Digital Education - on the way to a critical discourse
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To make digital technologies available for formal education, adjusting formal education to the digital transformation of culture is not sufficient. Therefore, this paper outlines a framework about the digital complex with its disruptions and their relevance for education. Categories of Antony Giddens' structuration theory in relation to education will be used. A pedagogic perspective in line with the intention of the European Enlightenment leads to the development of children in their processes of appropriating of contributing to culture. A cultural ecology will offer the categories resources for digital education, sustainability of child development and affordance as baseline for designing digital learning. The key point for this endeavour is to recognize digital means as semiotic cultural resources for discourses.

Introduction

The guiding issue of the paper is about the changing features of the world in which human beings are developing. Indeed, this statement contains an essential assumption about education, since education regards human interrelations with the world. This is a leading idea of the European Enlightenment of the 18th century, specifically based on the educational endeavour of Jean-Jacques Rousseau, as developed mainly in *Émile ou De l'éducation* (1762). Rousseau's conceptualization of education as human development met great opposition from the state and the church of his time. However, it is this orientation that led to the modern idea of the individual's subjectivity as a key characteristic of what defines "humanity" within specific institutions like the school and the state. Of course, the different conceptualizations of education as subjective developments within the surrounding world are influenced by the different ideologies and power structures of the different historical contexts in the different historical epochs. In contemporary societies, digital technology with its ideology and power structures profoundly impacts and transforms education.

This paper is not focused on a historical review of the evolution of education but especially on the ongoing process of social change boosted by informational technologies in which the digitalization of education has become very relevant and is now taking place.

I am not concerned with the current Corona pandemic. However, I observe that the pandemic makes visible some deep cultural changes produced by new technologies and that the institutionalized and formalized education in schools is incapable to include the communicative options of digital technology and the normality of these options as developed in everyday life.

Among other digital technologies of everyday life, the smartphone has always been excluded from the formal learning in schools (Miller *et al* 2021). However, the pandemic forced schools to use platforms like Adobe Connect or Zoom as a spatial digital tool to integrate teacher guided instruction with the families' home. Furthermore, the Coronavirus demonstrated how the individualization produced by

social isolation (e.g., quarantine, lockdown) has led to an individually defined form of social reality. This became visible as various conspiracy theories came to light; an example is the conspiracy theory according to which Bill Gates wants to force vaccination in order to monitor and control mankind through a supposed microchip in the vaccine.[1] An explanation for this is that a person's knowledge is very heavily shaped by what one reads and sees on social media. From the perspective of knowledge production and knowledge transfer that social media have broaden, it is possible to see how these replace or contradict the established formal learning in institutionalized forms of education. Outside formal learning, in our individualized mass communication society it is clear that consumption as individual appropriation of standardized commodities also characterizes the appropriation of digital platforms by virtue of the personal usage of tablets. Internet based platforms and individually owned tablets as a tool in the established form of individualized mass communication and its consumption play an important, integrative and delimiting role in social life.

Focusing on the concept of disruption[2], I will attempt to address, from a pedagogical perspective, the current dramatic processes of social change caused by digitalization. This perspective views the digital world as a complex structure which comprises technology and culture as an environment for the development of subjectivity. Culture is molded by our mobile devices, which provide an individualized and digitally based mass communication thanks to digital platform and their apps. If smartphones, apps, platforms etc. are seen as cultural resources, then the critical theoretical framing is open to a cultural ecology. This leads to a discussion about education concerning the impulses, options, restrictions, and constraints of the personal development of children and youth in a *digital* environment.

1. *A framework for analyzing digital education*

A theoretical task for this pedagogic discussion is to structure the analysis on what digital education is about. I am proposing a framework that focuses on cultural development by virtue of Anthony Giddens' structuration model (Giddens 1984). It summarizes the dialectic of social structures and agency, where "agency" is intended as the option and capability of action. In addition to Giddens, a third point of the dialectic argumentation leads to established cultural practices, such as school. The interrelated categories of structures, agency and cultural practices may profit of the conceptual analysis of the dispositive (Foucault 1978) and of configuration (Elias 1991, 139 ff.) with respect to digital education. In order to become pedagogically relevant, it is necessary to connect this structuration model to the pedagogical thinking of the European Enlightenment, specifically by Wilhelm von Humboldt's educational model (1792). Humboldt was concerned with the development of children in the process of the appropriation of culture and the communicative influence on their surrounding culture. This issue of cultural development was discussed among others by John Urry (2007) and Mimi Sheller (2014) by considering the impact of the changing of mobility. Zygmunt Bauman (2007) argued about the societal dynamic of

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[1] An example embedded in a scientific context: "Bill Gates' Global Agenda and How We Can Resist His War on Life", https://www.independentsciencenews.org/biotechnology/bill-gates-global-agenda-and-how-we-can-resist-his-war-on-life/, downloaded 11th May 2021.

