Don't resign, design! – Towards a Pedagogy of the Digital

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When "software takes command", people take fright – a reaction which frequently accompanies change or novelty. Their fears are understandable, but they also cloud people's view of the potentials that digital tools and digital media hold for society and especially educational contexts. Their fears also define societal debates and contribute to a general lack of ambition when it comes to seizing the opportunities for broad collaboration in the design of a "digital society". This paper identifies a selection of conceptual digital potentials, presents the initial findings of an ongoing study and uses these as a basis to formulate recommendations for reclaiming society's formative authority over the shape of the digital in its midst.

Why do we climb mountains? Because they're there.
[Sir Edmund Hillary]

INTRODUCTION

The critical approach towards digital technology taken by the Association for Media Education and Communication Culture (GMK) in 2016 in its forum entitled "Software takes Command – die Software übernimmt die Macht" compels me to respond provocatively by adopting what might be termed an *optimistic* posture towards *the digital*. The title of my keynote – *Towards a Pedagogy of the Digital* – is a provocation in itself. Because the digital is neither the purpose nor the aim of education and educational theory. We don't even need to come up with a specific educational theory to deal with the growing digital change of our societies. The *Pedagogy of the Digital* serves merely as a hashtag – just like the much heard and (especially in educational policy-making) frequently cited term "digital education" (cf. KMK, 2016; GI, 2016) – which is why this paper starts with some short attempts at classification and clarification.

Pedagogy

In the following I have intentionally chosen to speak of *pedagogy* rather than to use the term "education science", because the word "pedagogy" acts as an umbrella for scholarly approaches as well as the practice of teaching in one overarching concept (cf. Keiner, 2015: 14-34).

Potentials

I have also taken the conscious decision to use the term *potentials* rather than "effects" or "added values", because technology *on its own* accomplishes nothing – however "digital", "massive", "smart" or "big" it might be. This is why classroom teaching is not improved simply by adding the presence of technology to the picture – of course, but you can't say it often enough. But whereas some are lulled into a false sense of security by their *Vorsprung durch Technik*, some simply reject digital media without giving them a second thought, and others are blissfully oblivious to the potentials of these media as teaching aids or learning incentives. Still others squander the potentials these media offer for motivating youngsters or fostering their creativity in extracurricular education and youth work. On the basis of some simple equations and for reasons of (academic) economy, I therefore dispense with the practical applications of digital media, and use a number of studies to examine *whether* (i.e. through quantifiable access to media, levels of availability and user frequencies) rather than *how* digital media are used in educational contexts.

Furthermore, the term "effects" also seems ill-suited to the subject, as the world of pedagogical reality cannot assume the existence of any reliable causal effects. If we follow the lead taken by Karl-Eberhard Schorr and Niklas Luhmann, it is just about possible to state that there is a *technology deficit* (cf. Luhmann & Schorr, 1982p. 14; Baacke, 1997, p. 18). And it follows that the human will cannot be influenced by technology. The term "potential" therefore indicates that something exists which can occur under *a given set of circumstances*. This means: Whoever wishes to make use of potentials must know and create the circumstances that are necessary to bring them about. It is therefore fair to assume that digital technology in general, as well as *digital* tools and media in particular, have enormous potentials which have not yet – or only partially – been tapped.

Concrete vs. Conceptual

Here at the outset I would also like to attempt an act of terminological differentiation which is seldom undertaken in English, probably due to a lack of alternatives, or in German publications, no doubt for the same reason. It is the attempt to differentiate between the terms *technological* and *technical*. These two terms are often used to mean the same thing, but it is especially important to distinguish between them when discussing the *social significance* of technical matters in particular.

An example serves to illustrate the difference between the two: Whilst it can be eminently sensible on a conceptual level to use social media for collaborative processes

in classes at school and university (cf. Knaus, 2016b; Knaus & Valentin, 2016), actually using *Facebook* – a genuine online service – would no doubt draw criticism from students, parents and teachers alike. It is therefore the actual technical side of things, or services – and not the *concept* of a collaborative tool – that is problematic. This makes good sense insofar as companies like *Facebook* are understandably trying to make money with their ideas and their marketing and programming services. And whilst it is up to each individual to decide for themselves in more informal contexts whether they are in favour of something that has become an established norm on the Web, this does tend to result in legal constellations that have very little in common with our idea of collaborative learning in schools and universities.

