

Big Data: A Paradigm Shift in Education from Personal Autonomy to Conditioning toward Excessive Consumerism

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In the educational and psychological literature, researchers increasingly study the consequences of the young generation socializing through smartphones, tablets, and the Internet. The new technology fundamentally changes psychosocial and democratic structures. A person's data is the gold of the 21st century. The industry demands the right to 360° customer analytics, even including children. The transparent consumer, created by Big Data, is a prerequisite for stimulating consumer-based growth. Data mining is big business: the modern prospecting tools are smartphones and tablets. The hype of digital media covers up associated risks. Smart surveillance and the loss of privacy will become lodged in the subconscious mind and lead to conformity.

Critical voices point to the consequences for the healthy development of children associated with the use of digital media if started too early. Today measurable consequences show interference with brain development, risk of addiction, loss of the sense of reality and self control, and burnout. Educational institutions must consider these risks and develop educational concepts that show a path to media maturity instead of media dependency as promoted by industry.

Five key points for the use of digital media at schools have been developed that question current practices and suggest alternative educational approaches to media maturity.

Keywords: digital media, Big Data, privacy, consumer binge, stress, addiction, digital dementia, cognitive development, media maturity, electromagnetic pollution.

Introduction

Digital media - whether hardwired or mobile - is like a dream of humanity come true: limitless communication. And limitless is also its use: streetscapes, the quiet of a train ride, the setting and atmosphere at a restaurant, they all have changed. People hunch over small screens to look and swipe. In Antwerp, Belgium, special pedestrian walkways have been marked as "text walking lanes." As toys and educational tools, tablets have already made their way into pre-schools. How should we view these changes? From what

age should digital media-computers, tables, smartphones, and Wi-Fi - be used in the classroom? Do these devices lead to better learning outcomes, a modern education? The Internet, Google, social media, and e-learning generate a whole host of new risks, ranging from surveillance and personal data trading to addiction. As not to be sucked into the vortex of virtual risks, skills are needed whose development is a crucial part of education. What challenges do educational institutions face? First, let us have a quick look at two types of risks that apply to users of all age groups.

Data protection

By removing data protection and allowing the unlimited storage of digital profiles, the way people socialize and live together as well as the trust human interaction is based on have changed fundamentally. Smartphones make the perfect bugging device. Dozens of companies save each Google click and every Facebook entry to generated personal profiles or digital twins. By introducing digital devices and Wi-Fi networks to schools, surveillance now also extends to educational and school periods: a surveillance generation grows up. Every student in Germany, according to the federal government, shall receive a tablet PC (BT 2011: 3). Yielding to industry pressure, the right to generate digital profiles is said to be enshrined in the new EU data protection law. The Federation of German Industries (BDI) has this to say about Big Data: *"This kind of agent model [!] gains in importance because*

Zusammenfassung

Big Data: Der Wandel der Erziehung zur Konditionierung für den Wachstumswahn

Die pädagogische und psychologische Literatur setzt sich zunehmend mit den Folgen der Sozialisierung der jungen Generation durch Smartphone, Tablet-PC und Internet auseinander. Noch nie hat eine neue Technik so fundamental psychosoziale und demokratische Strukturen verändert. Erstmals kann der gläserne Bürger geschaffen werden. Daten sind das Gold des 21. Jahrhunderts. Das Data-Mining boomt, die mobilen Schürfwerkzeuge sind Smartphones und Tablets. Der Schutz der Privatsphäre weicht einer smarten Überwachung. Die Industrie fordert das Recht auf die 360 Grad-Kundenanalyse, bereits bei Kindern. Der gläserne Konsument, erschaffen durch Big Data, ist eine Bedingung für das Anheizen des konsumorientierten Wachstums. Der Hype der digitalen Medien verdeckt ihre Risiken. Die smarte Überwachung und die Aufhebung der Privatsphäre werden sich im Unter-Bewusstsein festsetzen und zum Konformismus führen. Die kritische Literatur weist auf die Folgen der zu frühen Nutzung digitaler Medien für die gesunde Entwicklung der Kinder hin. Bereits messbare Folgen sind Störungen der Gehirnentwicklung, Suchtgefahr, Realitätsverlust, Verlust der Selbstkontrolle und Burn-Out. Die Bildungsinstitutionen müssen sich frei vom Druck der Industrie machen, diese Risiken beachten und Konzepte einer Erziehung entwickeln, die statt in die von der Industrie geplante Medienabhängigkeit den Weg zur Medienmündigkeit ebnen. Fünf Thesen für die Nutzung digitaler Medien an Schulen werden entwickelt, die die derzeitige Praxis in Frage stellen und Alternativen für eine Erziehung zur Medienmündigkeit vorschlagen.

Schlüsselwörter: Digitale Medien, Big Data, Privatsphäre, Konsumrausch, Stress, Sucht, Digitale Demenz, kognitive Entwicklung, Medienmündigkeit, Elektrosmog.

empirical knowledge about customers and their needs have tremendous value. The goal is to gain direct access to customers...to gain control over the customer interface, in the same way as Google, for example, has done successfully with Android for mobile devices. On the basis of these data, companies are better prepared to make predictions and decisions" (RB & BDI 2015: 8). Creating needs to consume, controlling this consumption, and monitoring wants are all prerequisites for increasing production and sales. This also requires data to be gathered where present and future customers socialize, that is, at preschools, kindergartens, and schools. At the mercy of algorithms, transparent consumers can be controlled and manipulated. The so-called digitization of education is part of an overall transformational strategy to implement Industry 4.0, the fourth industrial revolution.

