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DANIEL PITTICH (Technical University Munich)
RALF TENBERG (Technical University Darmstadt)

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DANIEL PITTICH / RALF TENBERG

Editorial: Hybrid Learning Landscapes in vocational education

ABSTRACT: Digitalization and the use of digital media in vocational education has received a massive boost again, not least due to the Corona pandemic and the associated restrictions on present instruction. However, the implementation of digital media and digital learning environments poses new challenges that affect both the conceptual design of lessons and their media implementation. Furthermore, it affects the provision, management and use of the necessary digital infrastructure with all relevant changes or extensions in the teaching-learning interaction. In order to meet these challenges, an approach for teaching-learning arrangements and environments was developed, which combines the basic ideas and premises of competence-oriented classroom teaching with digital learning environments interlocked and consistently implemented. This is known as Hybrid Learning Landscapes and is currently in a test phase in the states of Bavaria and Hesse.

Keywords: digital media, hybrid learning, competence orientation, learning platform, virtual learning support.

Editorial: Hybride Lernlandschaften im beruflichen Unterricht

ZUSAMMENFASSUNG: Die Digitalisierung und der Einsatz digitaler Medien im beruflichen Unterricht hat nicht zuletzt durch die Corona-Pandemie und die damit verbundenen Einschränkungen des Präsentunterricht einen erneuten massiven Anschub erfahren. Mit der Implementierung von digitalen Medien und digitalen Lernumgebungen stellen sich jedoch neue Herausforderungen, die sich sowohl auf die konzeptionelle Unterrichtsgestaltung und deren mediale Umsetzung auswirkt, als auch auf die Bereitstellung und Handhabung der notwendigen digitalen Infrastruktur mit allen diesbezüglichen Veränderungen bzw. Erweiterungen in der Lehr-Lern-Interaktion. Um diesen Herausforderungen zu begegnen, wurde ein Ansatz für Lehr-Lernarrangements und -räume erarbeitet, der die Grundideen und Prämissen eines kompetenzorientierten Präsenzunterrichts mit digitalen Lernumgebungen verzahnt und konsequent umsetzt. Dieser wird als Hybride Lernlandschaften bezeichnet und befindet sich aktuell in einer Erprobungsphase in den Bundesländern Bayern und Hessen.

Schlüsselwörter: Digitale Medien, Hybrides Lernen, Kompetenzorientierung, Lernplattform, Virtuelle Lernunterstützung.

1 Starting point and current situation

In the editorial of the last issue of JOTED (published in February 2020), the topics "teacher education" and "digitization" were critically examined (Tenberg 2020b). A striking feature was the discussion of various potential areas of competence of teachers, which were either newly opened up by the digital change or had to be comprehensively updated. Media didactics and methodology can be assigned to the second point, because digital teaching and learning media have been around for a long time. This is documented in the International Computer and Information Literacy Study (ICILS), in which, among other things, only very limited digital media skills were determined for our teachers (Eickelmann et al. 2019). At the beginning of this year, this, in turn, seemed neither surprising nor necessary, since schools had proven to date that they could also function with "analog tools".

This situation fundamentally changed just a few weeks later and gave the theme "digital media in learning" a meaning never imagined and hitherto unknown in all areas of education (basic education, higher education and professional training). Due to "Corona Pandemic" and with the closure of associated schools, traditional face-to-face education was no longer possible, so it was necessary to switch to distance learning in a short term, which implied dealing with digital applications and infrastructures. In the process, an unprecedented (digital) media activism took place under the "home education" Anglicism. It quickly proved to be a "largely helpless emergency educational program" (Tenberg 2020a, p. 324), "in which teachers with roughly media competence use roughly suitable technologies to distribute tasks and solutions, flanked by virtual meetings in which no learning atmosphere can be created because they are permeated by constant fluctuations in the network and only those whose parents can afford a broadband connection can participate in them in any way" (Tenberg 2020a, p. 324).

Criticisms of this digital emergency program were and are wide and varied, especially from parents, who have now not only been appointed family teachers, but must also become experts in digital teaching media, with skills to deal with learning platforms, downloads and uploads to cloud structures and online conferencing tools. Tasks should be printed, their solutions digitized and appropriate explanatory videos selected and integrated into their own children's learning. In this way, many parents should compensate for the skills that teachers sometimes lack. The news that, after the summer holidays, face-to-face classes would return everywhere was a relief for students, parents, teachers and the educational administration. This decision, however, has also slowed down, rather than expanding efficiently and consistently the many and varied debates about modern digitalization of teaching. Consequently, the appropriate concepts and approaches (structure) - also in the context of a renewed "school lockdown" - can be seen as open questions and current challenges. In this context, the question of an adequate implementation of digital media and infrastructures in schools through flexible combinations of face-to-face and distance learning appears to be central.

