in it was voluntary and depended mainly on parents' decisions. The principle was followed that the informed consent should be clearly documented (Czarnkowski, Różyńska, 2008), which is why parents of potential respondents expressed their written consent to participate in the study.

The tests were carried out in identical conditions for all tested people. Figure 3 presents the task board, which required the respondents to assign a water structure model to the appropriate state of its clustering:

In the task, areas of interest (AIO) were separated. Data for selected areas of interest were generated for the analysis of task solving strategies. The figure below presents the task divided into AIO areas.

In the "A" area there was the task text. Appropriate models were placed in areas "B", "C" and "D", while in areas "E", "F" and "G" there was information regarding what the model concerns. The areas "H", "I" and "J" were fields in which the mouse had to be placed by dragging the appropriate models corresponding to the descriptions placed over these areas.

Each tested student had to pass the standard "eyetracking calibration test" positively. During validation, the test subject was asked to follow the smoothly moving marker appearing at various points of the screen. Then the student went to the basic research, which was to solve his task. The answer chart was divided into three areas in which the subject was to put answers in the form of drawings from the library above the chart. Downloading this data consisted of dragging them with the mouse from the library to the marked field. The same data may have been downloaded several times.

At each stage of the study, the respondent had any amount of time to answer. The teacher was present in the examination room, but he could not answer any student questions. Dialogue during research could lead to changes in the individual's

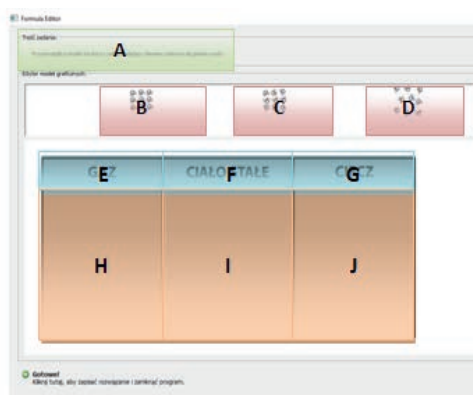


Fig. 4. Task board divided into AOI areas. Source: own study

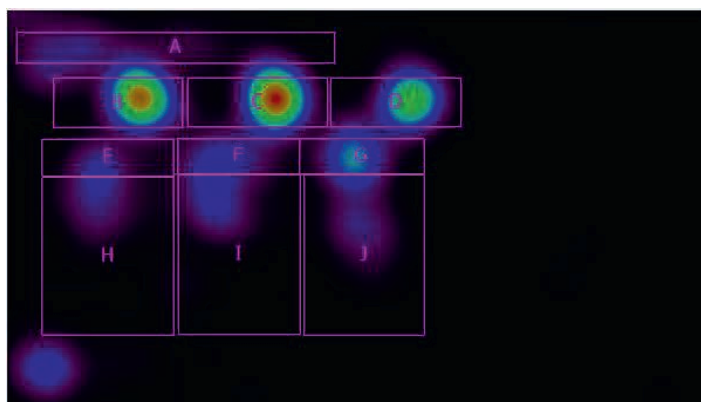


Fig. 5. Heat maps of the “sight”

Source: own study.

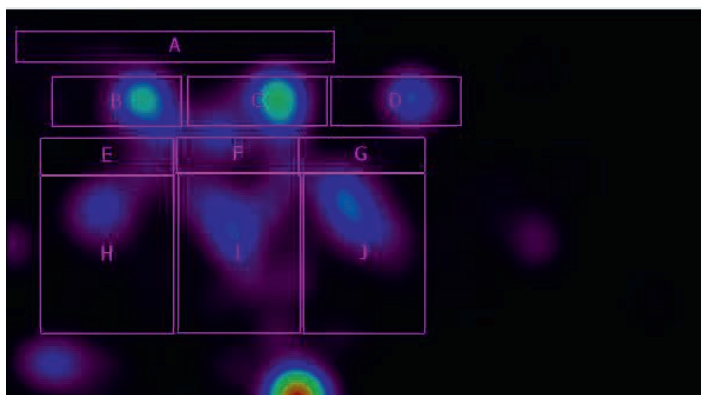


Fig. 6. Heat maps of a “computer mouse”

Source: own study.

behavior (focusing on a particular element or just the opposite – unconscious wandering around the screen while talking) (Mozol, 2011).

Findings

From the obtained data, activity maps (the so-called heat maps) of eyes (Fig. 5) and computer mouse (Fig. 6), also called heat maps, were generated. Heat maps are a graphic representation of the thermal distribution of areas that the respondent drew attention to. They simultaneously depict elements that were noticed and indirectly unnoticed by the respondent). According to the hypothesis of Just and Carpenter (1976), the location of fixations indicates the area of interest of the observer. It is assumed that the time taken by the user for visual analysis of the area of interest depends on the importance assigned to that area (Fitts et al., 1950). Red reflects

the highest concentration of sight, yellow slightly smaller, and smallest blue. Black means the area omitted by the subject during analysis.