Our children grow up under data-gathering conditions, which dwarf Orwell's surveillance society. Heribert Prantl describes an essential consequence: *"Anybody who is under surveillance will conform. Privacy will disappear. And, in turn, the free expression of ideas will also disappear. The power of surveillance causes people to take themselves prisoner" (PRANTL 2015: 57).*

This type of smart dictatorship insidiously transforms our society, our educational system, and our mental state (HAN 2014, THIEDE 2015). We cannot suppress surveillance, but it then becomes part of the collective superego: *"We thereby enter an era of self-chosen dependence - in a sense a childhood that lasts throughout life. Big Brother turns into Big Mother who cares for us and makes complex decisions for us. A little less prosaic: We are mothered by a surveillance apparatus. In the psychological discussion about such a system's impact on society, the term "apathy" features quite frequently. This collateral damage must be considered,"* writes the Swiss Think Tank GDI (Gottlieb Duttweiler Institut) (CELKO 2008).

The association between the pressure to perform, consumerism, Big Data, the elimination of privacy, and the ever increasing rate of the "collateral damage" called burnout, Prof. Schulte-Markwort, director of the Adolescent Psychiatric Clinic at the University of Hamburg, analyzes as follows: *"The secret to the success of Facebook and Co. is that people throughout the world disclose their personal data and habits so that they can be enticed even more effectively to buy products. Within the framework of Big Data analyses, the future buying behavior of individuals can be predicted with rather great accuracy today. With their market dynamics and commitment to growth, these laws of a maximized money society put huge pressure on people... A significant group of children and adolescents...are unable to cope with their everyday lives under such pressure and, as a result, burn out earlier and earlier" (SCHULTE-MARKWORT 2015:148).*

Children grow up in this climate of pressure and it is this background against which the educational discussion on digital media must be assessed; otherwise, this discussion will be

reduced to the formal principles of teaching. Students under surveillance and manipulated by Google cannot develop free, critical, and creative minds.

Radiation protection

Smartphones and tablets are used close to the body; the apps almost constantly transmit and receive data via microwave radiation. The scientific evidence regarding the effects of electromagnetic Wi-Fi fields (at 2450 MHz), which very often are used especially in school settings, is clear: The findings of 52 research papers document that Wi-Fi exposure may lead to concentration disorders, headaches, fatigue, ADHD, sleep disorders, sperm damage, and even DNA breaks, which ultimately may lead to cancer (BLANK 2014: 217, DIAGNOSE-FUNK 2013, SCHELER & KRAUSE 2015). In a meta-analysis regarding Wi-Fi, the authors point out that especially low-level Wi-Fi radiation exposure is harmful to human health (NAZIROGLU & AKMAN 2014: 2435).

Based on this body of research evidence, introducing Wi-Fi-enabled learning tools at schools would be a decision against one's better judgment, especially when considering that an alternative technology to Wi-Fi in the form of Visible Light Communication or VLC will shortly become commercially available. Schools should wait for this technological progress and initiate pilot projects now (HHI 2015).

Key skills for media maturity

Yet risks are ignored. Parents and educational institutions fear that their children might miss the boat to the future if they do not get an early start on how to use smartphones and tablets, preferably at preschool. On the surface, this sounds logical. But only on the surface because the reverse is actually true as demonstrated by media scholars and brain researchers (among others: BLECKMANN 2012, BUERMANN 2007, KORTE 2010, LEIPNER & LEMBKE 2015, RENZ-POLSTER & HÜTHER 2013, SPITZER 2012). When those growing up - children and adolescents up to about the age of 16 - are exposed too early to digital media and the virtual world, they will not turn into autonomous adults because the use of these devices greatly interferes with the healthy brain development of children. The above-mentioned authors concurrently agree on the assertion that media maturity starts with media abstinence.

This theory does not polarize for or against digital media, but it is about "when" to introduce or use it? Upon entering adulthood, adolescents have to be in control of media so that media will not control them. With all the hype on media, it has often been overlooked that this requires important key skills, which are not going to be developed when media use starts too early (RENZ-POLSTER & HÜTHER 2013: 159). Diverse sensory perceptions are necessary for the maturation

and growth of the human brain and self-awareness: sight, hearing, taste, smell, touch, gravity, proprioception, and the sense of balance. To connect experience and knowledge, all eight senses are needed. This is called sensorimotor integration (BLECKMANN 2012), which is the basis of healthy brain development and successful learning. For this to occur, however, intimate contact with the environment and nature as well as close social connections to other people are imperative. Sensory experiences made through being active, experiences of self-efficacy acquired by trial and error, and self-control learned in childhood, in turn, are the basis of developing skills and competences that provide a compass to finding one's way in the real world: analytical reading skills, language skills, information competence, self-reflection and reflection on others, self-control, ability to take criticism, self-awareness, productive competence, and social competence.

These are the exact skills and competences required to develop media maturity. Children and adolescents need to be rooted in reality before being exposed to the virtual reality of digital media; otherwise, they run the risk of being caught in the Net, conditioned to become consumers. The human brain develops better when there is no tablet or smartphone that prevents it from engaging with the real world. We need digital free zones up to and including elementary school so that children can have learning experiences that match their cognitive development (LEIPNER & LEMBKE 2015: 8).

