Tomasz PRAUZNER
https://orcid.org/0000-0002-8792-7794
Jan Dlugosz University in Czestochowa
e-mail: t.prauzner@ujd.edu.pl

Kacper PRAUZNER
https://orcid.org/0000-0002-6032-8433
Medical University of Warsaw
e-mail: kacper.prauzner@onet.pl

Application of assumptions of educational transactional analysis in the constructivist learning theory

Abstract

The article presents considerations regarding the use of current assumptions of educational transactional analysis in reference to the constructivist learning theory. The development of neurodidactics and the widespread use of modern information technology in education show the accepted ETA paradigms in current school education in a new light. The authors pose a number of open questions whose aim is to take the discussion further and reflect on the issue.

Keywords: educational theory, didactics, constructivism, electroencephalographic research, ETA.

The popularity of modern media in didactics in the form of modern teaching aids makes us feel admiration and, at the same time, forces us to self-reflect on current and implemented forms of innovation in didactics. This innovative character is noticed not only in changing educational methods, techniques and working tools, but also in a broader context – it changes the way of reflecting on things established some time ago and expressed postulates both from the teachers' and

learners' side. This different outlook on the future, a new vision of school triggers numerous questions, frequently problematic ones. The question about the direction of changes in the educational system is permanently accompanied by a doze of skepticism and a few hypotheses. Universal access to ICT at all levels of education seems to be a general social phenomenon and it does not evoke such a big interest as it used to several years ago. Does a teacher perceive a computer with Internet access as an "innovative educational practice"? Its universality and multitude of software is already known, used during lessons and constitutes an inherent element of a given lesson. This popularity provokes further reflections on the function the teacher fulfils in the contemporary school. Are they still a key source of knowledge or have they become a class coordinator? All the disciplines and branches of science, especially in the area of pedagogy and social studies, are trying to find answers to the aforementioned and similar questions. A good example might be so-called neurodidactics which is gaining more and more attention. What is important, progress in modern construction solutions and interaction concepts in computer software offers new communication opportunities via one's computer and facilitates software operation. Thus, a relational way of communication between the machine and man changes its nature.

As Z. Łęski (2017, p. 119) states, "The research highlights the tendency to attribute the personality structure (functional analysis) to computers, to a great extent coinciding with the user's personality"[1]. Therefore, attributing increasingly more human features to the machine, we can be interested in the mutual M e - C o m p u t e r relation. Man as the creator of information technology has also become its user. What is more important, within education, technology has a crucial impact not only on learners' upbringing but also on their personality, attitude to new working tools. The first research conducted on the *man-media* relation was the one by B. Reeves and C. Nass (2000), at the end of the 20th century. Taking into account such a dynamic process of media development, the question is whether we can regard this research as contemporary. The last years of IT development are characterized by a dominating role of society based on knowledge and continuous information processing, depending on current needs. The changes in culture of numerous communities are the result of this technology's interference in the inner life of human beings. This technology often creates our attitudes and needs, it replaces our former working tools. Thus, we witness the emergence of society whose partner is not another man, but a digital machine. Shall we therefore talk, according to the theory of transactional analysis, about new possibilities of using this idea in didactics, going beyond accepted limits of scientific considerations? Again, Z. Łęski (2017, p. 122) partially answers this question:

> How can we make use of the concept that was developed for the therapeutic purposes, to analyse the functioning of a human being, their relationships with others and themselves,

---

[1]   All translations – authors.

for research concerning new technologies, media and computers? It seems though that it is not only possible but the choice of transactional analysis is an excellent and justified one…We associate media with reality, treat them relationally, and now we also know that in some sense we adjust them to ourselves, attributing the structure of s e l f ego states to them as it is close to our own…, they are unique partners

What is more, the author poses the next interesting question: "What if we admit that they are the next, besides the learner's teacher, subject of that process?"