With this in mind, this study proposes the following simple differentiation by way of a working hypothesis: The *technical* and *digital tech* refer to the *concrete* manifestation, whereas *technology* refers to the scholarly debate which at one and the same time also includes the *conceptual* manifestation. Hence, whilst the technical or digital tech is always incomplete and encumbered by third-party interests – rendering it flawed and problematic – technology *as a concept* deals with potentials.

Design!

If – in the sense of Lev Manovich's bestselling book "Software takes Command" (Manovich, 2008) – it is the *Software* that *receives commands*, then it should be possible for people in the future to engage fairly effortlessly in *technical design* (cf. Schelhowe, 2011; Allert & Richter, 2011; Knaus 2020) in the same way they did in the bygone days of multiple hardware devices or before the advent of graphic user interfaces. If we take the design of websites using content management systems as an example, it soon becomes clear that designing an appealing website is something that primarily requires good ideas, suitable texts and good graphics and photos – but no longer any knowledge of HTML. It is even possible to individualise devices (like smartphones) without possessing any great technical know-how – this was not always the case in the past. Software is therefore becoming a material out of which useful tools can be constructed and combined. So what would happen if we didn't have to use the digital media and tech that are available to us, but we could *design them ourselves*? We could then design technical tools that fulfil *conceptual* potentials and which are unencumbered by third-party interests, because it is we who have designed them explicitly to suit *educational* contexts.

The proposal made in this study – namely achieving the individualised digital design of the technical – also includes the formative *social* processes that have been brought about by technical innovation: In the past, technical innovations have repeatedly brought about changes in society and the way we live together – but the digital revolution is changing our world in a way which is unprecedented barring the invention of written language or the printing press. And because this digital change is revolutionising the world, people fear it. But when people's fears cloud their vision, then the technical and the technological are prevented from taking up their deserved place in a long-overdue discourse. We need to know the dangers and challenges as well

as the potentials that go hand in hand with digital media and digital tools, so that we can decide what kind of life it is that we would like to live in the future.

The following therefore takes a closer look at the conceptual potentials presented by digital tech and analyses their importance for our societies. The focus here is on potentials not least because I generally prefer to speak of possibilities rather than risks.

ANGST SELLS

It is no secret that the current wave of *digital hype* in extracurricular education, youth work and schools is largely resulting in projects being financed that are firstly "in some way digital" and secondly "offer protection *from* the media" – David Buckingham speaks about the "media risk industry" (Buckingham, 2016) to refer to this sad state of affairs. I find it regrettable and at the same time alarming that the time we spend on media literacy education inside and outside schools – and also the relevance of our field – has to be justified and financed by *stoking these fears*. That *angst sells* is clear from the commercial success enjoyed by the literature being published on the subject: The book *Digital Dementia* by Manfred Spitzer has sold over a quarter of a million copies and has been translated into several other languages; the publishing house handling Olaf-Axel Burow's response to Spitzer – *The Joy of Learning and Creativity* (Burow, 2014) – declined to comment on the number of copies sold.

It is important to weigh up any dangers which we might find confronting us – this is also true for the way in which we handle digital media. It is of course particularly important that we provide lasting protection to those who are not (yet) able to protect themselves. And in my opinion, (media literacy) education provides them with the most enduring protection there is. Indeed, I believe that stoking people's fears and being *over*-protective distorts people's view of what it is exactly that constitutes the threat, that it is people rather than technical tools that are liable to press the nuclear button or abuse tech for their own ends. It is not the social networks that bully or hate people, but people using or abusing their technical tools. Anybody who believes that problems like *fake news*, *hate speeches*, *filter bubbles* or the way that *big data* breaches the rights of the individual can be solved by technical solutions has failed to understand the complexity of how we ascertain the truth in modern societies, and overestimates the power of the technical to find these solutions. This overestimation means that a number of fundamental questions – including approaches, strategies, methods and procedures in research – must be discussed all over again at regular intervals with the advent of every new medium. But we are under no compulsion to react to every new technical development with new approaches and new (teaching) practices (cf. Tulodziecki, 2016a, p. 87 f. and p. 93 f.). And is it really possible anyway to claim with any credibility that there was no hatred and non-intrusive busybodies before the rise of social networks? Is fake news really a new phenomenon?

So technical safety systems do not work and the discussion as to whether we should protect children and ourselves against the digital media is unrealistic. Instead, I would like to phrase things sociologically and borrow the words of Georg Jellinek: It can no longer be disputed that ours is a *digital world* and that there is no turning back – such is the "normative power of facts" (Jellinek, 1914, p. 338).

PHENOMENA

The following two photographs from the years 2005 and 2013 – depicting a crowd of people at the lying-in-state of the dead Pope John Paul II, and at the election of Pope Francis respectively – show that the smartphone has gained a firm foothold in society within the space of just a few years.