The digitization of everything natural

To ensure that children and adolescents do not drown in a flood of Internet data, they must learn to evaluate information and to separate the important from the unimportant. Only at the formal operational stage - according to Piaget from the age of twelve - has cognitive development reached the level at which a person can cut through information and stimulation overload (LEIPNER & LEMBKE 2015: 155). When digital devices are used too early, the development of the skills required to handle these devices is actually suppressed: We then have students with developmental deficits whose skills are reduced to swipe, click, and thumb. Their senses are limited to two dimensions.

What exactly is suppressed then? The average screen time of more than eight hours these days prevents users from gaining experience in the real world. Pany writes about the findings of his study: *"What chances do environmental protection, biodiversity, and respect of the biosphere have when the youngest children are already glued to electronic media and do not climb trees anymore, when their roaming radius has declined by 90% since the 1970s? When only about a third (36%) of the children between eight and twelve years play outside the home once a week, when only every fifth child knows how to climb a tree, and when every tenth child is convinced that cows hibernate"* (PANY 2010).

Especially children who grow up in the city are cheated out of these experiences by their media consumption. Everything natural is digitized. What is lost most of all is the cognitive ability to construct knowledge independently when computers explain how the world works, when algorithms take over education. They churn out profile-based consumer and fashion worlds, movie and Red Bull illusions. The teenagers' run on Primark fashion outlets is the result of such manipulation. Primark does not advertise for its low-cost, slave labor-produced clothing via print media or TV, but via bloggers in social media and on YouTube directly on the smartphone.

Information overload in the brain

The real world cannot be discovered by virtual means. The beautiful word "grasp" puts it aptly: *"The way we learn something determines the way the learned content is stored in the brain. The digital way of discovering the world with the click of a mouse has thus been shown to clearly impair brain formation"* (SPITZER 2012: 179). Digital media block the dynamic phase of brain maturation since before the age of twelve the brain is not up to the task of dealing with digital media. Why then are children crazy for digital media, the brain researchers Prof. Gertraud Teuchert-Noodt asks. Her answer:

"Children are basically forced to be all crazy over tablets and the like. The digital fireworks of fast videos and colorful animations trigger a flood of stimulation that swamps the hippocampus. The reward system goes haywire and pathologically distorted frequencies are fired constantly, thereby completely overwhelming the brain stem. Certain modules probably mature too fast and inadequately (premature formation!). And all of this occurs at an age at which the brain stem is not even close to being able to exert the necessary control over cognitive conflicts. Like a traumatic event, this stupor will affect the frontal lobes when additional negative factors come into play. In the development of the brain, this is a disaster beyond all expectations" (LEIPNER & LEMBKE 2015: 229). Teuchert-Noodt speaks of brain arrhythmias that manifest themselves as headaches, concentration disorders, and sleep disorders. The consequences of this kind of chronic media stress may lead to hyperactivity in children. Statistics of the German health insurance companies confirm that the incidence of these symptoms shows a considerable increase.

Changes in language, spelling, and reading skills

Language, spelling, and reading skills are essential to the processing depth with which knowledge can be stored. Every teacher knows how important these skills are for successful learning in all other subjects. Yet especially in this area, we observe a negative trend. The trend to phase out handwriting

lessons, as seen in Finland, in favor of typing lessons is alarming. While reading a book, the reader becomes "absorbed" in its contents; printed books teach us linearity and calm attention which lead to association and knowledge. Reading is on the decline: In 1992, still 50% of all parents read to their children; in 2007, this number had dropped to only 25%. The percentage of nonreaders among children who never pick up a book was at 7% in 2005, already at 17% in 2007, and already 25% in 2015 (MPFS 2013, 2014). Despite the adverse effects having been observed in research projects, textbooks are being replaced by tablets today (SPITZER 2015a). In an interview, Prof. Gerald Lembke, director of digital media at the Duale Hochschule Baden-Württemberg Mannheim, reports: *"Web pages only show a segment of a text; two thirds of the readers do not even scroll down or up anymore as has been demonstrated in studies. The result: articles displayed on a screen are only partially read or skimmed"* (KOHLMAYER 2015).

The development goes toward a superficial digital world. Users "surf" the net, only superficially surveying its content. Research shows that screen reading interrupted by hyperlinks and multitasking causes readers to retain less of the complex content; the ability to concentrate and memory retention declines (CARR 2013: 147, KORTE 2014: 3, SPITZER 2014b: 164).

Another key aspect: the different way of communicating delays language development. Young children are negatively affected by playing and learning with screens because the process of hearing is separated from the speaker and the associated body language, separated from the situational context, facial expression, inflection, ambiguity, irony, warmth, and coldness. Empathy—one of the most important virtues of social skills—cannot be developed this way. This development continues into adolescence: face-to-face communication is often replaced by virtual communication. Between 1987 and 2007, social interaction of children dropped from six hours to two hours daily, while the time for using electronic media increased from four to eight hours; and with the use of smartphones, the latter continues to increase (SIGMAN 2012). As a result, human relationships become more superficial; this, in turn, has an impact on the brain. The use of digital social media such as Facebook, which is associated with less face-to-face time, leads to a smaller size of social brain regions in children and thus less social skills. Prof. Manfred Spitzer writes that *"the largest longitudinal study to date with more than 4000 young people has shown a clear association between screen use and a lack of empathy for parents and friends. Not only the effect but also the effect mechanism has been the focus of intense research efforts over the last three years. For the first time, a study on monkeys in the journal Science could demonstrate that brain modules responsible for social behavior grow due to social interaction and we now have even similar evidence for humans: the size of an essential social module of the orbitofrontal cortex correlates with the size of a person's circle of friends."* (SPITZER 2015b).

