Initial Situation

On March 11, 2020, the World Health Organization (WHO) classified the outbreak and spread of the SARS-CoV-2 coronavirus as a pandemic; an epidemic that now officially has worldwide implications — including the operation of schools.

On this day, exactly three weeks before the beginning of the summer semester 2020, many teachers, pupils, students, parents, and politicians were suddenly made aware of the precarious situation in regards to the indispensable digitization at German schools and how we are by no means prepared for one or more potential "digital semesters".

Problem Identification

Teaching and learning in the liberal arts thrives on applied and self-determined practice-oriented work as well as on interdisciplinary and interpersonal exchange. The individual areas of the arts and creative disciplines differ and must be treated individually, which is why one cannot simply fall back on a generalized digital tool for the digital study of the arts; not to mention all the details and questions surrounding data protection, privacy, security, and ultimately any licensing and operating costs.

> *With Zoom, Webex, et cetera, we use an interface for exchanging with other people the way the companies have predefined it; not the way the context should individually demand it.*
>
> Norbert Palz, President of Berlin University of the Arts

At Berlin University of the Arts, we were faced with this unexpectedly problematic situation in March 2020 as well. Working, experimenting, researching, and studying could by no means take place in the established ateliers, classrooms, studios, and workshops in the upcoming summer semester; henceforth, an unrestricted verbal exchange between teachers and students was no longer conceivable in any of the conventional ways.

The big question is: How can we transfer the physical individual work processes which predominate the art and design disciplines into digital realms; or to what extent can we extend our physical processes with adequate digital tools?

How can we also make hybrid forms of artistic-scientific teaching structurally more effective through such digital tools and innovatively combine them with established digital forms of communication?

Problem Solving

For a sustainable and independent digitization strategy of educational institutions, adequate digital tools of this kind should by necessity be privacy compliant, free-to-use, intuitively understandable, scalable, comprehensible, verifiably secure, contemporary, and future-oriented.

There are a number of free-to-use digital tools that meet all of these imperative requirements; however, there is not one established approach to embed such tools into a modular, integrated, and extensible platform. A "digital toolbox" in which you can find all the tools you need for digital learning, teaching, and collaboration.

A small interdisciplinary team of students and teachers within Berlin University of the Arts has been working on this concept for ten months now; an individually configurable platform for digital learning, teaching, and collaboration — which interested institutions themselves can install, modify, and expand independently — based on the special experience and expertise of the arts in the fields of self-organized work and design processes.

> *We developed **medienhaus/** — not replacing but extending the physical space.*

Our **medienhaus/** project focuses on interdisciplinary and interpersonal exchange in the service of emergent, non-predetermined formative processes; the centerpiece of our conceptual approach is an asynchronous communication hub called **/classroom**. Similar to the physical space, **/classroom** works as a self-organizeable meeting and gathering point for classes, courses, seminars, and project forms of any kind in the individual digital **/classroom** channels. Unlike conventional chat rooms, these channels also allow for asynchronous discussion threads and make persistently long communicative project processes viewable, commentable, and archivable.

Individual digital **/classroom** channels can be extended in a modular fashion — depending on individual requirements and demands. The extension possibilities are virtually endless; some initial extensions provided by us are, for example, scalable audio/video conferencing, collaborative writing and editing, collaborative whiteboard for layouting and sketching, live streaming and stream watching — all accessible in the same browser window.

All these extensions — and many more, basically any web application — can be integrated into individual **/classroom** channels and are available on demand for all participants without switching to other, proprietary products. Even combinations with well-known and established — ather statically structured — LMS products like Moodle are possible and could bring out the best of both worlds in favor of a new digital learning, teaching, and collaboration approach for generations which have already grown up with social media and self-determined digital communication.

Federated Communication

Our **medienhaus/** platform intuitively introduces all participants to the paradigm of federated communication through the modern technology our platform is built around; this functionality enables **/classroom** channels to connect with other, external networks and, therefore, interconnect beyond the boundaries of Berlin University of the Arts or, respectively, other institutions.

Educational institutions could provide their own **medienhaus/** instance — physically located on the infrastructure of this educational institution, for example — for their teachers, students and staff; but this can also be any other platform based around the same technology, see below.