Figure 1: Via Della Conciliazione 2005 (AP), SPIEGEL, March 15, 2013

Figure 2: Papal Election 2013 (AP/DPA), SPIEGEL, March 15, 2013)

But what was it that *really* changed as a consequence of the smartphone – a mobile, networked computer – becoming so popular so quickly? Was it really a *technical* device that conquered our societies? Is anybody really that interested in the hardware used in information technology (IT)?

IT doesn't matter – Software takes command

The truth is that there is (now) very little interest in hardware – the physical IT. Once again, it is the familiar quotation by Lev Manovich which expresses it best: "*Software* takes command". The smartphone is symptomatic of the declining relevance of hardware and the rising importance of software and networks: Smartphones would be nothing without the apps that we users combine to suit our individual needs and turn this piece of hardware into our own bespoke tool – a kind of "digital Swiss army knife". Even the strategies used by the internet giants *Amazon*, *Apple* and *Google* paint a clear picture of how attitudes are changing: Hardware is being accorded an ever diminishing role in relation to the available "materials" (aka *content*) such as apps, music, videos etc. – even on an economic level.

Smartphones are only as powerful as they are because they can access the storage and processing resources of the network (aka *the cloud*). Voice control apps (such as *SIRI*) are a good example of this. Resource-intensive processes like speech analysis, content analysis and answer generation do not take place within the mobile device itself. Instead, the user's question is recorded and transmitted through the network to a specific server where it is analysed, answered and subsequently returned as a speech response or a control command. So when I state, using the words of Lev Manovich, that software and the network "are taking command" (Manovich, 2008), then I also include these processes too.

This change in attitudes is being confirmed by a number of current studies such as the KIM, JIM (cf. MPFS, 2019) and the study on *Generation What* – a Europe-wide youth study. This study asked young adults about their attitudes towards a range of subjects including the *relevance of the network* in their lives – with interesting results: According to their responses, 80% of young Europeans aged between 18 and 34 can imagine a life without God, 70% a life without a car and 79% a life without television. Even a happy life without children was conceivable for 52% of the participants – but "not without the internet". Software and the network have therefore changed and continue to change the world. Ultimately though, it comes as no real surprise to hear that *digital tech* is bringing about changes in our lives.

Digital tech is changing the world

It almost goes without saying that technical advances are changing the world – and always have done. Historically, technical innovation was primarily motivated by attempts to render physical work less arduous. And so it was that the railway revolutionised mobility; technical advances enabled the construction industry not only to build safer and more convivial buildings to live in, but also to construct entirely new types of building. Technical innovation also had a direct impact on human social interaction: One need look no further than the written word which redefined our understanding of time relations, or the printing press which made information accessible to the broad public and made school education possible. In short, whilst machines revolutionised physical work, media such as the written word, the printing press and the computer are making mental work easier (cf. Nake, 1992; Schelhowe, 1997 and 2016, p. 44): The pocket calculator assists us with mathematical problems, and the computer acts as a writing assistant and *aide de memoire*. Still, in a discussion of *digital* technical innovation, the primary interest here is not simply the technical devices which replace or improve analogue devices (cf. next chapter), but a redefinition of and therefore a new *quality to the technical* which is bringing about a new understanding of human-machine *interaction* (cf. Knaus, 2020). This brings us to the third thesis.

The media make reality

This section describes the way in which the programmability of *digital* tools gives them considerable adaptivity and a range of configuration options. Their technical interconnectivity also opens new ways for human society to develop; they therefore have potentials that far exceed anything that the analogue media might have been able to deliver (cf. Knaus, 2016a; Knaus, 2020, p. 24-26). First of all, the *digital* media have

the edge over analogue media (cf. SAMR-Modell in next chapter) because digital tech can combine analogue media – in the sense of "multimedia" but also in the sense of convergence (cf. Jenkins, 2006) – into new formats. Furthermore, due to its programmability, its high degree of functional adaptivity and its constant technical connectivity, it allows new usage scenarios to come into being which change the way people live together, communicate and engage in society, thereby challenging established practices and boundaries.