Other questions deriving from the aforesaid considerations are the ones about the level of communication between learners and their teacher that may be more a machine than another human being. What is a role of current information technology in spreading negative phenomena in the school environment and what prevention measures are taken? Does this technology, in a wider perspective, stimulate human educational inspiration or is it hindered by it? One can pose more problematic questions, however, taking into account the educational analysis approach, we are mainly interested in functional dislocation of any actors playing there.

Artificial intelligence means equipping a machine, in the most perfect way possible, with human features and skills, programming that machine to take over from people in many areas of their life. Is it going to become in the nearest future a regular participant in the educational process? F. Crawford (2012, pp. 99–110) states that

contemporary education aims not only at deepening knowledge of a given subject, but also at developing one's passions and one's engagement in the development of a new trend which is concentrating on participation culture development.

On the other hand, the main premise of public debates is a digression that

the essence of tomorrow's education is the question of ownership…, we shall become the owners of the learning process…, we shall take control over what, where and when we study. It was also stated that digital technologies facilitate creativity and teach logical thinking" (The global…, 2016).

Many considerations mention neurodidactics, i.e. a new term accompanying research on human cognitive activity concerning people's response to signals reaching them. Current research regarding the assessment of educational efficiency on the basis of the traditional form of pedagogic analysis undergoes a certain transformation due to using new research tools implemented in medicine and psychology. The possibility of interfering in advanced software settings, i.e. adjusting them to an individual user's needs contributes to a more friendly cooperation of man and the computer. Personalisation of computer system settings makes it easier for a given user to benefit from the software in question, which makes it possible to adjust the language of communication with the machine to one's individual style.

Pioneering studies by I. Stewart and V. Joines (1987) helped transactional analysis find its place, among all, in the area of education. The characteristic nature of relations between subjects engaged in the didactic process and the omnipresence of information technology in education (ITE) points to the necessity of developing new knowledge in transactional analysis (TA) regarding modern ed-

ucational methods. This trend has been noticeable in TA since the eighties as at that time IT took on a different function interfering in many areas of our life. Therefore, one of the key purposes becomes creating new perspectives for a more efficient teaching and learning process (Pankowska, 2012, p. 15). D. Pankowska (2012, p. 13) poses an important question how to name the relation between education and TA: *Transactional Analysis in education or educational transactional analysis?* It is a crucial question from the point of view of relating the TA theory foundations to modern IT in education. In our opinion, taking into account the very teaching practice, *educational transactional analysis* is a justified term. It derives from the fact (agreeing with the author's opinion) that this term limits the area of TA interest in education to

> adapting some theoretical and practical solutions in the area of education, closely related to both theoretical foundations of teaching and educative work and its realization in relations with the main teacher… Educational transactional analysis makes use of the assumptions of transactional analysis in relation to educational goals, conditions of education's efficiency, methods of teaching and educative work, approach to problems…Faith in a human being – their positive potential and possibilities of self-education and change…, strengthening one's self-esteem – these are main assumptions of ITE (Pankowska, 2012, p. 17).

Pankowska also remarks that since that time the use of TA in education has led to a bigger interest of active teachers developing their teaching and educational know-how, which resulted in a bigger number of scientific publications concerning ETA (Educational Transactional Analysis).

> Each person is treated in ETA like a subject due to being aware and self-aware, possibility of subjectively experiencing the world, making free choices based on their own system of values, deliberately influencing external events and their own life and taking responsibility for their own actions…The educational process aims at the development of the A d u l t ego state as only in that state one is fully aware and able to use one's own intellectual potential and to act responsibly (Pankowska, 2012, p. 23).

> Creating optimal conditions for learning does not consist solely in the right organization of the educational process, but also in creating an emotional atmosphere that would be favourable for the development of learners' subjectivity (Pankowska, 2012, p. 25).

Thus, our considerations shall not only focus on methodology but above all on the connectivist-constructivist theory in didactics.