As a result of the heat map analysis (Fig. 5 and Fig. 6), it can be stated that the students analyzed the text of the task to a relatively small extent, while reading the text almost did not move the mouse cursor over it.

They showed the greatest visual activity by analyzing areas B, C and D, in which water structures were placed in various states of aggregation. Similarly, in the same areas, they showed mouse activity, but this activity was less than visual (this can be read from the colors of the heat map in this area) in areas E, F and G, in which the names of the states of water were given, little visual activity and basically no mouse activity are visible.

In contrast, in areas H, I and j, which were the fields in which the appropriate structure had to be dragged from field B or C or D, visual activity slightly less than that of the mouse was observed. This is understandable because dragging a given structure to the appropriate field was the end of the mapping.

From the research results presented above, we conclude that by moving their eyes around the board and reading the information provided to them, they basically do not mark them with the mouse cursor.

Above, the heat maps show the average results of all students. On the other hand, it is interesting to what extent the results of individual students run above this average (table 1).

Table 1. Number of fixations and mouse cursor movements during primary school students' problem solving.

Student number	Number of fixations made, sight	Number of cursor moves performed, computer mouse
1	6	26
2	37	14
3	33	7
4	94	17
5	30	13
6	16	24
7	51	24
8	28	18
9	44	12
10	16	11
11	19	15
12	24	36
13	23	10
14	53	11
15	22	14
16	12	10
17	21	12
18	34	28

Student number	Number of fixations made, sight	Number of cursor moves performed, computer mouse
19	18	5
20	18	11
21	13	11
22	13	8
23	28	9
24	16	16
25	14	5
26	31	19
27	44	34
28	69	28
29	20	12
30	48	23

Table 1 sets the number of fixations by eye with the number of mouse cursor movements.

Only in three cases, students showed greater mouse activity than their eyesight. The number of eye fixations ranged from 12 to 94. Mouse activity varied between subjects and ranged from 5 to 36 displacements.

Table 2. The number of fixations in a given AOI area by sight (W) and the number of mouse cursor displacements (M) when solving the task.

Student number	Number of fixations in AOI																			
	A		B		C		D		E		F		G		H		I		J	
	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M
1	0	0	1	2	1	3	1	3	1	0	0	0	0	0	1	1	0	2	0	1
2	0	0	3	1	10	2	5	1	5	0	2	0	5	0	2	1	2	4	4	2
3	0	0	4	1	4	1	4	0	4	0	2	1	6	0	6	1	0	1	2	1
4	14	0	11	1	13	3	15	2	15	1	9	0	13	0	6	3	4	1	1	2
5	6	0	4	1	2	1	3	0	3	0	4	2	3	0	3	1	1	4	1	1
6	5	4	3	3	4	1	0	2	0	1	1	0	0	1	1	2	0	4	0	1
7	11	0	9	7	5	2	3	1	3	1	0	0	0	0	1	2	1	3	3	1
8	0	0	3	2	3	3	5	2	5	0	0	0	2	0	1	4	8	1	2	1
9	0	0	3	1	4	1	3	1	3	1	5	2	8	0	5	1	2	0	2	0
10	0	0	1	1	2	1	1	1	1	0	1	0	3	0	4	1	1	1	1	1
11	0	0	3	1	4	1	3	1	3	0	1	0	1	0	0	2	1	1	1	1
12	0	0	3	2	3	4	6	4	6	0	2	1	1	0	1	9	3	12	3	2
13	1	0	5	2	1	1	2	1	2	0	0	0	0	0	0	1	3	1	6	1
14	10	0	5	2	6	1	7	1	7	0	3	0	7	0	2	0	2	1	5	1
15	5	0	2	1	4	2	3	1	3	0	2	0	0	1	0	2	0	2	5	3
16	0	0	1	1	3	1	1	1	1	0	2	0	1	0	1	1	0	3	0	0
17	0	0	6	2	2	1	2	2	2	1	3	0	2	0	1	2	3	1	1	0
18	3	0	2	1	4	5	7	7	7	0	1	1	1	0	4	6	6	2	2	2