[2] German wording: Umbrüche, proposed by Koppetsch (2019, S. 14), disruption Hieker, Pringle 2021.

uncertainty and liquidity. Ulrich Beck *et al.* (1986, 1994, 2004) interpreted the processes of individualization as key points for societal and cultural delimitation which is now amalgamated with digitalization. This dynamic of mobility, uncertainty, liquidity, individualization and delimitation is summarized here by the term of disruptive culture, whilst for instance other influential scholars like Cas Mudde (2019, 14) proposed the metaphor of waves.

2. *Digitalization within a disruptive culture*

Whilst we are experiencing the worldwide cultural disruption caused by the pandemic, it is worth observing at the same time other broad processes of cultural disruption such as those produced by informational technologies with the intention to analyze the interrelation between digital technology and socialization in formal education. Cultural disruptions are features of the ongoing process of detraditionalization and delimitation of social structures. If one tries to understand our culture with the concept of disruption, then a new access to education and formal learning in schools can be possible.

- *Disruption 1: The new space as context. The new space is a text of action in and with digital modes of representation*

A view back to European modernity in the 17th century leads to Galileo Galilei's secular definition of the cosmic space encompassing stars and planets including the earth revolving around the sun. Drawing on a comparison, the disruptive effect of Galileo's model of space, can be experienced in the current digital, and globalized context, as a reaction to the impact of digital instruments in the Internet on our cultural practices. Especially during the pandemic lockdown, these experiences consisted in times of communication by Zoom or other Internet platforms in combination with home schooling as a new practice of learning. Such cultural practices have been combined with communicative competences (agency) which integrate the Zoom app (structures) in the practice and agency of digital spaces. In the field of formal education these Internet spaces seem to be still unfamiliar because of the dominance of the cultural practice of teacher-guided instruction. For instance, this correlates with boys' experiences and competences[3] to set up their spaces by sitting in their individual bedrooms in front of a tablet screen and playing with groups of other boys on digital playgrounds.

What defines these spaces? They are individualized contexts generated by acting people within and by means of their individualized mass communication using Internet, mobile devices etc. These mass communicative spaces of individualized activities can be described as user-generated contexts. It depends on the users' agency if digital structures take effect. A digital user-generated context is a spatial option which includes everyday digital platforms, apps, individually owned mobile devices etc. Following Paul Dourish (2004), a context is a frame under construction for optional combinations of actions, representational resources inclusive including media and literacy, virtual and local sites or social sites like socio-cultural milieux.

An instantiation of a learning space in the sense of a user-generated context has been

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[3] Details about the boys' gaming prevalence see: Medienpädagogischer Forschungsverbund Südwest (2021) pp 11, 61 f.

set up by virtue of WhatsApp used by girls and boys attending lessons online. These at risk learners use their WhatsApp-context for creating and writing their rap poem as their own reflection about war. This follows the multimodal structure of WhatsApp which actively contributes to their agency options at the borderline between the informality of everyday life and formal writing in the school's context. It leads young people to an active and critical discussion about their text for a rap poem. These options correspond to their socio-culturally-milieu, a social structure related to specific modes of agency and practices. This includes that these young people develop their skills in the digital spatial options of WhatsApp together with their individually owned smartphones, which contextualizes formal learning and informal writing within school communication (Grabensteiner 2021).