Therefore, a certain similarity between the aforesaid ETA theses and constructivism in the process of extensive education can be noticed. There is an adult man, responsible for their actions and, at the same time, equipped with suitable working tools. They have an opportunity to seek the truth in an individual way, showing significant creativity and reason in the choice of working methods and tools. And at this moment, the assumptions of TA show an individual in the A d u l t – A d u l t relation. They expect answers, truth and proofs, beliefs based on rational assumptions, and they approach emerging problems in a well-thought-out and responsible way. Thus, is it true that the man-cybernetic machine

relation constitutes such a dialogue? Do software interactivity and dynamically developing digital intelligence make such a dialogue possible? Can a properly prepared didactic process where a teacher is no longer a mentor but directs their actions towards lesson planning and management be compared to the A d u l t – A d u l t relation? If a computer with suitable software becomes a dominating intellectual tool and not just a tool in this sense of the word, is it right to mention it in the aforesaid relation? The authors conduct electroencephalography (EEG and QEEG) research focusing on cognitive processes occurring while learning with the help of Mitsar 202 equipment, at the Biofeedback Experimental Research Laboratory of Jan Dlugosz University in Czestochowa (Prauzner, 2013, 2015, 2017, 2018; Prauzner, T. et al., 2019). Referring to the abovementioned considerations, it is worth emphasizing the importance of the visual side and configuration of interactive software used during lessons. The detailed conclusions deriving from the authors' research have been presented in numerous scientific publications listed in the bibliography. For instance, the presence of sound during students' work significantly influences their cognitive activity, that is, from the didactic point of view, taking a responsible role during a lesson. The lucidity of a visual and audio message plays a crucial role as it can stimulate a given individual to work more or it can de-motivate them. The figures below show the map of the brain's activity QEEG, registered for the same learner in two different states (Fig. 1 and 2). QEEG maps make it possible, among all, to locate the areas with the right and wrong bioelectric activity of the brain.
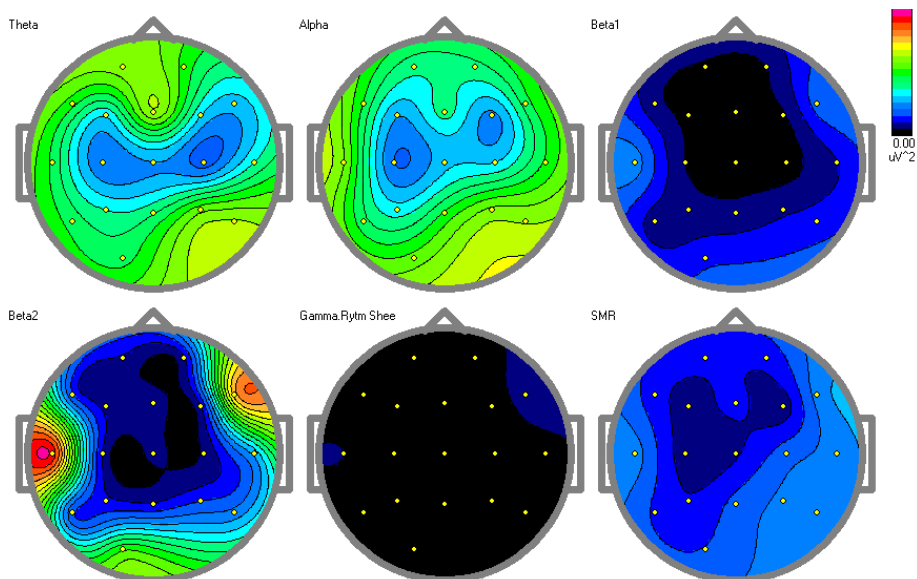
Fig. 1
Map of EEG spectrum strength for selected wave frequencies registered in the brain – the research stage "without sound" [own resources]
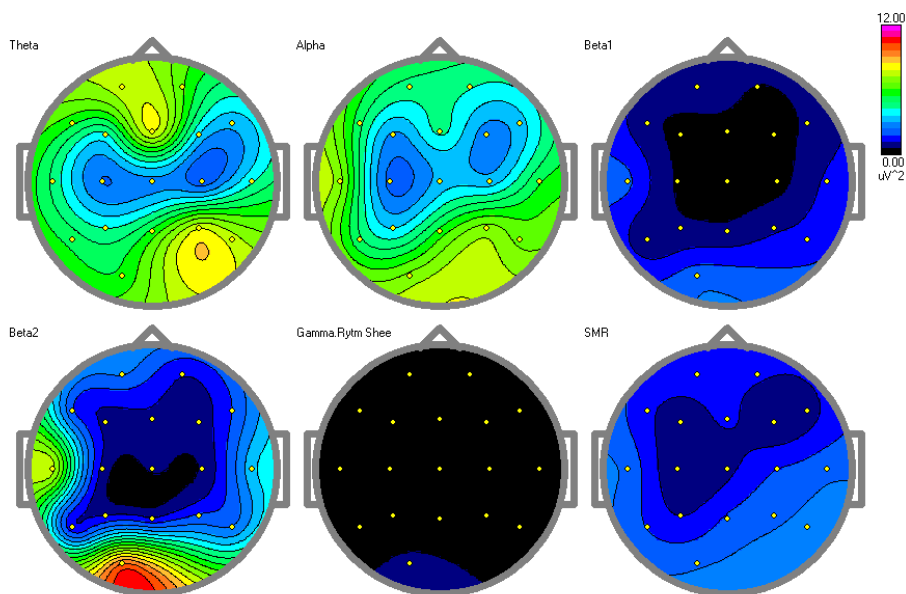
Fig. 2
Map of EEG spectrum strength for selected wave frequencies registered in the brain – the research stage "with sound" [own resources]