But what furthers our understanding better than the basic difference between the digital and the analogue is identifying the distinctive role the latter plays in relation to its *social function* (cf. Knaus & Engel, 2015): Does tech appear in concrete everyday social realities as a *medium* or as a *tool*? This distinction might seem – especially in the case of digital tech – artificial or even antiquated at first sight, especially as the dividing lines are ever less distinct and people have been shaping their material environment since time immemorial – a recent article in Nature reported that the oldest tools found to date are 3.4 million years old (cf. Nature, Vol. 466, p. 857-860). But distinguishing between the medium and the tool is helpful, because this distinction focuses our minds on the social function of tech: For example, tools – in contrast to media – are "useless" without their users, whilst media can still produce an effect without the presence of an active agent (cf. Knaus & Engel, 2015, p. 26 f.; Knaus 2020, p. 37 ff.). The tool analogy also serves to clarify that the medium is not only engaged when we *perceive* our environment, but also when we ourselves are engaged in shaping our environment and our digital materials (artefacts) by using our digital tools. In this scenario, codes and software become the raw material from which tools are made and combined and which can then in turn be used to transform materials into media or other tools.

Whilst the individual production and design of (mass) media was still basically possible back in analogue days, it was always an onerous undertaking – we just need to call to mind the historical reproduction of texts or the first films from the early days of cinematography. It was only with the rise of technical advances in the digital field that it became possible to *directly* influence the *object of perception* as well – or, as the information scientist Reinhard Keil termed it, to *manipulate* it: "For the first time in our media history, the object of perception can also become an object of manipulation" (Keil, 2006, p. 67). This allowed the digital medium to become an object of reception, at the same time becoming something which in itself – with little effort – could be produced and designed "interactively". It is important to note here that the rather negative connotation of the word *manipulation* which is common in everyday usage should not lead to any misunderstandings: Reference is not being made here to the specialist term from sociology or psychology which has its roots in the French language – it does not mean the targeted or concealed attempt to influence or even to condition something, and neither does it mean that the media "manipulate" people. The term manipulation should instead be understood in its more literal sense: "Manus" is the Latin word for *hand* and "Plere" means *to fill*. A literal translation gives us the sense of "a handful" or, more usefully, as "having something in one's hand". This implies that it is not only possible for us to perceive digital media, but that we can also take the object of perception into our own hands (cf. Knaus 2020b).

POTENTIALS

The SAMR model by Ruben Puentedura (cf. figure 3) is particularly useful for identifying whether a technical innovation (1) ultimately makes something *same but different* (substitution); whether (2) existing media – such as photography or telephony – converge in a new device such as the smartphone (augmentation); whether tech (3) contributes to redesigning tasks (modification); or (4) whether new types of task and potential come into being which were previously inconceivable (redefinition). Technical advances which have already redefined the world include written language and the printing press. The technical side of the digital world – meaning the software and the network – heralded the next *redefinition* of society (cf. Baecker, 2007; Knaus, 2018).

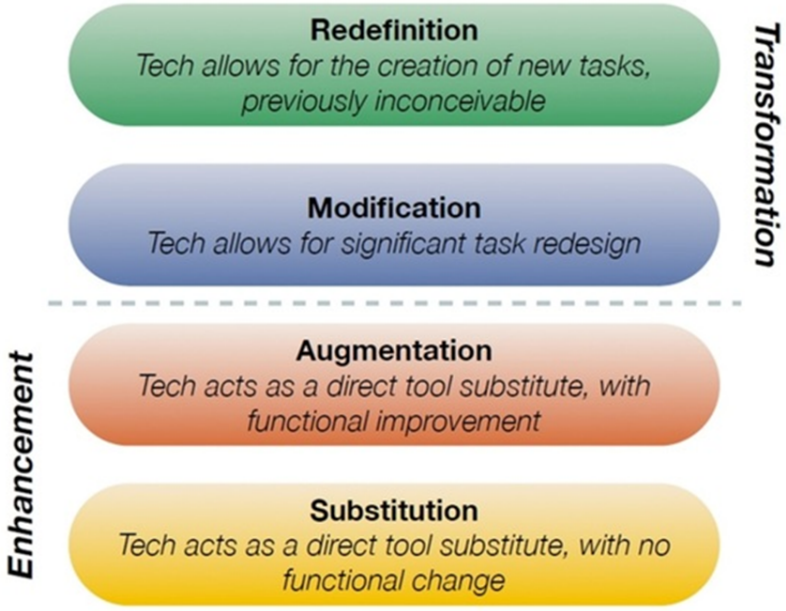

Figure 1: SAMR-Model by Ruben Puentedura (hippasus.com/rrpweblog/)

The model depicted in figure 3 was originally conceived to clarify the degree to which digital teaching and learning tools were being implemented in university and classrooms (cf. Puentedura, 2014); we can also use it to identify the *conceptual potentials* of the digital. Space constraints in this article means that I can only examine three of these aspects in the following: the potentials *manipulation and annotation* together with new forms of *social integration,* which unfold into the superordinate potential of *the network and the erosion of social division*.

