

# THE ROLE OF METACOGNITION IN C-LEARNING CURRICULUM

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## Abstract

*The article provides the Reader with an extensive review of literature, both theoretical and empirical, concerning c-learning and its possible content. Initially, the origins of the c-learning idea are reviewed, from the point of looking at the evolution of various forms of distance education over the Internet. Empirical results that led psychologists and pedagogues to consider c-learning as the answer to a majority of problems of traditional e-learning are presented, followed by a description of what c-learning currently is and what its main challenges are. Then, one of those challenges – c-learning curriculum – is considered and the path that led educational psychologists from treating instilling knowledge as the main aim of a teacher to treating training metaknowledge and metacognitive abilities as such is presented. Following that, the origins of the concept of metacognitive skills, the structure of those skills and their relation to cognitive functioning are discussed. Finally, the place metacognition should take in c-learning, and possibly all types of modern education paradigms (even traditional school), is considered, and the view presented is supported by a review of works from all fields involved in virtual schooling attempts: technology of education, educational and cognitive psychology and pedagogy.*

*Key words: c-learning, metacognition, metacognitive skills, modern school curriculum.*

## What is C-Learning?

In the recent years the focus of psychological attention on e-learning (and distance education in general) has slowly shifted from looking at it as a platform of delivering knowledge to looking at it as a completely new environment in which students and teachers alike need to function. This meant that both theoretical reviews and research programs lost the considerations of effectiveness and possible practical applications as their core foundation and main aim. Instead, more and more psychologists, especially those more cognitively and educationally oriented, adopt the perspective of exploring how individuals (students, but also teachers) react to this new paradigm of education, what psychological effects e-learning causes, and finally what challenges to education it brought about. This trend, and especially the critical outlook of 'traditional' e-learning emerging from various meta-studies of how individuals perform in virtual learning conditions, eventuated in the arrival of several concepts on how to improve e-learning environment, structure, teacher-student interaction and finally the very definition of a 'teacher' in the whole process. A brief recapitulation of those ideas, leading to the final one, c-learning, is needed before the latter can be considered as a good starting point for psychological analysis.

Traditional approach to e-learning saw it as an interaction of a (mostly) individual, lonely student with the material prepared in advance by the teacher. This approach, in the light of re-

search, presented researchers from both the field of pedagogy and psychology with an array of questions and difficulties (Postek, Ledzińska, 2010). In psychology, they were mainly focused on the issues of attention guiding (Jamet et al., 2008) and cognitive load experienced by the students (Moreno, Mayer, 1999) while pedagogy addressed more systemic matters of student support, help-seeking and the whole structure and didactics of e-learning (Tanaś, 2007).

Numerous study results are now available pointing to inadequacy of e-learning technology and didactics. Even e-learning results seem not very clear and certain studies point to counter productivity of both employing various means of attention guiding (Jamal, Gavota and Quaireau, 2008) and using multiple modalities (Rasch, Schnotz, 2009) in order to facilitate understanding, retention and transfer. Multimedia (Mayer, 2001) and redundancy (Sweller, 1999) principles are questioned in relation to learning in virtual environment and the issue of information overload (the inability of students to deal with information processing by themselves, Ledzińska, 2006) as one of the key factors responsible for the difficulties students experience is risen in psychological studies (Ledzińska, 2009).

In pedagogy, the main problems explored by researchers while testing e-learning effectiveness were the social aspect (or lack thereof) of learning and teacher-student interaction. The importance of social aspect (information exchange and mutual support in understanding) as an important facilitating factor was proven in relation to technology-enhanced learning in several studies (e.g. Knipfer et al., 2009), while at the same time results are available suggesting that, in e-learning, this aspect is next to non-existent (Walter, 1996; Mercier, Frederiksen, 2007).

The amount of studies into the psychological and pedagogical sides of distance education available has led theorists (Postek, Ledzińska, Czarkowski, 2010; Mc Cullough, Aimard, 2006; Tanaś, 2004; Gajda et al., 2002) to look for possible ways of enhancing the e-learning situation as it had been seen before. Initially, the concept referred to as b-learning was proposed (Graham, 2005, Young, 2002), in which the interaction between the e-student as a teacher was added, in an attempt to allow a certain level of teacher's influence over the learning process. However, due to the fact that the role of a b-teacher was poorly defined (e.g. Osguthorpe, Graham, 2003), the idea was soon abandoned to make way for one now commonly considered (Ward, La Branche, 2003) the most promising when it comes to combining the advantages of virtual environment with the guidance provided by teachers – c-learning. The main assumption behind the idea is that while knowledge, in a vast variety, is nowadays easily available and accessible' the abilities needed to actually acquire that knowledge (retention), reflect upon it (understanding) and utilize it later (transfer) are not only unavailable to many students, but also not present in teaching curricula.