The research focused on the course of the following wave frequencies proving a given person's activity:
1. Theta 4–7,5 Hz waves. Usually the excess of Theta waves (frontal lobes) results in de-concentration and attention focus issues. They also occur when we have just finished a given activity or task which required a lot of energy.
2. Alpha 7,5–12 Hz waves. Alpha waves, emitted by the occipito-cervical areas of the cerebral cortex responsible for processing visual information, are characteristic for the peace of mind state.
3. Beta 12–36 Hz waves. They show the engagement of the cerebral cortex in the cognitive activity. Emission of Beta waves is linked with the state of rest, vigilance, external orientation and logical thinking, problem solution and attention. A wide range of Beta waves can be divided into smaller frequency ranges, which to a greater extent correspond to particular ways in which the cerebral cortex functions (Thompson, 2012, p. 73).
   a. 12–15 Hz waves, so-called SMR, emerge when the brain receives information from five senses. It is responsible for relax with external attention and problem solving. One is relaxed in this state, but ready to observe the world. A too low level of SMR accompanies attention deficits.
   b. Beta 1 16–20 Hz waves are linked with concentration on one issue, directed inside. If an individual faces a necessity to solve, e.g., a mathematical task, we can notice the rise of the 17Hz amplitude, whereas, at the

same time, the amplitude of Theta and Alpha waves (8–10Hz) decreases (Thompson, 2012, p.74). This range correlates with the cognitive activity characteristic for active problem solving (intensive mental effort).

c. 18–36 Hz wave, so called Beta2 – a stress-inducing wave of anxiety accompanying us during intensive mental effort. It is linked with increased emotional tension as its emission is accompanied by adrenalin bursts responsible for the body's state of readiness. For the research concerned, it is rather undesirable.

d. 38–42 Hz waves, so-called Gamma waves. It has been noticed that this rhythm has a great significance for the process of learning. Gamma waves are linked with a high level of cognitive activities' tasks and regard our learning style, ability to take in new information as well as our senses and perception (Prauzner, 2019).

A brief analysis of the photographs confirms the occurrence of significant differences which prove different brain activity in different brain working conditions. Similarly, one could conduct research focusing on further factors determining computer software, which might influence the intensity of correlation between subjects in the teaching process.