Scribbling in books promotes learning

"Scribbling" in (school) books promotes learning. We can test this bold hypothesis by asking ourselves: How do I learn best myself? I often learn new things from physical books – so-called "one-way media" ["Einschreibmedien"]; but I turn a book which I am working on intensively into a medium I contribute to myself ["Aufschreibmedium"] (cf. Kittler, 1986; Winkler, 2002): I make notes in it, I underline words and phrases, highlight passages and so forth (cf. figure 4). More than just thinking clever thoughts, it is actually in summarising these thoughts that learning takes place – namely by

writing them down. The learning effect is enhanced by my own involvement in it, and it is this involvement which requires the greater degree of interaction between the learner and the subject matter. The philosopher Immanuel Kant made this observation in his text *On Education*: "We understand a map best when we are able to draw it out for ourselves. The best way to understand is to do" (Kant 1899).

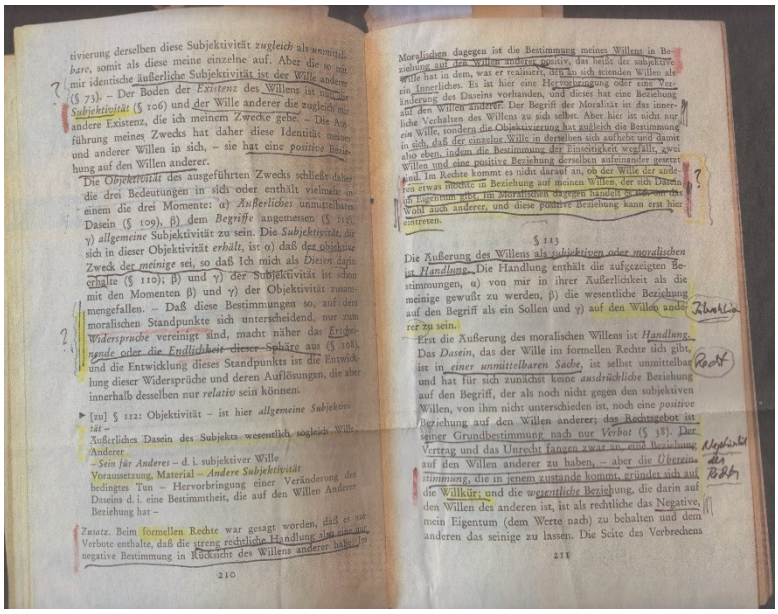

Figure 4: Photography of the Hegel edition by Axel Honneth (ZEIT, Jan. 03, 2019, p. 61)

As explained above, the manipulability and programmability of the digital medium (cf. chapter 3.3) accords it the function of a tool with which media – or more generally: digital materials – can be individually and collaboratively produced and designed. What is meant by this is that digital media can be used to embark on the path of transforming these materials from passive one-way media into active writing tools. The ability to engage in this design process has been made possible due to the rise of *digital* participative media – which have significantly broadened the scope for people's own active involvement. They have become an increasingly crucial constituent of people's media literacy, as Dieter Baacke has stated: "Media literacy [...] is essentially little more than a person's ability to utilise all available media in the world *proactively* [my italics], covering the entire communicative and behavioural repertoire of human beings" (Baacke, 1997, p. 119). Digital media therefore allows for the widening of people's existing behavioural repertoire due to the potential it offers for manipulation and annotation.

Tools are already available for text-based work – such as web-based text editors – which people can use to usefully exploit the potential offered by manipulation and annotation in an educational environment. However, learning does not just take place through texts but also – and especially in a "digital world" – increasingly through *images* and *moving images* (cf. German Council of Cultural Education, 2019). But this presupposes that we are not only able to annotate texts but also images and videos into *personal manuscripts* using editable meta-information (cf. Knaus & Valentin 2016, p. 157 f. and 172 f.) and to do this not only individually but also by using networked

applications. The ability to do this would certainly also encourage the use of largely neglected possibilities for linking videos with and to other media. What is of particular interest is the annotatable hyper video for teaching and learning contexts, where annotation is not only possible on an individual, but also on a collaborative level.