2 Learning platforms - potential vs. use

More than a decade ago, digital learning platforms were already being used in all areas of education, especially in the university segment. The Moodle and Mahara systems were increasingly used to facilitate but also to enrich university classroom teaching. However, as has become apparent since the spread of PCs in the 1990s and the multimedia development that arose with them, the technical possibilities are and have been far greater than their actual usage. Learning platforms are

primarily used to enter texts, media and tasks. Forums and e-portfolios are also included. Rarely are the reactive elements of these systems used - also due to legal issues - for exams or performance evaluations. Nevertheless, these learning platforms are now well established in university teaching and have proven to be effective and efficient technologies for many university lecturers with which they can enrich, expand, support or even (temporarily) replace their teaching.

In our schools it has always been different. Although similar course infrastructures were potentially offered, learning platforms have hardly been able to establish themselves in general education and vocational training. The reasons for this are manifold. It starts with the enormous equipment deficit, which is characterized by the fact that, up to now, teachers have only in exceptional cases been provided with IT equipment financed by the school system or government. A situation that would be completely unthinkable for the economy is standard in our schools. This technology deficit is similar on the side of the students. Where money is scarce, the only digital hardware currently available is a smartphone. Sometimes computers with monitor and keyboard, or notebooks are only common in higher educational levels. In addition to the hardware deficit, which is at best only briefly outlined, there is probably an even more serious competence deficit, especially among teaching staff. This was already mentioned at the beginning against the background of the pandemic (Tenberg, 2020b). Without wishing to criticize the classic blackboard, it is clear that some teachers are still in the "Cretaceous period" in terms of methodology and that digital media are only used in simple scenarios close to classical teaching. This can be seen, for example, in the spread of document cameras.

Nevertheless, learning platforms were established at general and vocational schools - even before Corona - wherever teachers with an affinity for technology were offered corresponding opportunities by the school or state. In comparison to the universities, their use for teaching purposes was much more reserved, also due to data protection regulations. Similar to universities, comprehensive and cross-individual didactic digitization concepts in schools are rather the exception. Vocational schools are recognizably more advanced than general education schools. This can be explained by their greater proximity to the business world or by the fact that almost 50% of their staff is recruited from the business world, which means that our deficits in this area are less evident in teacher training. Already at the beginning of the pandemic, a study showed that digital media were increasingly being used in vocational schools, that teachers ascribed great importance to the teacher-related use of digital media and that they were very open to their implementation (Pittich et al. 2021). This can also be seen in everyday school life, where individual digital solutions have tended to dominate and learning platforms have not played a significant role to date. One of the consequences of this is that the traditional "teaching pattern" and the typical interaction structures of classroom teaching are largely retained:

Digital media and content (hereafter referred to as content) are passed on directly and selectively from the teacher to the students during the course of a learning session. This is done either via data carriers (memory stick, hard disk, ...) or via electronic mail (email, messenger, ...). Similar to the handling of homework, the students are immediately activated to open up texts, view media or work on tasks. In the further course of learning, the students return their work and solutions either analog or digital to the teacher directly. Depending on the medium of exchange, the provision and use of the content may remain diffuse, once there is no concrete storage location. In addition, the scope and variety of the content is significantly limited, since larger files can hardly be handled in this way.

It is noticeable in this structure that the learner-related interaction takes place almost exclusively within the framework of classroom interaction, so that the teaching-learning interactions

and teaching-learning feedback and the learning actions initiated via the media and materials are not always consistently related to each other (Figure 1).