C-learning is most often defined as a learning process happening in virtual surrounding, in which the teacher assumes the role of not a source of knowledge, but rather a source of metaskills needed to operate on that knowledge. The main focus of the teacher, therefore, becomes to instill abilities like planning, self-evaluation, learning techniques, dealing with information overload and critical assessment of material in their student, helping them to learn more so than teaching them, assisting in the learning process rather than steering it. This approach, although already gaining popularity among researchers, brought with it a number of problems. Aside from the more systemic matter of the negative attitude many teachers show towards it (conflicting teacher ethos, Morbitzer, 2007; Michke, 2007), the fundamental question of the content of c-learning curriculum remains unanswered.

The psychological basis for considering such content have also not been decided yet. However, theoretical models describing metaskills from both cognitive and educational standpoints do exist. They cover three major perspectives and the impact they have on human functioning: the placement and of metacognition in regulatory processes (Carver, Scheier, 1998), the relationships between metacognition and cognition (Kuhl, 2001; Kahneman, 2003), and finally the more practical area of the role psychologists can play in rising the awareness of the

importance of certain metaskills in today's educational reality (e.g. Stapleton, 2001). Considering them one by one will create the necessary taxonomy needed to incorporate the psychological standpoint into considerations about what the 'new teacher' should be.

### The Origins of Metacognitive Skills Idea

In numerous disputes, the issue of technology, enhancing learning mainly in erudition tasks, comes forward as the key point. Increasing availability of information also created numerous, positive changes in teaching methodology: distance education becomes more and more popular as well as computer-enhanced learning. There are growing hopes connected with those changes for better stimulation of cognitive activity of students (Juszczyk, 1998) or a more effective realization of the long-standing postulate of individualization of learning (Przetacznik-Gierowska, Włodarski, 1998). Additionally, more flexible teaching programs can be easily coordinated with the needs of job markets (Delors, 1998), allowing job-holders to participate in education and stimulating their development. Those changes are more and more often referred to as an 'educational revolution' – one result of which is that they are accompanied by growing expectations toward increasing the course and effectiveness of education, lessening the workload demanded from the teachers or even replacing teachers by machines. From those expectations stem a number of false beliefs about the possibilities of computer-enhanced education (educational myths): that employing computers in education means less work for the teachers, that computers are a perfect tool for ensuring equal educational opportunities for the underprivileged, that distance education could possibly replace traditional school and so on (Morbitzer, 2007).

The fact is that incorporating information technology into educational processes is a very complex issue. The assessments of the situation formulated by technologists of education are convergent with those put forward by psychologists, particularly in the area of noticeable threats. The register of possible dangers is already long, the predominant part of which is made up of those connected, paradoxically, with the ease of access to information. Among the especially troublesome consequences of that ease the psychological outcomes of information overflow, namely mind overload (the feeling of disorientation and chaos), identifying information with knowledge, the chase after trivia and finally – the severing of the link between searching for information and goal-oriented activity.

The question of how to manage such threats naturally arises (e.g. Woods et al., 2002), and the answers are mainly concerned with analyzing the Internet as the main source of information overproduction. The current *modus operandi* of the Web makes it not only a magazine of information but also its waste dump (Shenk, 1997). The earliest suggestions of tackling the problem were, in their essence, legal-organizational. Ideas for simply turning off tv/radio receivers, reading only pre-selected books, classifying telephone numbers or restricting access to certain Websites were created, all boiling down to outside control and enforcing wide, obligatory regulations.

The solutions presented by those concerned with education are of course very different. The dominant standpoint is the one stressing the need to create proper attitudes towards technology and its outcomes among the receivers and creators of information alike. Those in favor of those solutions in their works refer to the – anchored in cognitive psychology – idea of auto-regulation of behavior. Such auto-regulation is a manifestation of 'higher-level' skills, otherwise called metaskills (Dembo, 1997; Eysenck, Keane, 2005, Braisby, Gellatly, 2005) the placement of which in regulatory processes will now be considered.