Student number	Number of fixations in AOI																			
	A		B		C		D		E		F		G		H		I		J	
	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M
19	0	0	4	0	3	0	2	2	2	0	1	0	2	0	2	0	0	0	1	1
20	0	0	4	1	3	1	5	1	5	0	1	0	0	0	1	0	0	0	1	3
21	0	0	3	3	3	1	0	0	0	0	0	1	0	0	0	1	2	1	1	1
22	0	0	1	1	1	1	0	1	0	0	2	0	4	0	1	1	0	2	1	0
23	0	0	7	0	3	1	4	1	4	0	1	0	2	0	3	1	0	0	2	2
24	0	0	3	2	3	4	0	1	0	0	0	0	1	0	2	1	1	2	4	3
25	0	0	3	0	4	0	2	1	2	0	0	0	1	1	2	0	0	2	1	0
26	5	0	1	1	4	5	2	1	2	0	0	0	1	0	1	1	1	2	3	5
27	6	6	4	2	10	5	6	2	6	0	0	1	5	1	1	1	1	3	0	11
28	2	0	4	3	1	2	1	2	1	0	6	0	8	1	4	3	10	8	5	4
29	0	0	2	3	5	2	2	1	2	0	0	0	2	0	3	1	0	1	0	1
30	0	0	8	2	12	4	8	4	8	0	1	0	6	0	5	2	1	1	0	1
TOTAL	68	10	113	50	127	60	103	48	103	5	50	9	85	5	64	52	53	66	58	53

Table 2 lists the numbers of eye fixations and the number of mouse cursor movements in the marked AOI areas. The analysis of the obtained data shows that, in principle, students (except one) reading the text of the assignment did not follow it while marking it with the mouse cursor. However, many students did not read the assignment text. Most of the respondents did not introduce the mouse cursor to areas E, F and G, in which information about the state of water was placed, which model should be placed in fields H, I and J.

Based on Chart 1, it can be seen that the number of eye fixations in individual AOI areas was always higher (in some cases even several times) than the number of mouse cursor displacements “Only in areas H, I and J these values are similar. Areas H, I, J are large fields in which the appropriate models are inserted (dragged), so in these areas students probably repeatedly moved the entered model.

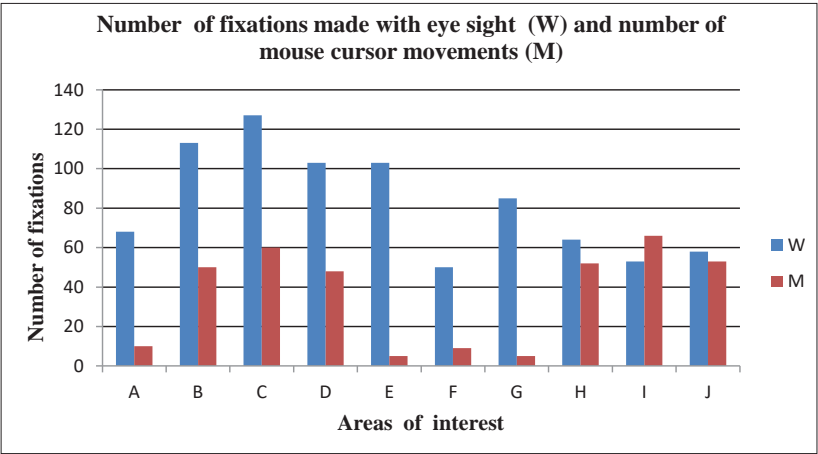


Chart 1. Number of fixations (W) and number of mouse cursor movements (M) of designated AOI areas during problem solving.

Based on the results of the study summarized in Table 3, it can be concluded that fixation times in a given AOI area are not proportional to the time the mouse cursor stays in that area. In some cases, the area was focused longer than the mouse cursor was. However, in some cases it was the opposite.

Table 3. Time of fixations [ms] taken by sight in a given AOI area during problem solving and time spent by the mouse cursor in a given AOI area by primary school students.

Student number		Fixation time [ms] in AOI made by sight and computer mouse cursor									
		B	C	D	E	F	G	H	I	J	
1	eyesight	0	6681	241	0	0	1159	0	0	234	0
	mouse	0	1655	1513	1228	0	0	0	866	974	904
2	eyesight	0	2349	1687	319	1078	527	631	1138	1886	0
	mouse	0	571	4156	1298	0	0	0	702	9845	8412
3	eyesight	0	1438	1683	521	1521	1661	0	662	1029	0
	mouse	0	726	3031	0	0	9219	0	486	1834	1600
4	eyesight	4738	3789	4609	2460	5180	1959	1534	1296	412	4738
	mouse	0	1923	15240	1620	6189	0	0	2487	1568	1237
5	eyesight	1849	1892	912	879	672	5327	304	1359	0	1849
	mouse	0	2298	1033	0	0	3976	0	706	6816	1624
6	eyesight	2806	6881	0	195	0	329	0	0	0	2806
	mouse	5312	9159	395	1327	2054	0	762	1557	3674	442
7	eyesight	3060	4443	1495	0	0	2537	228	549	203	3060
	mouse	0	6039	990	603	1020	0	0	1601	16492	453
8	eyesight	0	2248	2170	0	405	409	2666	848	167	0
	mouse	0	1730	5473	731	0	0	0	3651	722	346
9	eyesight	0	2612	1491	1348	2135	1383	502	1269	149	0
	mouse	0	3638	1127	1394	331	1933	0	415	0	0
10	eyesight	0	667	146	121	612	856	163	1096	358	0
	mouse	0	400	752	293	0	0	0	1129	603	724
11	eyesight	0	1961	2092	157	216	0	1216	300	1422	0
	mouse	0	406	362	832	0	0	0	878	439	1500
12	eyesight	0	637	4260	428	167	305	1686	1458	0	0
	mouse	0	1298	2392	4072	0	521	0	4751	11118	1013