Social skills, however, are a primary learning goal. They can only be developed through real encounters in social settings, associations, at preschool, with fellow students and teachers. Teachers and educators play a central role in this context. The e-learning concepts, which surely will follow the introduction of digital media, will reduce the teacher to be a coach; in the long run, this is even economically desirable. 'Schule ohne Lehrer' [School Without Teachers] is the prescient title of a book by the teacher Arne Ulbricht. Prof. Gerald Lembke, president of the Bundesverband für Medien und Marketing [Federal Media and Marketing Association] in Germany, writes that the Internet will turn into a pseudo teacher: "We therefore demand that classrooms shall be digital free zones so that real social interaction can occur. Young people need social interaction on a daily basis to grow into healthy adults—without mental defects!" (LEIPNER & LEMBKE 2015: 37).

Reaching 150 times for their smartphone - The stress and addiction factor multitasking

Digital humans of today are joined at the hip with their smartphone: it guides, captivates, and controls its user; it manipulates and dictates the user's adapted behavior. When teenagers arrive with their parents at a farm in a rural area, their first question will be: Is wireless reception available here? If not, they are plunged into a deep crisis. The reward and social reference system is missing. To adolescents, going offline means missing out, feeling isolated. It does not matter where you go on vacation as long as an online connection is part of it. While observing adolescents and adults at restaurants, one often has the impression that smartphones are meeting there. FOMO, Fear of Missing Out, is the name for this new state of fear, that is, the fear of being socially isolated when not being able to respond in real time (BLANK 2014: 194, DOSSEY 2014).

Schulte-Markwort describes this continuous stress factor as online stress: "This structure is supported by the fact that our digital families try very hard to keep pace with the rest of the world, at high speed and under extreme pressure. While parents and children fight over the correct use of smartphones, tablets, and PCs, their data have long been sold without ever having been reimbursed for them. The signatures of our digital world and the world of media are lightning speed and voyeurism. We are under surveillance. In this voyeuristic exhibition of one's own intimacy and the eager watching of and commenting on images of others, an atmosphere is created in which we turn into rushed narcissists. The modern narcissist is in search of his own perfect image, which he will never reach, which he cannot reach. The narcissist—no matter whether male or female—rushes through the vast and ominous world

and cannot find any rest, let alone him- or herself. In addition, we are all out of breath because we must not miss any message from one another" (SCHULTE-MARKWORT 2015: 217).

Due to internalizing the demands of an achievement-based society and being exposed to continuous digital stress, now every fourth child of elementary school age already complains about headaches or abdominal pain, sleep disorders or a lack of appetite (KORTE 2010: 148). Spitzer also sees a clear connection: "Studies show a clear connection between the use of digital media, on the one hand, and the incidence of stress and depression, on the other hand. Chronic stress due to a lack of control over one's own life not only triggers a low immune defense, hormone disorders, as well as impairments of the digestive, muscle, and cardiovascular system, but also causes nerve cells in the brain to die" (SPITZER 2014c).

Media educational theory must not ignore this overall social analysis and its consequences for the children. Any discussion of this issue is often blocked with the argument of a "lack of alternatives" to progress. The role of digital media is reduced to questions of didactics and usefulness. This type of pragmatism leads to adapting to a fully economy-based system, thereby contributing to perfecting its processes and enhancing the pathological state of society even further: "The concept of family presents itself as a postmodern factory that disposes off all those who cannot keep pace at this accelerated speed. And these quality-assured and triple-controlled processes are helped along by the innate high speed of our digital world, whereby slowness, thoughtfulness, or even pausing for only a moment is identified as an interference variable. And then, there is the pressure at school...where the world of a child is bombarded from all sides until the child itself is overwhelmed. The pressure becomes too high and the name of the relief valve is called burnout. In our society, there does not seem to be any change or willingness to reflect on this issue at the horizon that would be open to or capable of adjusting this bombardment and creating a warm atmosphere in which emotional and cognitive learning and life processes can unfold and be maintained. Let us change this" (SCHULTE-MARKWORT 2015: 91).

Some media education experts will now argue that we could make a change by simply running both nature and social education and digital education in parallel. However, this usually fails in practice. Continuous media use is in itself a stressor; technology develops its own laws. Digital media cannibalizes time. To be able to manage all tasks, multitasking is the way out: while doing homework, students tweet, mail, send WhatsApp messages, and listen to music all at the same time. Trying to do several tasks at once exacerbates stress. According to a study by the smartphone manufacturer Nokia, young people use their smartphone on average 150 times per day, that is, the user interrupts his or her work on average every six minutes. The ability to focus on a single subject gets lost.