The topic discussed in this article is complex and requires further detailed research. Its main aim is to develop guidelines for constructing computer software meeting the requirements useful for particular tasks at a given stage of formal education. Thus, there is a perspective of brain-friendly teaching, using complex programming algorithms supervising the selection of content presentation forms referring to a given learner's individual needs. The laboratory research presented here can be an example of innovative research concerning teaching efficiency, and as far as the assumptions of transactional analysis are concerned, it defines an innovative and interesting issue for further considerations.

References

Crawford, F. (2012). Uczestnictwo w transformacji systemu edukacji. In: G. Mazurkiewicz (ed.), *Jakość edukacji. Różnorodne perspektywy* (pp. 99–110). Kraków: Wydawnictwo UJ,

Łęski, Z. (2017). Nowe media w społeczeństwie informacyjnym z perspektywy analizy transakcyjnej. Praca czy współpraca?, *Edukacyjna Analiza Transakcyjna*, *6*, 119–125; http://dx.doi.org/10.16926/eat.2017.06.07.

Pankowska, D. (2012). Analiza transakcyjna w edukacji czy edukacyjna analiza transakcyjna? – próba porządkowania znaczeń. *Edukacyjna Analiza Transakcyjna, 1*, 13–30.

Prauzner, T. (2013). Information Technology in Contemporary Education – Individuals' Researche. *American Journal of Educational Research*, *1*, *10*, 430–435.

Prauzner, T. (2015). Analysis of the results of the pedagogical research and EEG in the aspect of effective modern teaching aids in the technical education. *Society. Integration. Education, Proceedings of the International Scientific Conference.* Volume IV, May 22nd–23rd 2015, Rēzekne: Rēzeknes Augstskola, Latvia, pp. 480–489.

Prauzner, T. (2017). The effectiveness of school education – featured implications considerations. *Society. Integration. Education, Proceedings of the International Scientific Conference*. Volume III, May 26th–27th 2017, Rēzekne: Rēzeknes Augstskola, Latvia, pp. 558–564.

Prauzner, T. (2018). Cognitive mechanisms in the didactics of technical vocational subjects in the light of research on bioelectrical brain activity. *Society. Integration. Education Proceedings of the International Scientific Conference.* Volume I, May 25th–26th, Rēzekne: Rēzeknes Augstskola, Latvia, pp. 454–463.

Prauzner, T., Prauzner, M., Prauzner, K. (2019). Aktywność pracy mózgu w procesie dydaktycznym w ujęciu badań elektroencefalograficznych. *Kwartalnik Naukowy, Edukacja – Technika – Informatyka*, *2* (*28*), 321–317. http://dx.doi.org/10.15584/eti.2019.2.46.

Reeves, B., Nass, C. (2000). *Media i ludzie*. Warszawa: PIW.

Stewart I., Joines V. (1987). *TA Today. A New Introduction to Transactional Analysis*. Nottingham and Chapel Hill: Lifespace Publishing.

The global, cross-sector conference on technology supported learning and training. Berlin 2016, www.online-educa.com [accessed: 11.12.2018].

Thompson, M., Thompson, L. (2012). *Neurofeedback, wprowadzenie do podstawowych koncepcji psychofizjologii stosowanej* (*The Neurofeedback Book. An Introduction to Basic Concepts in Applied Psychophysiology*). Wrocław: Biomed Neurotechnologie Sp. z o.o. Sp. k.

Zastosowanie założeń edukacyjnej analizy transakcyjnej w konstruktywistycznej teorii uczenia się

Streszczenie

W artykule przedstawiono rozważania dotyczące wykorzystania aktualnych założeń edukacyjnej analizy transakcyjnej w ujęciu konstruktywistycznej teorii uczenia się. Rozwój neurodydaktyki oraz powszechne wykorzystanie nowoczesnej technologii informatycznej w edukacji, stawia w nowym świetle przyjęte paradygmaty EAT w aktualnej edukacji szkolnej. Autorzy stawiają szereg pytań otwartych, których celem jest podjęcie dalszej dyskusji oraz refleksji.

Słowa kluczowe: edukacja, dydaktyka, konstruktywizm, badania elektroencefalograficzne, EAT.