

Need for ICT Use in Classroom as a Response to Cognitive Style Change in Children

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Many experts warn that there has been a profound reorientation of human attention and a generational shift in cognitive styles is in progress, going from deep to hyper attention. Experience of boredom, often termed as a disease of the modern world, is tightly related to regulation of attention. In the light of a rapidly changing environment, irrevocably followed by a change in cognitive style and most probably, a change in the preferred form of knowledge acquisition, the aim of this study was to explore the current opinion of school children (5th and 6th grade) regarding their fondness for school, the amount of time spent on their smartphone/PC and their learning approach and need for changing the learning method. We conclude that, in order for children to be more satisfied with school and their achievement, it is necessary to start a diligent implementation of a well-designed ICT in classroom.

Keywords: ICT use, hyper attention, learning method, boredom, education system

Introduction

Social modernisation and technological revolution at the turn of 21st century have created a rapidly changing environment. Changes in technology have increased the pace of information exchange and interconnectedness, brought new forms of employment and standards of education, but most of all, they have remarkably changed human lifestyle. Due to high brain plasticity in early childhood, susceptibility to environmental factors and lifestyle is remarkable in children. A general trend that includes much screen-time with often intense and overly stimulating content, little physical activity and a disrupted sleep-wake cycle is reaching epidemic proportions. Although the rapidly changing environment affects us and our everyday behaviour in a rather obvious manner, recent research pinpoint to a subtler cognitive and maybe more profound levels, at which changes in this technical age are taking place. These changes range from navigation skills (Sanders 2017) to how we use our memory (Storm, Stone, and Benjamin 2017) and length of attention spans (Christakis et al. 2004).

Childhood chronic conditions, including attention deficit/hyperactivity disorder (ADHD) have increased over the past few decades (Perrin, Bloom, and Gortmaker 2010). A pilot study conducted in 2016 in Slovenia revealed that school teachers evaluate children's abilities as significantly lower than those of previous generations of children, which, among others, include the ability to focus one's attention (Rajović et al. 2016). Those working with children do not find these findings surprising, often claiming that issues regarding attention are part of a general trend encountered with new generations of children.

However, many experts warn that there has been a profound reorientation of human attention and that attention is undergoing a profound transformation (Rogers 2014, 2). According to a research recently published by Microsoft (2015), in the period between 2000 and 2013, the ability to pay attention decreased from 12 to 8 seconds. This trend is tightly related to an occurrence in modern society. Media content has changed and an increased tempo of visual stimuli and complexity of plots became obvious (Johnson 2005, 61–106). There is a phrase used in commercial media advertising called 'Jolts per minute' which the Centre for Media Literacy (see <http://www.medialit.org/reading-room/measuring-jolts-minute>) defines as follows:

'Jolts per minute' programming is often cited as a principle – almost a first law – of commercial television. 'Jolt' refers to the moment of excitement generated by a laugh, a violent act, a car chase, a quick film cut – any fast-paced episode that lures the viewer into the program.

The number of jolts per minute is constantly increasing and some have also started measuring the frequency of jolts in seconds. A decrease in the time required for an audience to respond to an image is also observed. In the 1960s, an audience needed about twenty seconds to recognise an image and today this happens in several seconds (Hayles 2007).

Hayles (2007) denotes that this *shift in cognitive styles* that is in progress is a generational shift from deep to hyper attention. In contrast to the deep attention, the cognitive style which is characterised by concentrating on a single object for long periods, hyper attention means switching focus rapidly among different tasks, preferring multiple information streams, seeking a high level of stimulation, and having a low tolerance for boredom (Hayles 2007). The benefits and shortcomings of those cognitive styles depend on the context and the task at hand. As Hayles (2007) explains, hyper attention

was first developed, while deep attention has not developed before a group cooperation that would create a secure and danger-free environment. Given the standard of our educational institutions, it seems that deep attention is highly fostered, while hyper attention is being regarded as defective behaviour and not even being a cognitive mode (Hayles 2007).

As Hayles (2007) put it:

Whether the synaptic reconfigurations associated with hyper attention are better or worse than those associated with deep attention cannot be answered in the abstract. The riposte is obvious: Better for what? A case can be made that hyper attention is more adaptive than deep attention for many situations in contemporary developed societies.