This is an effective way of developing attention deficit disorder because, when under stress of a constant flow of data and multitasking, information is not transferred from the working memory to the long-term memory. *“What children learn at school in the morning and process during homework will only be stored in the long-term memory over the next twelve hours”* (KORTE 2010: 274). The rest and processing phases required for long-term information storage do not exist in this world of constant communication anymore. Seventy-three percent of 18- to 24-year-olds pull the smartphone out of their pocket when they have nothing else to do (DRÖSSER 2015). Moments of creative boredom or reflecting on meanings, which often is a source of new ideas, is suppressed. In the old days, when children still played and horsed about during recess, the brain was given time to process information, but in this era of smartphones data flow and information overload are continuous. The brain researcher Martin Korte observes that, *“when people constantly use many media simultaneously, that is, when they look at their smartphone and, at the same time, surf across social networks, monitor their e-mail accounts, and even try doing their homework on the side, their working memory is not exercised in these situations... The working memory works like this: when we constantly do many things at the same time, we will get worse at doing many things at the same time. We will become easily distracted, especially in situations in which we cannot do otherwise but multitask”* (KORTE 2014: 3). As a result, the flood of information does not turn into knowledge that is stored in the long-term memory, but the information stays on the surface as acquired facts. Learning is prevented. When children start consuming media too early, the very skills required to control the use of media are suppressed. It is quite amazing what radical action Gerald Lembke has taken for his students: *“I have done away with computers in the study courses on digital media at the university. Laptops remain closed during lectures when the lecturer asks the students to do so, and students can access the computer lab only upon request”* (KOHLEMAIER 2015).

Digital junkies

In his book *Digital Junkies*, the psychiatrist and media therapist Bert te Wildt refers to the smartphone as an addictive substance and starter drug. Te Wildt estimates the number of addicts and those at risk of addiction at five million in Germany alone. Reward mechanisms deliberately integrated into these devices chain their users to them, shutting off any self-control. Multitasking is an addiction factor as well: *“Our concentration training goes wrong. Instead of exercising to focus our attention on one subject, we train ourselves to be attentive for only a short moment and to look at something else immediately. But this also means: since the brain is rewarded in each of its channels from time to time—by receiving a reply to an e-mail or being the first one to hear about a news—this is perceived as a reward and may lead to an increased risk of addiction”* (KORTE 2014: 4).

According to a study by the Bank of America, the worldwide number of cell phone addicts has increased from the second quarter of 2014 to the second quarter of 2015 by 59%, from worldwide 176 million to 280 million users (KHALAF 2015).

In the leading country of digital device use South Korea, the numbers of smartphone addiction have dramatically increased over only one year: from about more than 10% to almost 20% in 10- to 19-year-olds. In South Korea, the government has tried to counteract this development with launching the 1-1-1 awareness campaign, which recommends that teenagers power off their smartphone for one hour one day a week (SPITZER 2014a). The government of South Korea estimates that up to 30% of the 18-year-olds belong to this risk group. To tackle this problem, there are now more than 200 therapy centers and hospitals with more than a 1000 psychological counselors (trained in Internet addiction) that offer free treatments to those affected (DOSSEY 2014). All signs point to a similar development in Germany. The findings of the project BLIKK-Medien support this observation: *“More than 60% of the 9- to 10-year-old children can keep themselves occupied without the use of digital media for less than 30 minutes”* (DROGENBEAUFTRAGTE 2015).

Better learning?

The myth that digital media would lead to successful learning seems to persist. For whose benefit? Lembke says: *“Research findings give us clear answers: Children need to be strongly rooted in reality before they embark on virtual adventures. Their brain develops better when there is no tablet or smartphone to prevent them from making experiences in the real world...Primarily, this is about a multibillion dollar market for the IT industry; educational concepts serve mainly as a pretext”* (LEIPNER & LEMBKE 2015: 8, 9). This is a market that promises ca. 7.2 billion euros in sales during the current introductory phase in Germany (LEIPNER & LEMBKE 2015: 187).

Let us take a look at an example here. The German Federal Ministry of Science and Research, the European Union, and the Deutsche Telekom AG sponsored a large study called *“Schulen ans Netz. 1000 mal 1000: Notebooks im Schulranzen”* [Schools on the Web. 1000 times 1000: Notebooks in the Backpack] (SCHAUMBURG et al. 2007). The finding: neither better grades nor better learning behavior of the students. It says in the final report:

- *“Overall, the study cannot provide clear evidence that the use of notebooks would generally improve performance and skills as well as positive learning behavior of students”* (p. 120).
- And the study found *“that the students with notebooks in class tended to be less attentive”* (p. 124).

In 2007, the mayor of Birmingham in the US state of Alabama wanted to do something special for the students most at risk and distributed 15,000 notebooks. In 2011, this large-scale test was canceled because the performance of those students with notebooks was much worse than those without notebooks (SPITZER 2015b). After reviewing the global body of research, Spitzer comes to the following conclusion: *"After acquiring a laptop and gaining access to the Internet, school grades dropped"* (SPITZER 2012: 70, -89). In ignorance of educational research findings, governments decide to introduce digital media after all. Media Professor Ralf Lankau (Offenburg) uses very clear language: *"Thus we better call things by their proper names: There is no valid professional or subject-didactic or educational reason to use digital media and tools in the classroom. The only ones for whom the use of digital technology and media at schools (and universities) is of real importance are the distributors of hardware and software who can increase their profits by constantly updating IT products and services at public schools"* (LANKAU 2015).