- *Disruption 2: Multimodal forms of representation are taken for granted. They range from linear text to narrative, multimodal collages such as gifs*

In the example above, students outside formal school learn how to write a rap poem in a school project on World War 1. In their spatial context using WhatsApp the self-written Rap poem they composed draws on the multimodal form of WhatsApp. In particular, the genre of Rap represents the students' own way to reflect on war using a genre they are familiar with. In this case, the pregiven multimodal structure of the digital app and of the multimodal genre of rap corresponds to the students' preferences as a feature of their own agency. The multimodal Rap text with sounds and linear writing takes the 15- and 16-year-old young people to the rhythm of the classic traditional poem which is odd to them. By virtue of the students multimodal writing the cultural practice of formal learning changed from teacher-guided instruction to a model of the Inverted Classroom. To do this, young people work on their expressivity critically and communicatively using the multimodal WhatsApp on their smartphones. Using WhatsApp on their smartphone they employ their different family languages. In the WhatsApp communication framework, and without adult guidance they put into question whether or not the rhythm of the text lines of their rap fits to the translation of the non-German languages of their classmates. Here, WhatsApp as a multimodal and global cultural resource, which is fully familiar to young people as a specific agency feature, leads to an intensive, sustainable engagement with poetic texts. The chorus of this rap contains the following trilingual message, which the pupils had discussed word by word and line by line in the writing process of WhatsApp.

Modes in the definition of Kress and van Leeuwen (2001, 21) are: "semiotic resources which allow the simultaneous realization of discourses and types of (inter)action". Elisabetta Adami (2017) explains multimodal semiotic resources as the key feature of multimodality:

"different resources used in communication to express meaning […] As a phenomenon of communication, multimodality defines the combination of different semiotic resources, or modes, in texts and communicative events, such as still and moving image, speech, writing, layout, gesture, and/or proxemics" (Adami 2017, 451).

Looking for multimodal resources the traditional term 'Media' loses its relevance, that is to call an Internet platform a "social media". More adequate is *a multimodal form of representation.* From a semiotic perspective of multimodality Gunther Kress

(2010a, 22) propose that "Media are the material resources used in the production of semiotic products and events, including both the tools and the materials used".

- *Disruption 3: Egocentric worlds of experience as a reality construct in the individualised mass communication*

One mode of the current construction of reality is based on individualized experiences within and by the individualized mass communication like Facebook and Twitter. Thus, digital platforms together with mobile devices have become a moulding form of mass communication with important integrative as well as delimiting functions for the construction of "reality". Gerhard Schulze (1982) identified this phenomenon as a social structure drawing on the keyword of "experience society" ("Erlebnisgesellschaft"). This is the result of the development of individualization in specific social contexts defined "milieux". This agency-based process of individualization of life experience is now combined with the internet-based mass communication of platforms such as Facebook, Instagram, YouTube, and Twitter. In this process, group-specific forms of reality emerge in the modes of communication that are typical of internet platforms and of their specific ways of interpretation and representation. Colloquially described, this individualized form of experience constitutes a *filter bubble*. Currently, Covid-19 pandemic as a global, forced and individually, daily, and dramatically experienced transformation process has given impulses to these new forms of communication and their related views, as well as ways of constructing reality. Examples in Germany are the so-called *Querdenker*[4]. In their communication context as a social group they build their own means, their individual reality about what Covid-19 is. According to this social group, Coronavirus is not only what it appears to be: *no, corona virus is not a viral infection, but a politically justified social production by someone*.

As already mentioned, this constitutes a further development of the process of individualization produced by the industrial society and by consumption practices as an individual decision in standardized commodity societies (see George Ritzer 1993). In the 1980s Ulrich Beck described the framework for this societal development (1986) as a "risk society", with the core idea of risk in the sense of individualization "on the way to a different modernity" ("auf dem Weg in eine andere Moderne"). Today, this includes the individualized form of experience as a reality construction based on mass communicative contexts, as Gerhard Schulze (1982) emphasized.

As established institutions of formalized learning, schools have not yet come to grips with individualized constructions of reality. The concept of reality of the European Enlightenment is still the guiding principle for schools. It demands that we observe reality by looking directly into it. Therefore, the Central Perspective defines leading mode of representation of reality itself. In today's digital everyday life, the photo function of smartphone has become an established mode of representation. But it offers a double access to reality. On the one hand, a smartphone with photo or video apps makes it possible, argued in the rational of the Enlightenment, to face the world at an observer's distance. On the other hand, the *selfie* supports *me in* confirming *my* situation. Educationally this double function of the photo app offers the opportunity,

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[4] Possible translation of "Querdenker": Thinking outside the box.

and also the educational design task, to document and report one's own learning process with the smartphone by taking photos in the sense of my learning report. To communicate the visual result within the school's learning process is a digital form of reflection and assessment. In addition, the pedagogical task is to introduce "authentic and creative learning environments" into the digitally formatted appropriation processes of children and young people, according to Meriläinen and Piispanen (2015, 69). Based on the individuality of students, learning as "knowledge acquisition" (ivi, 74) is directed towards the students' individual lifeworld. Currently, this includes the digitalized everyday life of children and young people with multimodal forms of representation such as those of gifs, which use images as comments on WhatsApp, and those of video platforms such as TikTok.