Communities of homework

Digital media – especially mobile media – permit a new dimension of social integration. Just a few years ago, having constant access to the internet and its services was still the exception; then the first smartphone was put on the market with an internet flatrate using mobile phone networks – resulting in significant changes: Thanks to technical connectivity, it was not only possible for the relatively inefficient hardware in the mobile devices to be supplemented using online storage and processing resources – making mobile devices more efficient: people themselves became *connected* to one another (cf. Winkler, 2002). This was by no means simply the connection brought about by technical social networks, but the fact that the individual was now constantly connected to his *social networks and peers* – such as his family and circle of friends. Equipped with this new, constantly available communicative connection, individuals were now in a position to develop new personal networks: Whereas even just a few years ago social networks were to a large degree shaped by *physical proximity*, in future – for example in "communities of practice" (Wenger, 1998) – it will be topics or individual *interests* that determine people's personal attachments and their degree of social integration. The convergence of physical and virtual realities will enable people to overcome barriers of distance and in doing so, to experience new forms of human association.

Overcoming borders

The common denominator for the potentials we have discussed so far lies in the concepts *connectivity* and *overcoming borders*. The following seeks to unravel what is perhaps at first sight a confusing dichotomy and to use a number of examples to clarify what this means.

One of the oldest media (which, incidentally, was also "new" at one point) – the *written word* – led to the dissolution of temporal dimensions: Before the written word there was only the word of mouth, something which was bound to the human physiology. Afterwards, even if the storyteller was at some point no longer alive, his stories lived on in books and pictures. Printing is a technology that made information available to the broader population and in doing so, dissolved not only temporal but also proximal barriers. Further well-known examples are the telephone and the computer. All of these technologies brought about a shift in people's physical and mental barriers.

Nowadays, the digital media are challenging established organisational boundaries – such as those between work and free time. And it is this challenge and it's associated softening of borders that is making new networks of connectivity possible which were previously unheard of.

Action-oriented Media Education

By using media-pedagogical project work based on subject and action-oriented approaches such as those proposed inter alia by Bernd Schorb (cf. Schorb, 1995), Dieter Baacke (cf. Baacke, 1973) and Gerhard Tulodziecki (cf. Tulodziecki, 1997), the opportunity presents itself for using digital media as the lynchpin for uniting two things that do not actually have to be separate: the lifeworlds ["Lebenswelten"] of the school pupils and their (school) learning environments. To do this it would be helpful to challenge the established boundary between school as an institution and extramural media (project) work – to date the virtually insurmountable demarcation-line between formal, non-formal and informal educational contexts. This would reinforce the role of school as a *life* space and at the same time provide the school pupils with new experiential spaces which they could bring into their learning environment (cf. Wagner & Ring 2016, p. 147 f.). As I have described in greater depth elsewhere (Knaus, 2015a; Knaus, 2016c; Knaus, 2017a; Knaus 2020a), it is already possible now to use the potentials offered by digital media to activate and combine the children's life worlds in the school environment; technical and social developments make things possible, but they also make it necessary to challenge existing organisational boundaries such as lesson scheduling, traditional subject boundaries and classroom layouts, and to look at them afresh.

Subjective Media Literacy Education is no longer enough

Media literacy education targets the education of the subject. Media literacy education should be comprehensive and the media-educated subject is and remains relevant in a "digital society". But it is increasingly the case that it is not *only* the individual who has sovereignty over his or her own (personal) data. It makes little difference if a person is cautious when surfing the network: If rather unassuming *apps* are busily gathering personal data – does anybody really read the overly long use agreements (which can change anyway with every update)? – or if the person affected is saved in the address book of another *WhatsApp* user, then individuals can no longer take a sovereign decision on a case-by-case basis on whether they agree to their personal data being saved and passed on to a third party, or assess whether their decision is even relevant. It is therefore necessary, in addition to subjective media education, to have a *societal debate* about what *the technical* and globally operating and interconnected companies should be allowed to do. This debate must be codified in rules and (voluntary) commitments – or more generally: standards – which are as transparent as possible and easily understandable. Since the network and the companies operating on it are not constrained by national borders, these standards should be conceived, discussed and agreed internationally.

Disciplinary boundaries

The necessity of challenging boundaries also affects our field and our line of work: Media education is – in contrast to its reference disciplines – an *open discipline*. Edwin Keiner, following Peter Meusburger's lead, refers to pedagogy in this sense as a "fractured-porous discipline" (cf. Meusburger 2009, p. 117; Keiner, 2015, p. 16). It is a discipline that does not command a broad consensus with respect to theories and methods, which stands out for its high degree of diversity and which is only able to

defend itself against the influence of other disciplines to a limited degree – one might also say that it has a negative *balance of trade*.