In the light of rapidly changing environment irrevocably followed by a change in cognitive style and most probably a change in the preferred form of knowledge acquisition, the aim of this study was to explore the current opinion of school children regarding several questions. The issues regarding their fondness for school, the amount of time spent on their smartphone/PC and their learning approach and need for changing the learning method.

Methodology

The research involved 172 pupils (aged 11 to 13) who attend the fifth and sixth grade of elementary schools in Republic of Serbia. The study was conducted in four elementary schools located in Belgrade ('Stevan Dukić'), Paraćin ('Stevan Jakovljević'), Sremska Mitrovica ('Jovan Jovanović Zmaj') and Zrenjanin ('Dr Jovan Cvijić'), respectively.

The dominating research methods included a theoretical content analysis and descriptive scientific research method with a survey, as the selected data collection instrument. A quantitative data analysis was conducted using the SPSS for Window program. For the assessment of opinions and attitudes of 5th and 6th grade pupils, a questionnaire titled *Comparative analysis of the use of new technologies and learning methods* was prepared. Questionnaires were filled out anonymously. The research was carried out in December 2017. The groups of pupils were heterogeneous with respect to their involvement with specific learning method (NTC system of learning) and their grade. Initially, the children were grouped based on their grade and whether or not they belonged to an experimental (NTC method of learning implemented by teacher) or control group (no alternative methods of learning). For the purposes of this study, a general group analysis was carried out, with compar-

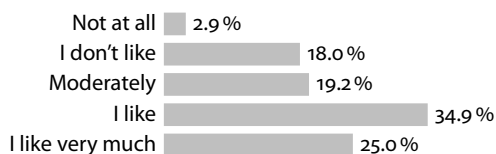


Figure 1 Graphical Representation of Students' Answers to the Question 'How Much Do You Like School?'

ative analysis conducted for one of the survey questions. Opinions and attitudes students with regard to the particular questions are represented in the tables and summarised in the accompanying figures. Questions/statements of interest were as follows:

1. How much do you like school?
 - a) Don't like at all
 - b) Don't like
 - c) Moderately
 - d) Like
 - e) Very much like
2. How do you learn and acquire the study material:
 - a) Reading a lesson several times
 - b) Reading a lesson and highlighting important parts
 - c) Using some other technique
3. How much time do you spend daily on the smartphone/PC?

Results

The extent to which the children liked school was accessed using 1–5 scale (*not at all, I don't like, moderately, I like, I very much like*). The greatest percentage of children liked school (59.9%). Among them, 25% said that they liked school very much. However, 20.9 % of children were to be found on the other end of the spectrum, with 18% not liking school and 2.9% not liking school at all. Neither liking nor disliking school was found to be the case in 19.2% of the children. The graphical representation is given in Figure 1.

However, the distribution of pupils' answers significantly changed when their classification into control/experimental groups and 5th grade/6th grade groups was considered. These results are given in Table 1.

If we consider only the 6th grade children from the control group, the percentage of those who did not like school is significantly higher. In this

Table 1 Numerical Representation of Answers to the Question 'How Much Do You Like School?'

Classes		(1)	(2)	(3)	(4)	(5)	Total
6th grade control group	(a)	3	20	0	16	5	44
	(b)	6.8	45.5	0.0	36.4	11.4	100.0
	(c)	60.0	64.5	0.0	26.7	11.6	25.6
6th grade experimental group	(a)	0	6	15	7	16	44
	(b)	0.0	13.6	34.1	15.9	36.4	100.0
	(c)	0.0	19.4	45.5	11.7	37.2	25.6
5th grade control group	(a)	1	5	12	20	4	42
	(b)	2.4	11.9	28.6	47.6	9.5	100.0
	(c)	20.0	16.1	36.4	33.3	9.3	24.4
5th grade experimental group	(a)	1	0	6	17	18	42
	(b)	2.4	0.0	14.3	40.5	42.9	100.0
	(c)	20.0	0.0	18.2	28.3	41.9	24.4
Total	(a)	5	31	33	60	43	172
	(b)	2.9	18.0	19.2	34.9	25.0	100.0
	(c)	100.0	100.0	100.0	100.0	100.0	100.0