One of the earliest classifications of the regulators of human behavior splits them into two basic categories: emotional-urge and rational-volitional. Steering behavior – taking place as a result of volition and mind functioning – is a complex process, covering various forms of

activity. The simplest one is essentially keeping information in a certain sequence in order to create a representation of an object or an occurrence. Among the more complicated and more highly organized ones are conscious selection, control and auto-regulation. They constitute, according to many researchers, the core of rationality, and are therefore the focus of numerous scientific analysis (Carver, Scheier, 1998). Those processes are connected to formulating the goal, supervising the actions undertaken to achieve that goal, upkeeping and modifying the direction of activity and finally ceasing activity after the goal has been reached. The highest level of regulation – called autoethical – is connected with observing one's own psychical processes, realizing one's attitude to oneself, surroundings and social environment. Multiple studies were carried out in order to combine the 'lower' (emotional-urge) and 'higher' (rational) mechanisms of regulating behavior (e.g. Ledzińska, Zajenkowski, 2009). The key factor in such combination proved to be metacognition, one's ability to observe, interpret, utilize and steer one's regulatory processes. Initially, studies over metacognition covered metamemory, the knowledge an individual has about one cognitive function, memory. Gradually, the scope of metacognitive studies widened to include other cognitive processes, their specificity, conditioning, and their influence over the efficiency of human functioning (Flavell, 1979, 1987; Kitchener, 1983; Nelson, 1996; Nelson, Kruglanski, Jost, 1998; Borkowski i in., 2000).

A significant breakthrough in research over metacognition took place when metacognitive *skills* were included into the interests of those involved in the field. Metacognitive skills are commonly considered to be the manifestation of the most complex human competences (Pintrich, Wolters, Baxter, 2000; Koriat, 2000; Kuhl, 2001; Paris, 2002; Nęcka, Orzechowski i Szymura, 2006). The ability to formulate goals, oversee activity and regulate behavior are all examples of metacognitive skills. The core of metacognition in this understanding of the problem is conscious individual activity, based on the assessment and selection of goals as well as the control over their realization.

### **The Basis and Structure of Metacognitive Skills**

One important aspect of the skills described above is control exerted over one's mind. By analogy to control over environment, control over mind can be either:

- cognitive, when thoughts and emotions are properly registered and their sources understood
- behavioral, when influence over one's thoughts (mental control) as well as moods and emotions (affective control) is exerted successfully.

The core of control over mind lies in checking whether what is happening in the area of thoughts, experiences and activities corresponds with one's intentions. Mental control, on the other hand, is much more complex by nature, and covers two main fields: the drive to achieve certain desired states of mind, and the desire to avoid others.

In summary, mental control can be defined as directing attention to specific content and avoiding others, affective control by achieving desired emotional states and leaving undesired ones and finally behavior control by monitoring behavior, upkeeping its direction and influencing the level of performance. In this approach, control requires both monitoring – in order to check adequacy – and ability to influence processes, when such influence is needed.

A deepened analysis of the connections between cognitive and emotional processes was made possible by the arrival of the idea of metacognitive experiences (Efklides, 2005, 2006, 2008). Three main categories of such experiences are recognized in literature:

- experiences – emotions. These are defined as experiences and affections about similarities between tasks and situations, their level of difficulty and the satisfaction connected with accomplishments. Those emotions are directly bound with cognitive processes (recognition, comparison, memory etc.) and are also known as metacognitive feelings. In the literature on

the subject, a point is made about their difference from emotions associated with cognitive processes that refer to their outcome, like fear, curiosity or apprehension (Clare, Parrott, 1994; Valcke, 2002).

– experiences – judgments. Individual judgments about the amount of effort and time investments it would require to complete a specific task.

– experiences – knowledge. Individual opinions about how unique a task is, and especially what already known procedure can be used to complete it.

Metacognitive experiences are placed between metacognitive knowledge and metacognitive skills and are treated key link between an individual and a task as well as between monitoring and regulatory steps taken (Efklides, 2006). The ability to make decisions based on observing and interpreting one's own metacognitive experiences is one of the abilities of paramount importance, especially in the situation of solving problems which require selecting and processing vast amounts of information.