- *Disruption 4: Knowledge society with the utilization and standardization of education by metrification and algorithmic analysis of human action*

Our culture is molded by the industrial mass production of standardized commodities and the individualized mass consumption. An instance of this is constituted by the individual mobility by car triggered by Fordist mass production which was based on standardizing techniques under the heading of Taylorism. Fedrick W. Taylor's "Principles of Scientific Management" (1911, 2004) set up and improved industrial efficiency, among others by "methods based on a scientific study of the tasks" (Taylor 1911, 11). This replaced "mechanical arts" of workers and its rational which led among others to practice and logic of mass consumption e.g. for food in McDonalds' global fast-food restaurant chain. Ritzer (1993) summarized the *principles* of mass consumption under the heading of the "McDonaldization of Society" with the following characteristics:

- "Efficiency": the optimal way to go from being hungry to be satisfied.
- "Calculability": to transform food, production and consumers for being measured, e.g. by making food units.
- "Predictability": predictable management of offering and eating food units: surprise is announced.
- "Control": working people and consumers are subdued to these processes e.g. by pre-organized choice, going through channels. (Ritzer 1993; 35, 62, 83, 100).

Taylorism replaced craftmanship's agency through an engineered and substituted experience by standardization and linearity, which led to the conveyer belt with mass production. Alternatively, today's digitally structured mass communication is built on individualization, which follows the mass vehicle of the personally owned car. The model of mass consumption also as structure of mass communication was successfully established by McDonalds' fast-food. Working at the Fordist conveyer belt was supplemented by consuming McDonalds' Hamburgers. Until the normality of ubiquitous digital resources like the Internet, smartphones, platforms, apps, and tools like Zoom would have taken place, the traditional school offered formal learning in the rational of the craftmanship of teacher-centered instruction. This kind of instruction is also in line with the Renaissance model of reality to stand in distance to the world. Everyday life experiences with digital representations plus the pressure of the digital economy on school did not change this formal learning by means of digital

options until Corona virus and the so-called home-schooling came. Home-schooling shows now a transfer of responsibility from school to families, more generalized, to the learning individual. This could increase assessment which is controlled by Apps. And, this is the disturbing idea, Apps offered by an Amazon-like learning company. Anna Wilson *et al* (2017) propose the following which is rather close to Ritzer's description of mass consumption:
- "Real-time insight into the performance of learners".
- "The widespread introduction of virtual learning environments (VLEs) – also known as learning management systems (LMSs) – such as *Blackboard* and *Moodle* has meant that educational institutions deal with increasingly large sets of data. Each day, their systems amass ever-increasing amounts of interaction data, personal data, systems information and academic information."
- To realize learning analytics in the sense of the "Society for Learning Analytics Research (SoLAR): learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs."
- This leads to: "two assumptions: that learning analytics make use of preexisting, machine-readable data, and that its techniques can be used to handle 'big data', large sets of data that would not be practicable to deal with manually."

Colin Crouch (2016) hints to new definitions of what is accepted as knowledge. Crouch asks how knowledge is "corrupted" e.g. by the market with indicator systems for performance of knowledge with the reduction of success to units of measurement that function like prices: "performance scores playing the role of prices". This "gives us in one datum" what "we need to make effective choices" (Crouch 2016, 6-7). 'Likes' on social media platforms are an example. In addition, Steffen Mau (2017) talks about the "quantification of the social". He analyses the quantification options and quantification constraints associated with digitalization. Digitalization leads to the algorithmic measurement of more relevant processes of living. Therefore, the mobile phone 'knows' what I have looked at on Amazon and offers me the appropriate advertisements. It also happens via the digital watch on my wrist or with the navigation system in my car. Keywords of Steffen Mau are "Quantifying the Social" (2017, 5):
- Status competition and the power of numbers. Comparative diapositives.
- Hierarchizations: rankings and ratings.
- Classification: Scorings and screenings, determinations of social value.
- Cult of evaluation: stars and points, like-my-reputation in social media.
- The inequality regime of quantification: the production of value, reputation management, collectives of the unequal, from the conflict of classes to the competition of individuals.