Notes Column/row headings are as follows: (1) don't like at all, (2) don't like, (3) moderately, (4) like, (5) very much like, (a) count, (b) percentage within the class, (c) percentage within 'How Much Do You Like School?'

group, 52.3% of children either did not like school (45.5%) or did not like it at all (6.8%). In the 5th grade control group, the situation was slightly better, with 14.3% of those who did not like school and 28.6% of those who neither liked nor disliked it. The largest number of children who liked school is to be found in the fifth grade in the experimental group. More specifically, out of 42 pupils, 18 of them (42.9%) said they very much liked school, whereas 17 of them (40.5%) said they liked school.

We observe relevant results regarding the methods of learning and acquiring the study material. The analysis shows that the most represented learning method is the second one among the methods offered: Reading a lesson and highlighting important parts (52.6%), while the least represented are answers concerning other learning techniques (19.9%). The other learning techniques used by pupils were provided by an open question and include the following: double associations, drawing of lessons, illogical stories, key segments with illogical story, mind maps, NTC learning techniques, selection of key words, creation of images in the mind, reading followed by revision and visualisation, reading a lesson and making short notes, reading a lesson and revision using earphones, learning the things one least knows etc. Figure 2 presents

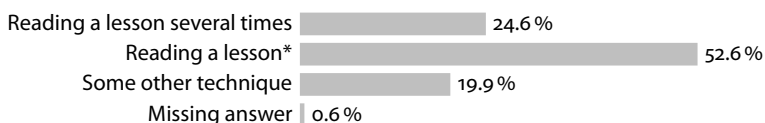


Figure 2 Graphical Representation of Students' Answers to the Question 'How Do You Learn and Acquire the Study Material?' (* and highlighting important parts)



Figure 3 Graphical Representation of Students' Answers to the Statement 'I Would not Change the Learning Methods Used in School'

the current situation in methods of learning and acquiring the study material. As already specified, *reading a lesson and highlighting important parts* is the most common knowledge acquiring technique used by pupils.

Concerning the time pupils spend on their smartphone and PC, the following results were obtained: on a workday, the average time spent on these devices is 1.9 h using a smartphone and 1.4 h using a computer, respectively. At weekends, pupils spend on average 3.3 h using a smartphone and 1.9 h using a computer, respectively.

Finally, pupils were asked whether they would change the learning methods used in school. While 58.5% of them said they would not change the learning methods, 41.5% of them said they would (Table 3). The graphical representation is given in Figure 3.

Discussion

The obtained results give us a valuable insight. The results are rather worrisome when we consider that 40.1% of children cannot state that they like school and 20.9% clearly state that they don't like school. The situation is even more alarming when we take into consideration only the answers of the children taught via the classical method. In the control group of 6th graders, 52.3% of children don't like school, while this is the case in only 13.6% of 6th graders in the experimental group. This difference demonstrates the impact an innovative method (in this case, the NTC system of learning) of learning and acquiring knowledge may have on children's resistance towards school. At the same time, a detrimental effect of methodologically classical approach to children's attitude towards school is implied. School, as the institution in which young people spend most of their childhood, whose aim is to prepare them for life, does not have the luxury to be regarded by children as some-

thing that is neither liked nor disliked, lest as something that is strongly disliked. If such high percentage of those disliking school is to be found in 5th and 6th graders, with a noticeable downward trend, what could we expect to find in higher grades? A change that would enable children to experience school as a pleasant place, where they like to spend their time, is becoming a clear priority.

When asked how they learned, it is evident that most children (76.7%) use classical repetitive approach that consists of reading several times and optionally highlighting important parts of a lesson. On the other hand, 41.5% of children would change the learning method used in school. While keeping in mind the fact that, on average, pupils spend several hours a day using new technology devices (workday: 1.9 h using a smartphone and 1.4h using a computer; weekend: 3.3 h using a smartphone and 1.9 h using a computer), we will discuss the necessity of integrating an ICT-based new learning method into everyday school environment.