### **Metacognition vs Cognition in Curriculum**

It comes as no surprise, therefore, that cognitively-oriented educational psychologists, pedagogues and those involved in educational technology put a lot of stress on metacognition, treating it as their priority (Drucker, 1999; Dryden, Vos, 2000; Mietzel, 2002; Morbitzer, 1997, 2001; Stapleton, 2001). An point often made is that one of the best venues for training metacognitive skills is a classroom. Teachers responsible for particular subjects would, in this line of thought, put more effort into explaining the logic of the subject, the difference between information and knowledge, the border between the laws and hypothesizing, the relative character of knowledge and the dynamics of how it changes. Information is very easily available to practically everyone, while the abilities needed to transform it into knowledge are an extremely scarce resource.

In the cognition vs metacognition dilemma, the above statement defines the difference between traditional learning and various forms of e-learning. Traditional education relied (and quite justly so) on teachers to deliver knowledge and skill, becoming the only available source of 'cognition' – information bound together to create knowledge. How that process of creation happened was of course never explained, knowledge was provided as a ready-to-use system, already structuralized, seemingly stable. This was of course justified by simple ergonomics, plus that fact that most pupils never had access to any other source of knowledge than school. However, with the development of technology, the availability of information kept increasing, until it reached a point in which school can possibly be described as the least significant source of information. Tasks set by teachers are done by a copy-paste technique, contradictions between teachers and the Internet (in particular wikipedia) are solved with the aid of abstract 'teacher authority' and rarely discussed or reflected upon in the classroom. The drive to implement traditional curriculum in a world steered by information results in the sense of futility in teacher and questioning usefulness of school in pupils.

The inclusion of metacognitive skills into curriculum (already advocated by the c-learning idea, albeit not precisely defined in it) seems to be the answer to such problems. Regardless of how such skills are understood, either on an operational (e.g. the ability to criticize new information), tactical (e.g. the ability to plan learning, or focus on the task) or strategic (e.g. the ability to read, understand, use and control one's emotions) level, the need to teach them and train them has been clearly proven. In school environment, the actual contact between teachers and pupils, the ability to interact, presents itself as a facilitating factor. Teachers focusing a part of their efforts on training their pupils in such a way would regain the sense of self-importance, and pupils would regain the attitude to school as being useful to them.



## Conclusions

One important task placed before psychologists in the current world remains to popularize knowledge. This means that in addition to the scientific work needed normally, the responsibilities connected to educating and influencing education become more and more important. Among the problems worth wider attention, some seem exceptionally important. Researchers and theorists of education from many standpoints (psychology, pedagogy, technology of education) stress the importance of metacognition, the knowledge and abilities referring to one's own cognitive processes, as an invaluable factor in individual development and especially learning in modern society (Bruner, 2006; Drucker, 1999; Dryden i Vos, 2000; Mietzel, 2002; Stapleton, 2001). School, or in broader terms 'traditional education', seems to be a good place to train this particular sphere of functioning, and the following two aspects of deciding how to train it are exceptionally important:

- the realization of the difference between information and knowledge and the relation between the two. Knowledge should be understood on the basis on information, but should be the result of systematic cognitive effort – planned, evaluated and upkept.

- the knowledge of the tools and procedures allowing for finding, selecting, structuring information followed by the ability to apply appropriate cognitive powers to process it, turn into knowledge and incorporate into the existing structures of knowledge and values. The ability to select information, in the light of extreme data overproduction, becomes more and more important, to the point where learning without selecting becomes virtually impossible.

In an attempt to answer to the question about what a psychologist, in the times of overwhelming fascination with technology and the possibilities it offers, can do for the society, it can be safely said that advocating the need to aid individuals in building knowledge based on (but not equal to) properly processed information becomes highly important. The question about the gain such a perspective might bring can be answered by stating that the very orientation towards the importance of subjectivity and intellectual independence is a gain in itself. It enables the thinking about cognitive adjusting to the fast pace of technological changes, allowing not only to increase the quality of life, but possibly social and intellectual survival.