This sounds rather disadvantageous, but it might also represent one of the discipline's core strengths: This is because media education takes a keen interest in absorbing influences from other disciplines and applies itself creatively to them. This reflects a modern understanding of scholarly work, but this openness is determined by the "subject matter" of media education in two ways: Firstly, digital media and the new technologies are transforming the media themselves – as described above; secondly, technical innovations and new technologies are changing our societies and the way people interact with one another within these societies (for more detail see Knaus, 2018; Knaus 2020), ergo: Technological and technical developments necessitate the ongoing development of society and its respective debates on what *the technical* should be allowed and able to do in the future. This is the interface where media education operates, and since it is exposed in several ways to technological and technical innovations, it must remain attentive to what is happening around it and, indeed, to itself.

One point in this discussion which is not shared by all colleagues to the same degree is the need for interdisciplinary collaboration between researchers in the fields of computer science, media science and education science. It is my belief that it could be highly enlightening and beneficial for us to add technical disciplines to the fields from which we draw our inspiration – and if we were to see ourselves as social intermediaries and designers with respect to technical developments. I shall use the following chapter to explain why media education should take inspiration from the technical disciplines and offer its services in an intermediary capacity.

PROSPECTS FOR THE FUTURE

When we see something, it appears to us as being *real*. We intuitively accord images a high truth content – they appear to us as something "objective". But it is common knowledge nowadays that pictures can also be *manipulated* – for example in advertising or in the pursuit of political interests: Images and videos might appear to be authentic, but that does not mean they always are. They too can be modified or intentionally tampered with.

In an age of continuous technical progress, it is not only the world of images that is subject to manipulation. Slowly but surely, this is becoming true for all aspects of our lives: Nowadays, anybody applying for a loan from their local bank will not have their bank manager to thank for the positive or negative response, but rather the fact that they have managed to convince an *algorithm* of their credit worthiness. Whilst it was not so long ago that people decided about the credit and trustworthiness of people, it is now data and algorithms which are doing this work nowadays. At the same time, algorithms are not only establishing the trustworthiness of the customers, they are also being used because they are considered more trustworthy than human beings, who might take a poor decision based on their emotional feelings. The technical world is therefore accorded an objectivity which humans do not possess – with the aim of reducing interest-based approaches to decision-making. But are data and algorithms really objective?

Data, algorithms and objectivity

As computers ease the strain of mental work (cf. Nake, 1992; Schelhowe, 1997 and 2016, p. 44), and assume tasks which people themselves are cognitively unable to perform, we are increasingly witnessing a dependency on the technical in the collection and processing of large data. Current experiences of and discussions surrounding *Big Data Analytics* reveal that decisions are increasingly being taken based on complex processes and volumes of data which people are unable to cope with (cf. Gapski, 2015; Assmann et al., 2016). At best, people are only partially able to comprehend them. At the same time, these decisions are being accorded a degree of objectivity which they cannot conceivably have in reality due to the man-made codified operating guidelines which govern how they are taken. Just like texts and images, software and algorithms are produced by human beings and therefore also potentially flawed. It might contain third-party interests and therefore lead to the prevalence of subjective aims and desires in supposedly "objective" decision-making processes.

It is therefore necessary to engage in the social demystification of *the technical* and to develop a critical attitude to algorithms and the data which they generate: Are algorithms being subjected to intensive *testing* when (first) results appear plausible? *Who* is responsible for setting the limits and threshold values which algorithms use as the basis of their decision-making and (machine) learning processes? How transparent are algorithms, especially those which are processing people's personal data and – as in the aforementioned example – occasionally even generate it? Being in a position to ask these questions requires us to possess a fundamental understanding of digital tech itself (cf. Wing, 2006).

Up to now I have spoken of the potentials presented by technologies and digital tech. But new technological and technical developments also necessitate the involvement of politics and society: If computers are engaged not only in making mental work easier but also in assuming tasks which people themselves are cognitively unable to perform, then underlying these computer-based tasks are processes of such complexity that people are in no position to control them nor comprehend their outcomes. As discussions and articles on *Big Data Analytics* reveal, it is very often the case that decisions are taken precisely on the basis of these data volumes and complex processes which people find so difficult to grasp (cf. Cukier & Mayer-Schoenberger, 2013; Gapski, 2015; Assmann et al., 2016). So whilst people might understand simpler logical corollaries and be able to make rough calculations, they are not able to validate the results of processes which are based on larger data volumes which are harder for the human brain to grasp without some kind of additional technical support. This results in a technical dependency when analysing and evaluating large data volumes to which we nevertheless accord an undue degree of objectivity. Codes, algorithms and analyses are made by human beings. As mentioned above, every analysis is therefore fundamentally flawed and its results potentially shaped by third-party interests. It is therefore necessary to demystify and explain technology and to distance ourselves from our erroneous perception of its objectivity. In a society in which fundamental decisions are reliant on big data and algorithms, and in which "computers [...] are beginning to participate in social communication – something previously reserved for humans only" (Baecker, 2007, p. 9), media literacy should be expanded to include *digital literacy* (cf. Knaus, 2020b). A fundamental understanding of technical processes will then become