An important question is raised: What kind of learning and knowledge acquisition method would correspond to the needs of modern children? If we acknowledge the generational trend of hyper attention, and the screen as the second nature of their perception, it comes as no surprise that children frequently experience boredom in school settings. Many regard boredom as a modern disease. We have school environment that still highly values and encourages the cognitive mode of deep attention on the one hand and children who mostly function in the hyper attentive mode, and are on the constant quest to novel stimulation, on the other. Boredom occurs when one is not able to successfully engage attention with internal or external information (Eastwood et al. 2012). Furthermore, how could a child who mostly functions on the hyper attention end of the spectrum be almost constantly engaged in activities that require deep attention? Do we have the right to expect that?

Boredom has been found to relate to dropout at school (Bearden, Spencer, and Moracco 1989), truancy (Sommer 1985), deviance (Wasson 1981) and juvenile delinquency (Newberry and Duncan 2001). Middle-school students report feelings of boredom during 32% of the time spent in class (Larson and Richard 1991) while in some studies, this percentage is much higher, reaching as much as 58% (Nett, Goetz, and Hall 2011). Moreover, boredom is experienced more frequently by students than anxiety, which is most commonly researched emotion in the education domain (Goetz et al. 2006). That boredom as an extremely negative state, from which we feel the need to escape, was demonstrated in an experiment, which indicated that people preferred to be

administered electric shocks, rather than to be left alone with their thoughts (Wilson et al. 2014). Interestingly, boredom induction results in significantly higher cortisol levels than an induction of other states with negative affect, such as sadness (Merrifield and Danckert 2014). Zakay (2014) suggests that perceived slowing of time is a signal which alerts the executive system that resources should be recruited in order to cope with the hazardous state. In that sense, when information processing load is below an optimal level in a certain individual, a feeling of boredom is raised (Zakay 2014). The relevant question to be raised here is: What is the optimal information processing level and how much has it changed over the past decades?

It becomes clear that an adequate learning and knowledge acquiring method, which could successfully engage the child's attention, is highly needed. The method that is dynamic, interactive, requiring faster information processing and enabling higher frequency of stimulation. If boredom is the kind of experience we want to avoid, what kind of experience do we strive toward? This would be the state experientially opposite to boredom, with the lost awareness of self and time. This mode of functioning exists and is known as the flow (Fullagar and Kelloway 2009). In a free play, children easily enter the flow state. However, in school it is often not the case, and therefore it is of great importance to encourage the state of flow in the classroom, on a regular basis. Proper and well-designed use of ICT in classroom could bring great benefit to child's well-being and the much needed, and rarely met, desire to have their attention fully engaged.

Conclusion

Some valuable insights were gained from the study. The obtained results have encouraged us to conduct a longitudinal study, so a larger perspective could be gained of the issues regarding pupils' opinion on the use of new technologies and learning methods.

The problem of boredom and attentional shift go far beyond the education context. Children get bored more frequently and more rapidly. Issues regarding impulsivity, cognitive control, attention, patience and delayed gratification must be understood in the light of the emerging problems. Although boredom, as such, could be beneficial (as a way of fostering creativity) and children should experience it, from time to time, it may be unbearable for those who are born and raised in an over-stimulating environment. Instead of perusing some creative action as a response to boredom, those children are highly frustrated by it.

The function of the school is to prepare a child for life and the education

system cannot allow itself to be excluded from general trends. It is the responsibility of the education system to go hand in hand with the child's nature and generational changes, especially those conditioned by the child's biological needs and physiology.