2. *A pedagogic perspective and educational guidelines*

In a world formatted by digital technology a necessary question is that concerning what defines contemporary education in a pedagogic perspective? In order to develop a pedagogic perspective on our culture driven by digital technology, it is necessary to connect the analysis above about cultural disruptions and their interrelation with agency, societal structures, and cultural practices with the pedagogic

thinking of the European Enlightenment, specifically with Wilhelm von Humboldt's educational model (1792). The rationale is to argue not only by looking at the technological and cultural structures of digitalization but also by addressing children's agency. In order to operationalize children's agency, it is necessary to analyze their appropriation of culture and their influence on culture.

Pedagogy in the European Enlightenment was engaged to contrast feudal and religious power by supporting genuine child development. By looking back to the Enlightenment and to the Humboldtian idea of education (*Bildung*, formation) the pedagogic perspective and the resulting active endeavour of education consists in dealing with children's agency in the appropriation and shaping of cultural environment. The recent school practice of digitalization is, in my view, a consequence of the societal power structures which takes shape in the assemblage of cultural practices of everyday life and economy. Economy became the driving force of innovation for digital options in formal learning. The Covid-19 crisis impact on everyday life and economy brought a new dynamic to the digitalization of formal, institutionalized learning by opening the traditional school's space of instruction. The classroom is or will be amalgamated with digitally-based contexts.

To sum up, the innovation dynamic of digitalization has come and still comes from the societal structures of digital technology. This development needs the educational enforcement of the agency components of the digitalization of culture. And this is where pedagogy is needed. A decisive impulse for the development of agency – that is agency as capacity to act on the world - motivated especially the young 'cultural sociologis'' Wilhelm von Humboldt in time of the European upheaval of the French Revolution. It is, as already said, pedagogical thinking in the categories of the development of children, young people, human beings. W. v. Humboldt (1792) proposed the following model for this, which I have updated linguistically (Bachmair 2009, 161):

- *Bildung*/formation is the holistic process of
- appropriation of cultural resources and of producing cultural resources as subjective traces within the pregiven culture
- within the dynamic of personal development and
- the essential intention of citizenship, rationality (*Vernunft*) and liberty (*Freiheit*).

This agency oriented model of learning as acquisition consists of appropriation plus externalization. In the sense of the structuration model the categories of citizenship, rationality (*Vernunft*) and liberty (*Freiheit*) are societal structures which frame child development. This argumentation reached already the 20th century with Lev Vygotsky's model of development and learning from 1930. It is based on the dialectic of internationalization and externalization (Vygotzky 1978, 1930, 56 f.). Learning as process of internalization consists of a series of transformations

- "An operation that initially represents an external activity is reconstructed and begins to occur internally."
- "An interpersonal process is transformed into an intrapersonal one."
- "The transformation of an interpersonal process into an intrapersonal one

is the result of a long series of developmental events."

This agency-based processes of internalization and externalization contains the option to change societal structures of digitalization. To put it simply, there are not just the children who have to be cultivated in the processes of digital literacy, but it is children who on their part cultivate digital structures.

Today in our individualized society as pregiven structure the agency feature of freedom is in common with social responsibility. This acquisition model has also to be broadened to learning as meaning-making, and even further as a consequence of the new cultural space, that is the user-generated contexts, drawing on ~~to~~ the theoretical idea of meaning making in specific contexts and their cultural resources. The contextual orientation of the educational view on learning belongs to the long tradition of the educational reform like "Kindergarten", as space for learning. Recently it was proposed by Lave and Wenger (1991) under the heading of "situated learning". A second leading feature of the context orientation comes from the so-called "conversational" function of media and nowadays from the diverse digital representation modes like Apps, platforms, technical tools etc. Referring to Gordon Pask from the 1970s Diana Laurillard (2002) proposed the Conversational Framework as a basis for educational designing.

2.1 Input from cultural ecology - sustainability and affordance of digital resources for learning as personal development

The pedagogic argument about cultural disruptions leads straight to the consideration about sustainability. Further, educational approaches to learner-oriented and communication-oriented designs of instruction were actualized by the ecologically perceived design of affordance (Gibson 1979).