an essential component of this augmented media literacy. But this does not mean that people will be able to fully exploit technical processes or to "programme" computers – as other overly-hasty demands for certain specific skills have proposed – but they will be provided with a basic understanding of technologies, technical operations and processes within the scope of their general education (cf. for a more in-depth discussion: Knaus, 2016c, p. 103 f. and 106-116; Knaus, 2018; Knaus, 2020).

Connecting *media literacy* and *digital literacy*

Media literacy is a concept which, in its traditional meaning, has relatively little to do with matters of a technical nature (cf. Schelhowe, 2007, p. 28) although nowadays – interestingly and erroneously – it has actually become a byword in people's minds for someone who possesses technical skills (cf. Knaus, 2016c, p. 107). But when Dieter Baacke coined the phrase in line with Noam Chomsky's concept of competence and the works of Karl-Otto Apel and Jürgen Habermas, he was not interested in the technical devices or the media themselves, but in *communication and cooperation* (cf. Baacke 1973), that is the ability of human beings to take media, (digital) tools and technical innovations in general and use them with confidence for their own ends and needs, to use them in a creative and participatory way, to discuss them with respect to themselves, media and society, and to acquire knowledge analytically and in a structured manner (cf. Knaus, 2016c, p. 109).

Nowadays, the issue is still not primarily one of digital tech itself, but rather the question of how and what we (intend to) use digital materials, tools and media for, so the issue remains one of communication and cooperation – just in a digital form. But because *the digital* is more than just a "facilitator" and is also involved in the production of (media) content (cf. Schelhowe 2007, p. 45 f.) and can undertake interpretations itself, a further aim of media literacy comes to the fore, namely possessing knowledge of technical and organisational conditions. It is therefore important that all people are capable of understanding the technical side of the media they use, including the technical aspect itself, the algorithms which allow it to work, as well as general processes of how knowledge is created and reproduced. Only those who understand what goes on behind the user interface – behind the inter*face* of the machine – can truly absorb what is happening and actively communicate (cf. Knaus, 2020a). This explains why significant aspects of informal education represent a key component of a comprehensive media literacy education for a digital world (GI, 2016; KMK, 2016). In the spirit of dissolving boundaries, a demand made above, it is therefore desirable to find a suitable way of combining media literacy and digital literacy (cf. Tulodziecki, 2016b, p. 18-21; Herzig, 2016, p. 73 and 75 f.; Knaus, 2017b, p. 39 f.; Knaus, 2020b).

Designing the Digital

What should we not *do?* We should refrain from demonising digital tech and media, but at the same time we should not reach for technical solutions thoughtlessly and "digitise" our world to no purpose; we should not confuse media literacy with knowing how to *swipe* on a smartphone, thereby reducing it to mere technical skills. We should not automatically fall back on direct instruction in the classroom as our default approach, merely because digital tools and media – such as interactive whiteboards – are conducive to this. We should – at least in this context – take a lead from *the digital*

itself: The digital media – as described above – are overcoming traditional boundaries, are establishing new connections and are *re-form*ing organisations.

And what should we do? We should acknowledge the potentials of the digital media and – wherever possible and appropriate – use them; we should step up our collaboration and sharing of workable ideas – and even our willingness to fail – across local and national borders but also across academic and disciplinary borders (and in doing so ideally reconsider the boundaries such as lesson scheduling, traditional subject boundaries and classroom layouts); we should promote the media literacy of all people – including in the sense of Joseph Weizenbaum's highly relevant simplification: "Media literacy is identical to the ability to think critically" – and to enable them to engage competently in a digital society; we should not stoke people's fears that software is taking over control, but initiate a debate on what it is that constitutes a convivial digital society and allow society to reclaim its formative authority. Part of this authority is a comprehensive debate on the openness of systems and content, standardised interfaces, media education standards, transparent codes and the respective national and transnational standards and norms.

Returning to the insight that digital media not only *affect us* but can also *be affected by us*, I would like to paraphrase those memorable words of Sir Edmund Hillary: Let us "digitise" our societies – because we can.

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