## References

- Borkowski, J., Chan, L.K.S., Muthukrishna, N. (2000). A process-oriented model of metacognition: Links between motivation and executive functioning, [w:] *Issues in the measurement of metacognition* (s. 1-43). Lincoln, NE: Buros Institute of Mental Measurements.
- Braisby, N., Gellatly, A. (red.) (2005). *Cognitive psychology*. Oxford: Oxford University Press.
- Bruner, J. (2006). *Kultura edukacji*. Kraków: Towarzystwo Autorów i Wydawców Prac Naukowych UNIVERSITAS.
- Carver, C.S., Scheier, M.F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.
- Delors, J. (red., 1998). *Edukacja. Jest w niej ukryty skarb. Raport dla UNESCO Międzynarodowej Komisji ds. edukacji dla XXI wieku*. Warszawa: Wydawnictwa UNESCO, Stowarzyszenie Oświatowców Polskich.
- Dembo, M. (1997). *Stosowana psychologia wychowawcza*. Warszawa: Wydawnictwa Szkolne i Pedagogiczne.

- Drucker, P. (1999). *Spoleczeństwo pokapitalistyczne*. Warszawa: Wydawnictwo Naukowe PWN.
- Dryden, G., Vos, J. (2000). *Rewolucja w uczeniu*. Poznań: Wydawnictwo Moderski i S-ka.
- Efklides A. (2005). Emotional experiences during learning: Multiple situated and dynamic. *Learning and Instruction*, 15, 377-380.
- Efklides, A. (2006). Metacognition and affect: What can metacognitive experiences tell us about the learning process? *Educational Research Review*, 1, 3-14.
- Efklides, A. (2008). Metacognition: defining its facets and levels of functioning in relation to self- and co-regulation. *European Psychologist*, 13, 277-287.
- Eysenck, M.W., Keane, M. (2005). *Cognitive psychology. A student's handbook*. Hove and New York: Psychology Press.
- Flavell, J. H. (1979). Metacognition and cognitive monitoring – A new era of cognitive inquiry. *American Psychologist*, 34, 906-911.
- Flavell, J.H. (1987). Speculations about the nature and development of metacognition, [w:] F.E. Weinert, R.H. Kluwe (red.), *Metacognition, motivation and understanding* (s. 21-29). Hillsdale, NJ: Erlbaum.
- Gajda, J., Juszczak, S., Siemieniecki, B., Wenta, K. (2002) *Edukacja medialna*. Toruń: WUMK.
- Jamet, E., Gavota, M., Quaireau, Ch. (2008). Attention guiding in multimedia learning. *Learning and Instruction*, 18, 135-145.
- Juszczak, S. (1998). *Komunikacja człowieka z mediami*. Katowice: Wydawnictwo „Śląsk”.
- Kahnemann, D. (2003). A perspective on judgment and choice. *American Psychologist*, 58, 697-720.
- Kitchener, K. (1983). Cognition, metacognition and epistemic cognition: A three level model of cognitive processing. *Human Development*, 4, 222-232.
- Knipfer, K. (5 authors) (2009). Computer support for knowledge communication in science exhibitions: Novel perspectives from research on collaborative learning. *Educational research Review*, 4, 196-209.
- Koriat, A. (2000). The feeling of knowing: Some metatheoretical implications for consciousness and control. *Consciousness and Cognition*, 9, 149-171.
- Kuhl, J. (2001). A functional approach to motivation: The role of goal enactment and self-regulation in current research on approach and avoidance, [w:] A. Efklides, J. Kuhl, R.M. Sorrentino (red.), *Trends and prospects in motivation research* (s. 239-268). Dordrecht: Kluwer.
- Ledzińska, M. (2006). Specyfika doświadczenia indywidualnego w dobie rewolucji informacyjnej, [w:] J. Morbitzer (red.), *Komputer w edukacji* (s. 131-135). Kraków: Wydawnictwo Akademii Pedagogicznej.
- Ledzińska, M. (2009). *Człowiek współczesny w obliczu stresu informacyjnego*. Warszawa: Wydawnictwo Instytutu Psychologii PAN.
- Ledzińska, M., Zajenkowski, M. (red.) (2009). *Z badań nad pograniczem intelektu i osobowości*. Warszawa: Wydawnictwo Instytutu Psychologii PAN.

Mayer, R. E. (2001). *Multimedia learning*. New York: Cambridge University Press.

Mc Cullough, C., Aimard, V. (2006) *E-Learning in Europe: How do trainers, teachers and learners rate e-learning?* Paris: Cedefop.

Mercier, J., Frederiksen, C. H. (2007). Individual differences in graduate students' help-seeking process in using a computer coach in problem-based learning. *Learning and Instruction*, 17, 184-203.