Economic usability must not dominate education

The IT industry is not interested in education, but in present and future customers. The so-called digitization of education is driven by industry. The digitally interconnected platform Industry 4.0 requires complete data collection of all citizens, starting as early as infancy. In the Google roman à clef *The Circle*, the author says about the company's goals: *"The actual buying habits of actual people were now eminently mappable and measurable, and the marketing to those actual people could be done with surgical precision"* (EGGERS 2013: 22). New children's toys such as Hello Barbie dolls are like spies in a child's room. They monitor the dialogs and behavior of children, transmitting all this information back to the manufacturer via Wi-Fi (BOIE 2015). There is no boundary of shame. Manufacturers will start with babies, the German IT industry trade association BITKOM predicts: *"The broad range [of data-infused products] will continue to grow in the coming years. Thus, we can assume that with lower prices for these technologies, soon strollers...will also be equipped"* (BITKOM 2015: 116). The high-tech stroller with built-in Wi-Fi will monitor the number of sounds a baby makes, her cries, laughter, facial expressions, and body temperature. Via remote servicing, the mother can view the current status update on the display of her smartphone, while following her other digital activities. And the matching pharmaceutical products, baby foods, or digital toys are recommended in real time. According to the brain researcher Gerald Hüther, "a self-organized childhood" falls by the wayside in this process: *"With the attempt to recruit their combat team for a globalized competition already at preschool, the initiators simply forgot how children actually learn"* (RENZ-POLSTER & HÜTHER 2013: 101, 207).

Educational policies must not become the gate opener for the commercial interests of the industry; rather, it must be the mission of education to help children develop immunity against the latter. Media competence is not a question of technical skills—to which it is often reduced—but the ability for abstraction, reflection, and self-reflection, including civic education; this is about media maturity. For this to occur, however, school boards have to develop educational concepts that consider the cognitive development of children and then determine at which age what dosage is not a poison, but a supportive tool—without any pressure from industry. Every medium has its own time.

The educational record

When children and adolescents perceive the world mostly in digital formats, reduced to two senses, played back by Google, and swamped with multimedia and advertising as early as preschool and elementary school age, healthy brain development becomes impaired and sensorimotor perceptions and basic skills will not be developed. This is like starting to build a home on the third floor—without a foundation. The social environment becomes limited, mental depth is replaced by shallowness. The overstimulation prevents self-control and triggers stress. As a result, world-views become limited and selective and human beings are conditioned for consumption. Spitzer refers to this mental state as "digital dementia." After all, we would like to have adolescents who are capable of shaping the future:

"Learning must have as a goal to promote creative thinking. This type of thinking focuses on finding your own answers and critically examining answers offered by others" (ANSARI 2013: 13).

This is not a simple task when faced with powerful media corporations as well as the new possibilities of surveillance and manipulation. Due to Big Data, the prerogative of interpretation lies more than ever with them because smartphones and tablets allow them direct access into the heads of children and adolescents. The industry and its algorithms control the smartphone users. Parents and educational institutions lose control. The loss of control means stress. Should schools be integrated into this system of utilization, data collection, and stress at this time? We must get involved and demand educational concepts that – instead of media dependency - pave a way for media maturity.

From this current core debate about the direction of education policy, five key points emerge:

1. Digital and wireless media must only be introduced if two legal matters are regulated:

A specific data protection law for children and adolescents must be issued, for example, based on the Children's Online Privacy Protection Act (COPPA) that regulates the tracking and storing of data of children below the age of 13 (FTC 2012) in the US.

The precautionary principle¹ must be applied and resulting protective measures to minimize the children's exposure to radiation must be defined. Any conclusions should be based on an independent assessment of the currently available evidence regarding biological effects of nonionizing radiation sources, especially WLAN or Wi-Fi, but also other frequencies such as GSM, UMTS, and LTE. Radiation protection means: hardwired connections of digital media are given preference and new optical technologies such as Visible Light Communication (VLC, Li-Fi) are supported.²

2. Children and adolescents need to be rooted in reality before being exposed to the virtual reality of digital media. Their brains develop better when there is no tablet or smartphone that prevents them from engaging with the real world. We need digital free zones up to and including elementary school so that children can have learning experiences that match their cognitive development.

3. From the age of 12, digital media can be introduced as supportive tools - one step at a time. Students must know their

benefits and their risks. Media maturity is an essential part of media competence. Both are necessary so that young adults can use media confidently at school, university, and later in working life, without having to be stressed out or manipulated by them.

4. For introducing digital media to schools, education authorities must develop educational concepts that consider the body of evidence in brain research and the psychology of learning as well as respect the rights of children to a natural development. Education programs must not be rewritten to allow for the economic usability of children, to condition them to follow the ideology of higher, faster, better, and consumerism.

5. At this Internet age, the high stakes and risks call for teachers who are sensitive to these issues. It is critical that we invest in more teachers and smaller class sizes instead of handing new billion dollar sales on a silver platter to the IT industry.

(1) In the declaration of the UN Conference on Environment and Development (UNCED) at Rio in 1992, the precautionary principle was specified in Chapter 35 Paragraph 3 of Agenda 21: "In the face of threats of irreversible environmental damage, lack of full scientific understanding should not be an excuse for postponing actions which are justified in their own right. The precautionary approach could provide a basis for policies relating to complex systems that are not yet fully understood and whose consequences of disturbances cannot yet be predicted" (quote taken from: <https://sustainabledevelopment.un.org/outcomedocuments/agenda21>).

(2) The Fraunhofer Heinrich Hertz Institute (HHI) in Berlin has developed a VLC-based data transmission technology that uses indoor lighting systems with commercially available LED lamps that have a microchip embedded as a data carrier for the wireless communication (HHI 2015). The hazardous microwave radiation technologies of current wireless communication networks could be replaced by it. First pilot projects with VLC are already being carried out.