Student number A		Fixation time [ms] in AOI made by sight and computer mouse cursor									
		B	C	D	E	F	G	H	I	J	
13	eyesight	168	1918	1207	0	0	0	568	1283	683	168
	mouse	0	1234	600	1493	0	0	0	509	938	612
14	eyesight	4570	2768	2810	814	1212	539	435	1902	302	4570
	mouse	0	4390	3503	758	0	0	0	0	1497	531
15	eyesight	1608	703	1356	615	0	0	0	1420	315	1608
	mouse	0	502	3336	635	0	0	1283	3147	1563	6211
16	eyesight	0	428	131	296	136	207	0	0	677	0
	mouse	0	1064	805	735	0	0	0	848	2051	0
17	eyesight	0	1772	1560	1425	382	284	1102	605	0	0
	mouse	0	977	499	848	864	0	0	1505	734	0
18	eyesight	1390	819	3179	206	142	592	2478	780	407	1390
	mouse	0	728	3472	4945	0	592	0	7735	963	13160
19	eyesight	0	968	773	234	266	309	0	331	489	0
	mouse	0	0	0	3461	0	0	0	0	0	1661
20	eyesight	0	1236	2415	235	0	748	0	265	298	0
	mouse	0	736	501	469	0	0	0	0	0	9464
21	eyesight	0	788	0	0	0	0	512	135	145	0
	mouse	0	3538	397	0	0	771	0	840	288	1081
22	eyesight	0	630	0	486	1831	158	0	518	293	0
	mouse	0	688	1495	624	0	0	0	1538	1780	0
23	eyesight	0	2463	1148	189	502	862	0	332	397	0
	mouse	0	0	476	466	0	0	0	1513	0	1428
24	eyesight	0	1306	0	0	428	2841	261	1506	1091	0
	mouse	0	1523	8874	335	0	0	0	1255	2208	1744
25	eyesight	0	1232	1329	0	121	331	0	134	0	0
	mouse	0	0	0	396	0	0	306	0	4779	0
26	eyesight	1587	266	472	0	133	238	338	1179	848	1587
	mouse	0	736	5560	366	0	0	0	720	805	3506

Student number A		Fixation time [ms] in AOI made by sight and computer mouse cursor									
		B	C	D	E	F	G	H	I	J	
27	eyesight	2702	2513	2279	0	894	572	540	0	5193	2702
	mouse	3256	1377	5322	3002	0	498	770	352	6822	7526
28	eyesight	381	1635	237	1334	2293	2305	3082	2491	1403	381
	mouse	0	3474	1899	792	0	0	1926	3296	9193	5291
29	eyesight	0	1105	545	0	947	674	0	0	743	0
	mouse	0	2311	1064	637	0	0	0	1067	6735	1729
30	eyesight	0	3478	3859	262	1101	994	302	0	553	0
	mouse	0	668	2197	3107	0	0	0	869	424	1735

Conclusions

When you solve a task that uses the mouse cursor to move items from one field to another, it plays two roles. One of them is selecting the elements of the task, while the other is the shift. The use of the cursor depends on the subject. Some move it along with directing their eyes on the element. On the other hand, others use it to select certain elements and in the final stage of solving the task, when it is necessary to move the element.

Hypothesis put forward: "During problem solving with the use of a computer program, students first analyze parts of the task, then move the cursor with the mouse". It has not been fully verified. Moving the mouse cursor depends on the subject. Some use it to track the text and data of the task and others only in some cases.

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Eye fixation and computer mouse cursor movement

Abstract

The most important source of information for most people is the image in the broad sense of the word received by sight. The subject of the research is the path of sight and computer mouse while students solve a problem task in the area of nature. The research tool used in the research is eyetracker, a program that records eye and mouse movement – ogama, and a computer program with the task placed in it in nature at primary school level. When you solve a task that uses the mouse cursor to move items from one field to another, it plays two roles. One of them is selecting the elements of the task, while the other is the shift. The use of the cursor depends on the subject. Some move it along with directing their eyes on the element. On the other hand, others use it to select certain elements and in the final stage of solving the task, when it is necessary to move the element.

Keywords: education, eyetracking, fixation, computer mouse cursor movement

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