Mietzel, G. (2002). *Psychologia kształcenia*. Gdańsk: Gdańskie Wydawnictwo Psychologiczne.

Mischke, J. M. (2007). Rozważania na temat jakości kształcenia w aspekcie e-learningu akademickiego, „*E-mentor*”, 1(18) luty 2007, 47-48.

Morbitzer, J. (red.) (1997). *Współczesna technologia kształcenia*. Kraków: Wydawnictwo Wyższej Szkoły Pedagogicznej.

Morbitzer, J. (2007). *Edukacja wspierana komputerowo a humanistyczne wartości pedagogiki*. Kraków: Wydawnictwo Naukowe Akademii Pedagogicznej.

Moreno, R., Mayer, R. (1999). „Cognitive principles of multimedia learning: The role of modality and contiguity”. *Journal of Educational Psychology*, 91, 358-368.

Nelson, T.O. (1996). Consciousness and metacognition. *American Psychologist*, 51, 102-116.

Nelson, T.O., Kruglanski, A.W., Jost, J.T. (1998). Knowing thyself and others: Progress in metacognitive social psychology, [w:] Y. Yzerbyt, G. Lories, B. Dardenne (red.), *Metacognition: cognitive and social dimension* (s. 69-89). London: Sage.

Nęcka, E., Orzechowski, J., Szymura, B. (2006). *Psychologia poznawcza*. Warszawa: Wydawnictwo Naukowe PWN.

Osguthorpe, R. T., & Graham, C. R. (2003). Blended learning systems: Definitions and directions. *Quarterly Review of Distance Education*, 4(3), 227-234.

Paris, S.G. (2002). When is metacognition helpful, debilitating, or benign? [w:] M. Izaute, P. Chambres, P.-J. Marescaux (red.), *Metacognition: Process, function, and use* (s. 105 -120). Dordrecht: Kluwer.

Pintrich, P.R., Wolters, C.A., Baxter, G.P. (2000). Assessing metacognition and self-regulated learning, [w:] J.C. Impara, G. Schraw (red.), *Issues in the measurement of metacognition* (s.43-97). Lincoln: University of Nebraska – Lincoln.

Postek, S., Ledzińska, M. (2010). Psychological and Pedagogical Challenges in B-Learning. In. *DIVAI 2010 - Distance Learning in Applied Informatics* (Conference Proceedings, Nitra, Slovakia, May 4-6, 2010). Nitra: Constantine the Philosopher University in Nitra, p. 243-247.

Postek, S., Ledzińska, M., Czarkowski, J. (2010). Psychological and pedagogical problems of distance education for adults. *Problems of Education in the 21st Century (Current Research on ICT and Science Education – 2010)*, Vol. 22, 99-108.

Przetacznik-Gierowska, M., Włodarski, Z. (1998). *Psychologia wychowawcza*. T.1. Wyd. 7. Warszawa: Wydawnictwo Naukowe PWN.

Rash, T., Schnotz, W. (2009). Interactive and non interactive pictures in multimedia learning environments: effects on learning outcomes and learning efficiency. *Learning and Instruction*, 5(19), 411-423.



Shenk, D. (1997). In data smog: surviving the information glut. *Surviving the information glut*. London: Abacus.

Stapleton, M. (2001). *Psychology in the practice*. Education. London: Hodder & Stoughton.

Sweller, J. (2005). Implications of cognitive load theory for multimedia learning. In R. E. Mayer (Ed.) *The Cambridge book of multimedia learning* (pp. 19-30). New York: Cambridge University Press.

Tanaś, M. (2007). Teoretyczno metodyczne uwarunkowania rozwoju kształcenia na odległość, In: Kramek, Z. *Teoretyczno metodyczne podstawy rozwoju e-learningu w edukacji ustawicznej*. (pp. 52-71) Radom.

Tanaś, M. (ed.) (2004). *Pedagogika @ środki informatyczne i media*. Warszawa-Kraków.

Valcke M. (2002). Cognitive load: updating the theory? *Learning and Instruction*, 12, 147-154.

Ward, J., LaBranche, G. A. (2003). Blended learning: The convergence of e-learning and meetings. *Franchising World*, 35(4), 22-23.

Woods, D.D., Patterson, E.S., Roth, M. (2002). Can we ever escape from data overload? A cognitive systems diagnosis. *Cognition, Technology and Work*, 4, 22-36.

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