With the help of federation, *@alice:udk-berlin.de* and *@bob:tu-berlin.de* can communicate with each other in a comparable format across collaboration channels that were previously isolated from each other by different technical licensed products (such as Slack, Microsoft Teams, Cisco Webex Teams, Mattermost, WhatsApp, Facebook, et cetera); likewise, students of Berlin University of the Arts can view and join the various publicly federated spaces of courses at Technical University of Berlin — and vice versa, of course.

Schools could easily network internationally without any additional technical or organizational effort, as Berlin University of the Arts was able to test with the “digital sandpits” collaboration with the University of Oxford in the summer of 2020.

Our **medienhaus/** platform is based on the Matrix protocol; an open networking standard enabling secure, decentralized communication with other Matrix-based platforms; there are a variety of different Matrix clients for a wide range of systems, which means you don’t necessarily have to use the **medienhaus/** platform to communicate via the Matrix protocol.

You can think of it a little bit like email; different vendors, different clients on different systems, completely independent of each other, and yet they can all communicate with each other using the underlying email protocol. Valuable collaborations can occur within this interinstitutional network.

Decentralized Infrastructure

The decentralized, modular, and scalable approach of this free and open-source platform we designed and developed, combined with the principle of edge computing, would enable not only large educational institutions to participate in this federated network, but also other forms of organization even small associations and individuals.

Personal digital tools can be installed on your own resource-effective low-tech hardware; via this instance, the essential participation in the federated network via Matrix takes place; furthermore, collaborative writing and editing as well as a collaborative whiteboard for layout and sketching, for example, can be made available on such resource-effecive low-tech hardware.

Non-personal digital tools can be operated by larger institutions and made available for shared use, when not currently busy; for example, audio/video calls, audio/video conferencing, live streaming and stream watching, et cetera.

Climate & Sustainability

This decentralized and federated approach, combined with the principles of edge computing and idle resource sharing, comes with two immense benefits:

First, the number of hardware resources running in parallel, but largely unused at certain times, is reduced; this results in more power-efficient and cost-effective operation, as well as a reduction in CO2 emission.

Second, underutilized and unused hardware resources are made available to other members of the network in solidarity; this enables interinstitutional balancing of infrastructure load and allows especially smaller groups and individuals without their own expensive hardware resources to use the non-personal digital tools that are otherwise resource-hungry in redundant operation.

The climate crisis is the greatest challenge of the present and future, so we believe that any project must be examined from this perspective in order to counteract the worsening of this global crisis.

We cannot assure absolute CO2 neutrality for the operation of the **medienhaus/** platform; the previously described low-tech hardware for personal digital tools could be operated CO2 neutrally; resource-hungry non-personal digital tools would have to be located in hardware clusters or small data centers which can be optimized for CO2 emissions, such as the data center of Free University of Berlin.

To achieve the best possible carbon footprint, a specific balance between decentralized and centralized hardware resources for digital tools is recommended.

Principles

The **medienhaus/** concept is based on various technological principles:

Hacker Ethics of the Chaos Computer Club e. V. — excerpt of the relevant points

– All information should be free.
– Mistrust authority — promote decentralization
– You can create art and beauty on a computer.
– Computers can change your life for the better.
– Make public data available, protect private data.

The big commercial companies apparently offer the use of their platform without asking for a fee, and still record exorbitant profits. However, this business model represents the fundamental problem anchored in the system:

Primarily profit-oriented companies cannot act in the sense of protecting personal user data, because it is only with the processing of this personal data that the actual profits of the companies are generated.

> *If you're not paying for the product, you are the product.*

More than ever, designers and programmers have a growing responsibility to be aware of these interrelationships and to act according to the principles mentioned above, because the products they design and develop are used by a large number of people and, in the age of digital platforms, have a collectively formative influence.

Hardware and software projects financed by government and non-profit funds should definitely be made available free and open-source, because this is the only way to ensure some form of return to the community for their taxes.

Decentralization and federation are options for an alternative future; at the current time, we can still conceptually counter the prevailing paradigm of unrestrained data capitalism at its root. With approaches such as **medienhaus/** we attempt to proactively shape this paradigm change together.

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