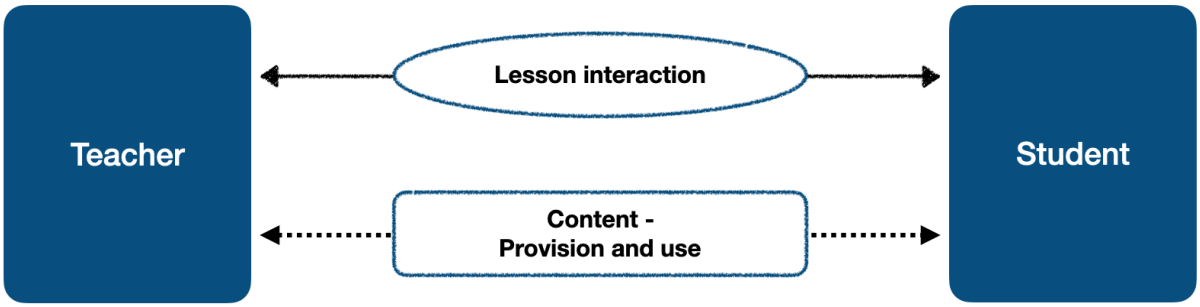

Fig. 1: Limited relationship between digital media and content - i.e. the learner-related content and classroom interaction

Learning activities outside of vocational school environments are the exception rather than the rule and are likely to be even more open, with very little or no teaching-learning interaction or feedback. As soon as the direct interaction context of the school is left or exceeded, the students are responsible for their own learning and for the handling of the content. So that especially students with learning or comprehension difficulties can hardly benefit from virtual learning environments. In addition, the opportunity to include learning in the workplace cannot be used consistently, since a lack of cooperation between learning locations is always connected with the difficult interaction of the involved protagonists and learners.

Although a consistent implementation of cloud-supported learning platforms is also based on traditional classroom teaching, it can significantly exceed this. The starting point here is the traditional, direct classroom interaction between learners and teachers. The integration of a learning platform opens up no more and no less than an option for indirect interaction. Teachers can make parts of the required content available via a learning platform and thus create learning environments that are not necessarily determined (in terms of time and sequence) in exact learning paths. Thus, self-regulated learning, which is only possible to a limited extent in class, is expanded. This is relatively independent of the teaching objective, i.e. of the question whether something new is to be learned, deepened, practiced or relearned immediately. The situation is similar with learning-related feedback processes: the limited possibilities of direct teaching feedback can be supplemented by indirect feedback via the learning platform.

There is further potential in the collective use of learning platforms, as this can significantly increase the efficiency of conceptual work on behalf of teachers. In addition, there are extended possibilities for the inclusion of the company learning location, because learning location cooperation also depends to a large extent on the efficiency of the exchange between teachers and trainers (Figure 2).

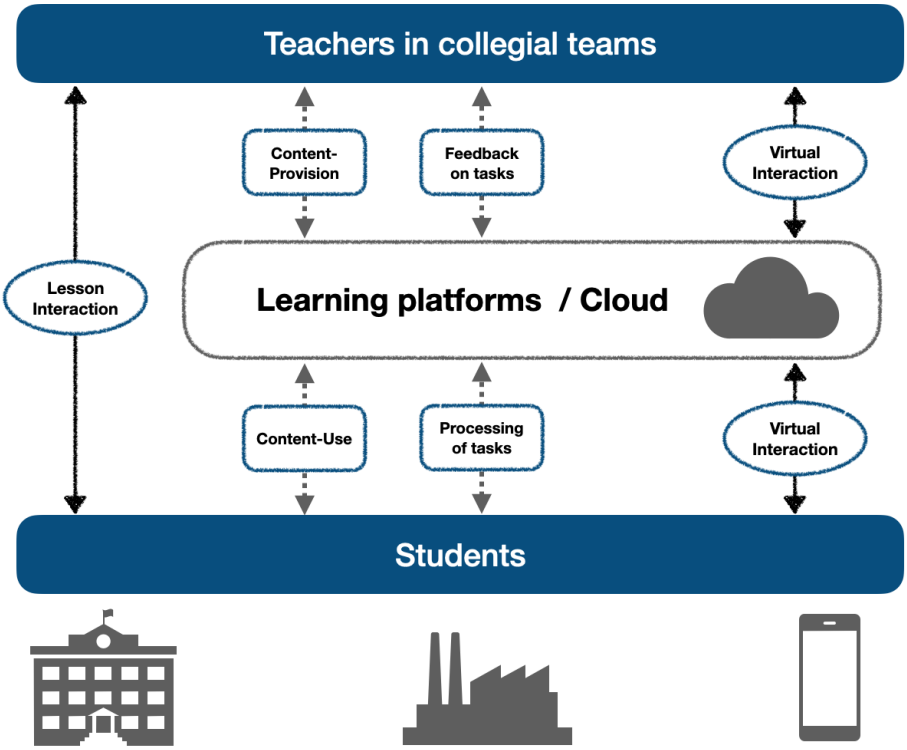

Fig 2: Approach of a consequent interlocking of content (provision and usage), task processing and feedback and especially classroom interaction and virtual interaction (incl. learning feedback)