3. Education as system of resources

Education as a system of resources comprises an institutionally organized process of learning as well as that of informal learning. Considering the idea of resources and education as a system of resources in the societal and cultural transfer situation of digitalization, pedagogy can receive argumentative input from ecology. Ecologies of energy, agriculture and nature developed a critical access which also gives political answers about power in these areas. Basil Bernstein (1987) made the idea of cultural resources concrete with "restricted" and "elaborated codes" of everyday language and language in school for education and social justice. Bernstein investigated the educationally relevant cultural resources of these language codes of different socio-cultural milieux, and how they intervene in children's development in formal learning. Amartya Sen (2009) analyzed the interrelation of lifestyles and social justice (cf. Bachmair 2016). Such a cultural-political approach of the ecology movement is helpful here. In the 1970s and 80s, the question of resources was in the foreground from an ecological point of view: how to deal with energy and nature without overusing them or destroying them, and how to distribute them fairly. In cultural theory, Pierre Bourdieu (1983), among others, provided this opening with the idea of "cultural capital". Today, these are digital cultural resources such as smartphones, the internet, social media platforms, multimodal forms of representation

like gifs, etc. The leading politically motivated idea of a cultural ecology is that the structural power base of cultural resources includes formative functions for subjectivity, for education and for the education system. Humboldt's educational guideline to support the development of children's agency in the process of appropriation demands for shaping the digital cultural environment which is caged in the cultural and economic logic of contemporary knowledge-based society with its mechanisms of utilitarianism, measurement and mobility as well as its power structures.

4. *Footnote on Cultural Ecology Approaches*

At this point, a critical comment is necessary about the theoretical and practical risks of a cultural ecology without educational policy orientation. In this sense, risks of a cultural ecology pertain to the systematic exclusion of cultural innovations. One example is the exclusion of television from childhood since it is regarded as a closed system, as explicitly called by Neil Postman (1982) in the 1980s under the title of ecology. An example of exclusive mechanisms in the spaces model for an adequate socialization can be found in Zhao and Frank (2003). They write about the reaction of the school ecosystem that prevents the "invasion" of new technologies such as computers.

Furthermore, a question is necessary if a holistic approach for Learning Ecology is to be regarded as sufficient. Rather often in education the concept of ecology is used as a headline for holistic approaches. Just one example, in an international conference volume (Ma *et al.* 2017) on the "New Ecology for Education", in which the aim was "to unpack the complex interaction between communication and learning" by "having witnessed the explosion of information on the web". The task is "to explore better approaches to teaching and learning, along with effective and meaningful media communication through technology advancement" (ivi, V). According to Brad Hokanson (2017), this can be achieved with a "new ecology for education" (ivi, 1), if "educational technology" abandons the focus on learning content and moves beyond "knowing of content" (ivi, 2) to "low-level learning", to the "capability to synthesize information and to generate new ideas" (ivi, 2): "We have to begin to evaluate learning and development in ways that are more subjective and inclusive as is being done in design, some schools, and even daycare centers." (ivi, 5).

5. *Sustainability in a disparate culture with digitally dominated learning contexts*

The "Report of the World Commission on Environment and Development", the Brundtlandt Commission (1987) introduced a definition of sustainability as a "relational category" and not as a "maintenance of stability", which is also important for the educational argumentation. Sustainability as a "relational" category cannot be defined as a simple 'if-then' correlation. Thinking "relationally" is helpful when children's development in formal, institutionalized learning is to be considered critically. For example, keeping mobile devices systematically out of school is based on a non-relationally idea of education: leave everything the way that has successfully functioned at school insofar as it is regarded as a central cultural institution. Thus, no amalgamation of school, everyday life and entertainment. Also, the physiological

argument that mobile devices negatively change brain functions and related perception is based on a linear concept of sustainability. However, looking back to the impact of the car in individualized mass mobility society, makes it clear that such changes always have an impact on perception and modes of experience.

The concept of detraditionalization and delimitation of boundaries in sociology (Beck, Giddens, Lash 1994; Beck, Bonss, Lau 2003; Beck, Lau 2004) refers to recent disruptive societal and cultural development, including experiences in connection with digital technologies. Delimitation of the boundaries of experience requires a complex argument for sustainability in practical education, e.g. about mobile learning. The idea of provisionality (Kress 2010b) is an educational challenge for schools and institutionalized education. This provisional character of sustainability was already considered in different definitions reported by Scott (2002) for discussion in the field of education.