References

- ANSARI, S. (2013): *Rettet die Neugier. Gegen die Akademisierung der Kindheit*, Krüger Fischer, Frankfurt.
- BITKOM - BUNDESVERBAND INFORMATIONSWIRTSCHAFT, TELEKOMMUNIKATION UND NEUE MEDIEN (2015): *Big Data und Geschäftsmodell-Innovationen in der Praxis: 40+ Beispiele, Leitfaden*, Berlin.
- BLANK, M. (2014): *Overpowered. What science tell us about the dangers of cell phones and other WiFi devices*, Seven Stories Press, New York.
- BLECKMANN, P. (2012): *Medienmündig. Wie unsere Kinder selbstbestimmt mit dem Bildschirm umgehen lernen*, Klett-Cotta, Stuttgart.
- BOIE, J. (2015): *Lauschangriff im Kinderzimmer. Ich will eure Stimme hören*, Süddeutsche Zeitung, 18.04.2015.
- BUERMANN, U. (2007): *Aufrecht durch die Medien: Chancen und Gefahren des Informationszeitalters und die neuen Aufgaben der Pädagogik*, Flensburger Hefte Verlag, Flensburg.
- BT - DEUTSCHER BUNDESTAG (2011): *Medienkompetenz. Zweiter Zwischenbericht der Enquete- Kommission „Internet und digitale Gesellschaft“*, Drucksache 17/7286, 21.10.2011, Berlin [http://dipbt.bundestag.de/dip21/btd/17/072/1707286.pdf, accessed on 7.7.2015].
- CARR, N. (2013): *Surfen im Seichten. Was das Internet mit unserem Gehirn anstellt*, Pantheon, München.
- CELKO, M. (2008): *Hyperlocality: Die Neuschöpfung der Wirklichkeit*, GDI Impuls 2.
- DIAGNOSE-FUNK (ed) (2013): *Tablet-PCs und andere WLAN-Geräte: Ein Bildungs- und Gesundheitsrisiko für Kinder und Jugendliche*, Stuttgart.
- DOSSEY, L (2014) *FOMO, Digitale Demenz und unser gefährliches Experiment*. Diagnose-Funk e.V., Stuttgart.
- DRÖSSER, C. (2015): *Wie jetzt? Die Gedanken schweifen lassen? Das Smartphone als Dauerunterhalter verhindert einen hochproduktiven Geisteszustand: Die Langeweile*, DIE ZEIT No. 13 from 26.3.15: 38.
- DROGENBEAUFTRAGTE (2015): *Kinder und Jugendliche in der digitalen Welt stärken – Erste Ergebnisse des Projekts BLIKK-Medien vorgestellt*, Pressemitteilung, 16.7.2015, Die Drogenbeauftragte der Bundesregierung im Bundesministerium für Gesundheit, Berlin [http://www.drogenbeauftragte.de/presse/pressemitteilung-2015-03/erste-ergebnisse-des-projekts-blikk-medien.html, accessed on 23.7.2015].
- EGGERS, D. (2013): *The Circle*, Alfred A. Knopf & Alfred A. Knopf, Canada, and McSweeney's Books, San Francisco.
- FTC – FEDERAL TRADE COMMISSION (2013): *Children's Online Privacy Protection Rule („Coppa“)*, Children's Online Privacy Protection Act of 1998 [http://www.coppa.org/coppa.htm, accessed on 21.06.2015].
- HAN, B.-C. (2014): *Psychopolitik: Neoliberalismus und die neuen Machttechniken*, Fischer Verlag, Frankfurt.
- HHI - FRAUNHOFER HEINRICH HERTZ INSTITUT (2015): *Photonic Networks and Systems, Optical Wireless Communication*, Berlin [http://www.hhi.fraunhofer.de/departments/photonic-networks-and-systems/research-topics/optical-indoor-networks/optical-wireless-communication.html, accessed on 7.7.2015].
- KHALAF, S. (2015): *Mobile Addicts Multiply Across the Globe*, July 15, 2015, Flurry insights blog, Flurry, Sunnyvale CA, USA: http://flurrymobile.tumblr.com/?soc_src=mail&soc_trk=ma, accessed on 23.7.2015].
- KOHLMAIER, M. (2015): *„Raus mit den Computern“*, Interview mit Prof. Gerald Lembke, Süddeutsche Zeitung from 24.3.2015.
- KORTE, M. (2010) *Wie Kinder heute lernen*, Goldmann, Random House, München. KORTE, M. (2014): *Synapsenstärkung im neuronalen Dschungel. Lernen und Hirnforschung*, SWR Wissen, broadcast on 06.07.201 [http://www.swr.de/swr2/programm/sendungen/wissen/synapsenstaerkung-im-neuronalen-dschungel/-/id=660374/did=13458446/nid=660374/15xaqt6/index.html, accessed on 7.7.2015].
- LANKAU, R. (2015): *Unter dem Joch der Digitalisten*, Frankfurter Allgemeine Zeitung from 9.4.2015.
- LEIPNER, I., LEMBKE, G. (2015): *Die Lüge der digitalen Bildung*, Redline Wirtschaft, München.
- MPFS - MEDIENPÄDAGOGISCHER FORSCHUNGSBUND SÜDWEST (ed) (2013): *JIM-Studie 2014: Jugend, Information, (Multi-) Media*, Stuttgart [http://www.mpfs.de/fileadmin/JIM-pdf13/JIMStudie2013.pdf, accessed on: 7.7.2015].
- MPFS - MEDIENPÄDAGOGISCHER FORSCHUNGSBUND SÜDWEST (ed) (2014): *JIM-Studie 2014: Jugend, Information, (Multi-) Media*, Stuttgart [http://www.mpfs.de/fileadmin/JIM-pdf14/JIM-Studie_2014.pdf, accessed on 7.7.2015].
- NAZIROGLU, M., AKMAN, H. (2014): *Effects of Cellular Phone - and Wi-Fi - Induced Electromagnetic Radiation on Oxidative Stress and Molecular Pathways in Brain*, in: LAHER, I. (ed): *Systems Biology of Free Radicals and Antioxidants*, Springer, Berlin- Heidelberg: 2431-2449.
- PANY, T. (2010): *Natur-Defizit-Syndrom*, heise online, 18.8.2010, [http://www.heise.de/tp/blogs/6/148220, accessed on 30.6.2014].
- PRANTL, H. (2015): *Bürger unter Generalverdacht*, Edition Le Monde diplomatique No. 16.
- RB – ROLAND BERGER STRATEGY CONSULTANTS, BDI – BUNDESVERBAND DER DEUTSCHEN INDUSTRIE (2015): *Analysen zur Studie: Die digitale Transformation der Industrie*, München [http://www.rolandberger.de/media/pdf/Roland_Berger_Analysen_zur_Studie_Digitale_Transformation_20150317.pdf, accessed on 7.7.2015].