If it is not possible for individual students to attend classes, e.g. due to prolonged illness or a stay abroad, the classes can be taught completely via a learning platform during these phases. However, this only makes sense in extreme cases, such as a pandemic or in individual cases. At the current time, however, it can be assumed that the optimal use of learning platforms will not take the place of classroom teaching, but rather in alternating supplementation. Accordingly, a concept called "Hybrid Learning Landscapes" has been developed[1].

1 The concept of "Hybrid Learning Landscapes" is currently being concretized and implemented jointly by Daniel Pittich, Ralf Tenberg and the Hessian Ministry of Education and Cultural Affairs in a broad-based approach consisting of 1) implementation assistance including self-development courses on a learning platform and 2) a Hesse-wide further education series. In addition to this, ongoing pilot projects in the network of the TUM School of Education should be mentioned.

3 Hybrid Learning Landscapes

In the following section, in addition to the basic concept (Section 3.1), the methodological potential (Section 3.2) and assessments of educational practice on the present overall topic (Section 3.3) are presented. Success factors for implementation are derived from these (Section 3.4).

3.1 Basic concept of Hybrid Learning Landscapes

Hybrid Learning Landscapes (HLL) are competence-oriented vocational teaching formats, whose implementation involves a precisely tailored integration of digital content (content including media and materials) and infrastructures. The overarching goal of HLL is a didactic-methodological balance between student orientation and instruction as well as between analog and digital teaching-learning interaction. While maintaining the strengths of conventional classroom teaching at vocational schools, the learning environment "school/class" is to be transcended in terms of time, space and didactic-methodological enrichment through the use of learning platforms and their digital possibilities (Figure 3).