References

- Bearden, Lisa, William Spencer, and John Moracco. 1989. 'A Study of High School Dropouts.' *School Counselor* 37 (2): 113–120.
- Christakis, Dimitri, Frederick Zimmerman, David DiGiuseppe, and Carolyn McCarty. 2004. 'Early Television Exposure and Subsequent Attentional Problems in Children.' *Pediatrics* 113 (4): 708–713.
- Eastwood, John, Alexandra Frischen, Mark Fenske, and Daniel Smilek. 2012. 'The Unengaged Mind: Defining Boredom in Terms of Attention.' *Perspectives on Psychological Science* 7 (5): 482–495.
- Fullagar, Clive, and Kevein Kelloway. 2009. 'Flow at Work: An Experience Sampling Approach.' *Journal of Occupational and Organizational Psychology* 82 (3): 595–615.
- Goetz, Thomas, Reinhard Pekrun, Nathan Hall, and Ludwig Haag. 2006. 'Academic Emotions from a Social-Cognitive Perspective: Antecedents and Domain Specificity of Students' Affect in the Context of Latin Instruction.' *British Journal of Educational Psychology* 76 (2): 289–308.
- Hayles, Katherine. 2007. 'Hyper and Deep Attention: The Generational Divide in Cognitive Modes.' *Profession*, 187–199.
- Johnson, Steven. 2005. *Everything Bad Is Good for You: How Today's Popular Culture Is Actually Making Us Smarter*. New York: Riverhead.
- Merrifield, Colleen, and James Danckert. 2014. 'Characterizing the Psychophysiological Signature of Boredom.' *Experimental Brain Research* 232 (2): 481–491.
- Microsoft. 2015. 'Attention Spans Research Report.' <https://www.microsoft.com>
- Nett, Ulrike, Thomas Goetz, and Nathan Hall. 2011. 'Coping with Boredom in School: An Experience Sampling Perspective.' *Contemporary Educational Psychology* 36 (1): 49–59.
- Newberry, Angela, and Renae Duncan. 2001. 'Roles of Boredom and Life Goals in Juvenile Delinquency.' *Journal of Applied Social Psychology* 31 (3): 527–541.
- Perrin James, Sheila Bloom, and Steven Gortmaker. 2007. 'The Increase of Childhood Chronic Conditions in the United States.' *Jama* 297 (24): 2755–2759.
- Rajović, Ranko, Iva Rajović, Domen Kovačić, and Nika Dajčman. 2016. 'Descending Trend of Motor And Cognitive Abilities Of School Children.' In *Proceedings of 1st International Conference 'New Challenges in Education'*, 56–61. Novi Sad: Smart Production.
- Rogers, Kenneth. 2014. *The Attention Complex: Media, Archeology, Method*. New York: Springer.

- Sanders, Laura. 2017. 'Digital Minds: Are Smartphones Changing Our Brains?' <https://www.sciencenews.org/article/smartphones-may-be-changing-way-we-think>
- Sommer, Barbara. 1985. 'What's Different about Truants? A Comparison Study of Eighth-Graders.' *Journal of Youth and Adolescence* 14 (5): 411–422.
- Storm, Benjamin, Sean Stone, and Aaron Benjamin. 2017. 'Using the Internet to Access Information Inflates Future Use of the Internet to Access Other Information.' *Memory* 25 (6): 717–723.
- Wasson, Avtar. 1981. 'Susceptibility to Boredom and Deviant Behavior at School.' *Psychological Reports* 48 (3): 901–902.
- Wilson, Timothy, David Reinhard, Eron Westgate, Daniel Gilbert, Nicole Ellerbeck, Cheryl Hahn, Casey Brown, and Adi Shaked. 2014. 'Just Think: The Challenges of the Disengaged Mind.' *Science* 345 (6192): 75–77.
- Zakay, Dan. 2014. 'Psychological Time as Information: The Case of Boredom.' *Frontiers in Psychology* 5:917.

Potreba po uporabi IKT-a v učilnici kot odgovor na spremembo kognitivnega stila pri otrocih

Veliko strokovnjakov opozarja, da je prišlo do značilne reorientacije človeške pozornosti in generacijskega premika kognitivnega stila – od globoke do hiperpozornosti. Dolgčas, na katerega se pogosto gleda kot na bolezen modernega sveta, je ozko povezan z regulacijo pozornosti. V luči hitro spreminjajočega se okolja sledijo trajne spremembe kognitivnega stila in najverjetneje spremembe izbranega načina osvojitve znanja. Cilj tega raziskovanja je bil raziskati (1) trenutno mnenje šolskih otrok (5. in 6. razred) o njihovi naklonjenosti do šole, (2) časa, ki ga preživijo na pametnih telefonih/računalnikih, (3) njihov pristop k učenju in (4) potrebo po spremembi učnih metod. Zaključujemo s tem, da bi bili otroci zadovoljnejši s šolo in s svojimi dosežki, če se začne uporabljati dobro oblikovane IKT v učilnici.

Ključne besede: uporaba IKT, hiper pozornost, učna metoda, dolgčas, izobraževalni sistem