RENZ-POLSTER, H., HÜTHER, G. (2013): *Wie Kinder heute wachsen*, Beltz Verlag, Weinheim.

SCHAUMBURG, H., PRASSE, D., TSCHACKERT, K., BLÖMEKE, S. (2007): *Lernen in Notebook-Klassen. Endbericht zur Evaluation des Projekts „1000mal1000: Notebooks im Schulranzen“*; Schulen ans Netz e.V., Bonn.

SCHELER, K., KRAUSE, G. (2015): *Vorsicht WLAN!*, Ratgeber Elektromog 3, Diagnose Funk, Stuttgart.

SCHULTE-MARKWORT, M. (2015): *Burn-out Kids. Wie das Prinzip Leistung unsere Kinder überfordert*, Pattloch, München.

SIGMAN, A. (2012): *Setting Children up for Screen Dependency: Causes and Prevention*, Paper presented at the 1st International Conference on Technology Addiction, Istanbul.

SPITZER, M. (2012): *Die digitale Demenz. Wie wir uns und unsere Kinder um den Verstand bringen*, Droemer Knauer, München.

SPITZER, M. (2014a): *Editorial: Smartphones. Zu Risiken und Nebenwirkungen für Bildung, Sozialverhalten und Gesundheit*, *Nervenheilkunde* 33(1-2): 9-15 [<http://www.schattauer.de/de/magazine/uebersicht/zeitschriften-a-z/nervenheilkunde/inhalt/archiv/issue/1828/manuscript/20740/show.html>, accessed on 7.7.2015].

SPITZER, M. (2014b): *Rotkäppchen und der Stress, (Ent-)Spannendes aus der Gehirnforschung*, Schattauer, Stuttgart.

SPITZER, M. (2014c): *Digitale Demenz - Zu Risiken und Nebenwirkungen Digitaler Medien*; in: TEUFEL, E., MACK, W. (ed) (2014): *Aus der Krise lernen*, Herder, Freiburg.

SPITZER, M. (2015a): *Editorial: Digital genial? Mit dem „Ende der Kreidezeit“ bleibt das Denken auf der Strecke*, *Nervenheilkunde* 34(1-2): 9-16 [<http://www.schattauer.de/de/magazine/uebersicht/zeitschriften-a-z/nervenheilkunde/inhalt/archiv/issue/2175/manuscript/23940/show.html>, accessed on: 7.7.2015].

SPITZER, M. (2015b): *Über vermeintlich neue Erkenntnisse zu den Risiken und Nebenwirkungen digitaler Informationstechnik*, *Psychologische Rundschau* 66(2): 114-123.

SPITZER, M. (2015c): *Buch oder E-Book?*, *Nervenheilkunde* 34(5): 319-325 [<http://www.schattauer.de/de/magazine/uebersicht/zeitschriften-a-z/nervenheilkunde/inhalt/archiv/issue/2209/manuscript/24292/show.html>, accessed on 7.7.2015].

TE WILDT, B. (2015): *Digitale Junkies. Internetabhängigkeit und ihre Folgen für uns und unsere Kinder*, Droemer Knauer, München.

THIEDE, W. (2015): *Digitaler Turmbau zu Babel – Der Technikwahn und seine Folgen*, Oekom Verlag, München.

ULBRICHT, A. (2015): *Schule ohne Lehrer. Zurück in die Zukunft*, Vandenhoeck & Ruprecht, Göttingen.

Hensinger, Peter (2015): *Big Data: Der Wandel der Erziehung zur Konditionierung für den Wachstumswahn; Big Data: A Paradigm Shift in Education from Personal Autonomy to Conditioning toward Excessive Consumerism*, *umwelt-medizin-gesellschaft* | 28 | 3 / 2015, 206 - 213; Translation Katharina Gustavs for *Diagnose - Funk e.V.*

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