However, in order to avoid a type of digital arbitrariness in this cultural development with de-limitation of boundaries, provisionality, the above-quoted relationally defined concept of sustainability of the World Commission on Environment and Development from 1987, can be helpful. For instance, mobile devices and mobile learning as a typical structure of digitalization are dependent on a mobility complex which does not function statically. If one thinks of control and examination algorithms, and a developmental direction of the ubiquitous communication instruments, then the impact of smartphone becomes apparent. Such a mobile app profoundly impacts on the personal development by controlling, steering, evaluating, excluding. Although sustainability is a relational category, it is legitimate and necessary to promote sustainability also as the maintenance of stability for a child's growing up. How can this practical requirement of sustainability be combined with its relational and provisional character? Scott's (2002) and Ng & Nicholas (2013) suggestion is helpful to bring sustainability of innovation (e.g. mobile learning) as dialogue, communication, and discourse into Technologically Enhanced Learning. Thus, digital tools of representation like smartphones or WhatsApp with gifs need a school context open to a flexible structure of user-generated contexts. If one looks at the earlier example of WhatsApp communication in the context of the teaching project on World War 1 from the point of view of sustainability, then what emerges is that it is far away from sustainability in the sense of instructional teaching which assesses learning outcomes. The WhatsApp example performs sustainability in the sense of integrating the diversity of family languages into formal learning. Moreover, the WhatsApp option via smartphone enabled a communication independent of the classroom. This was important because as a group of pupils (only boys) aimed at to writing a Rap, then this means to write in a multimodal text genre of youth culture as a manifestation of their self-defined learning objective. To do this, they had the opportunity, that they really appreciated, to work in the familiar recording studio of their youth center. The boys gender dominated decision to choose the recording studio outside the school, was compensated by the usage of the cross-gender smartphone app WhatsApp. The public presentation of the project results, the anti-war Rap public event in a regional cultural center, was then based on an analogy to the learning sustainability of a school examination.

6. Conversational extension of affordance in the ecology of perception

Affordance, or better in my opinion correspondence, consists in the correlation between digital modes of representation and actions. Affordance, a concept developed in James J. Gibson's (1979) ecological approach to people's perception, is concerned with how contexts and environments correlate with agency. With respect to this, the idea of affordance becomes relevant. It is about the correspondence between smartphones, app contexts, learning activities and learning objectives. On a first view, affordance can be explained by the question of how the elements of an instructional design fit or do not fit together. In the case of smartphones, for example, so far school as an institution has assumed that the smartphone as a tool of informal everyday communication cannot correspond to the conscious learning process. James J. Gibson (1979, 127 ff.), psychologist of perception, asks how environments – he speaks of the "layout" of environments and their "surface" (131) – can be joined with action. In Gibson's logic, this is an interpretative correlation. If we look at Anglophone education, we can approach this interpretative correlation with Diana Laurillard's concept of the "Conversational Framework" for learning technology, generalized, for digital education (Laurillard 2002). In social semiotics as a starting point, Insulander and Lindstrand (2013, 226) describe the concept of affordance as interpretive action in contexts. This discursive frame with the key term of Conversation for technology enhanced instruction refers to the constructivist approach of cybernetics by Gordon Pask (1976). Pask saw cybernetics and its practice of computer programming as a form of conversation. Pask's definition of conversation emphasizes the context of action that is related to objectified meaning and that generates meaning. By conversation, Pask did not mean an option of everyday communication, but regarded it as "one method of exteriorizing cognition to engage on a verbal conversation" (Pask 1976, 1). One can now add the idea of conversation inherent in cybernetic coding to the argument of Symbolic Interactionism of this time (e.g. Blumer 1969).

Conclusion

The ecologically motivated idea of affordance, in my definition, the correspondence of structural, agency and practical feature elements, lead to search for discursive connections in digital learning. These are main elements in mobile learning forms which impact on the educational and formal learning options in the mobility infrastructure of our complex culture. One perspective is the discursive characteristic of digital tools like smartphones, along with their communicative ubiquity. Communication, in other words, the conversational function of smartphones is a structural element which corresponds to the learners' agency. This correspondence is appropriated to formal learning because mobile devices are multimodally integrated in the individual dispositions of learners in everyday life contexts, as well as in contexts of formal learning. This disposition of learners needs a correlation with the instructional design. The context orientation of the educational view of learning belongs to the long tradition of the educational reform-orientation like the kindergarten as space for learning. Recently it was proposed by Lave and Wenger (1991) under the heading of "situated learning". Current version of situated learning are user-generated contexts.

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