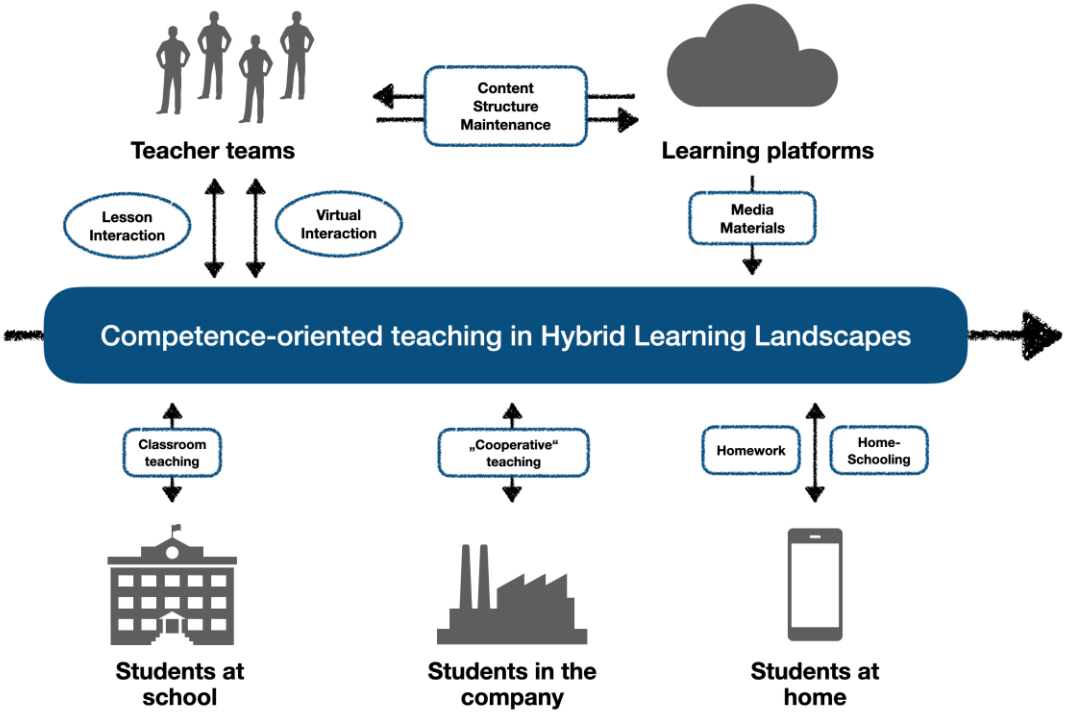

Fig. 3: Process logic and basic approach of Hybrid Learning Landscapes

HLL requires that all content for competence-oriented instruction is set up on a learning platform. From there, competence-oriented teaching is implemented centrally via a digital course system (e.g. Moodle). This instruction takes place primarily in the vocational school as face-to-face instruction. There, the usual teacher-student interaction takes place, supported by media and materials as well as instructive options, e.g. explanatory videos. Every teacher is free to use the available media and materials, to explain himself/herself or to work with explanatory videos or to combine them. In relation to the operational partner, cooperative activities between learning locations can be integrated into a HLL. This can be done by the teachers in a push process, e.g. by tasks they set in order to be solved in the company (e.g. processing tasks on company machines),

or in a pull process, in which the trainers also supervise elements that relate to school backgrounds (e.g. theoretical development of company-specific processes). Inside and outside of school and the learning location cooperative environment, HLL offers options for homework or distance learning (not only in pandemics, but also in cases of illness or stay abroad). HLL is also particularly interesting and connectable with the topics of individual differentiation, inclusion, the promotion of the disadvantaged and language promotion, since efficient and address-oriented support options and approaches can be integrated and used in the sense of remedial teaching.

In addition, digital learning platforms open up a wide range of possibilities for learning status surveys, resulting in a better feedback process and possibilities for interaction between teachers and students. In addition to these reflection- and feedback-related facets, the basic concept of HLL can be expanded regarding to a (performance) evaluation of distance learning. The prerequisite for this is a closely coordinated and cooperative team of teachers who 1) place and support the HLL content and media on the learning platform, 2) create and manage the appropriate learner-related structures for the course system and 3) ensure didactic-methodological system support for Cloud, Moodle and end devices.

3.2 Methodical potential

The current teaching paradigm focuses on student-centered, action-oriented teaching (KMK 2018), in which knowledge relevant to action - in the present approach differentiated into factual, process and reflective knowledge - is acquired in an integrative and professionally adequate manner (Tenberg et al. 2020). For this purpose, work-related scenarios are ideally performed in the classroom and, as a rule, work-related tasks are worked on in (fictitious) contexts. The aim here is to enable students to develop and construct knowledge independently. This requires learning environments in which they can pursue their own learning paths and successfully complete them.

With the broad information, development, implementation and reflection or control possibilities of a HLL, learners can start with their individual knowledge, follow their individual logic, work at their own pace and possibly also reach their goal in multiple ways, using repetitions or quick runs. With the virtual interaction possibilities, direct presence interactions can be supplemented and extended. Due to the familiarity with the learning platform and its elements that develops in school, extracurricular learning can be adequately prepared and continuously embedded.

In summary, the methodological potential of Hybrid Learning Landscapes lies, on the one hand, in a consistent implementation of the competence requirements of vocational education and, on the other hand, in its conclusive expansion into virtual environments, which currently offer better possibilities for access and interaction and also they have future potential. In order to achieve this added value, an effort is required, which can be accompanied by an adequate return on investment. This is because HLL are not only more effective in terms of the integration of in-school and out-of-school teaching-learning environments, but they also create long-term structures in which the implementation and updating costs of vocational training are lower than they are at present.

3.3 Practical assessments of the current situation, needs and feedback on the concept and didactic added value

The present concept of Hybrid Learning Landscapes has been thoroughly discussed in workshops and discussions with educational practice, both at the level of school management and with teachers. In the context of the current and future challenges of digital enrichment of vocational teaching and learning, its strengths and weaknesses were compared from a school-practical and quality-strategic perspective and the associated opportunities and risks were considered. In addition, different implementation strategies were discussed. In the following, central feedback and implications - without claiming to be complete[2] - are presented in marked manner:

Current challenges and open questions as well as the related questions possible reasons and possible solutions:

- Many students find it difficult to acquire competencies via digital media with a high degree of autonomy. Consequence for teachers: Slow progress in the curriculum.
- A significant proportion of teachers associate additional work with the preparation of digital teaching formats.
- Suitable teaching formats must be found so that it does not become a "frontal teaching with a camera".
- Teachers need specific assistance in order to gain confidence in the use of digital media, accompanied by timely training courses.
- Students as well as schools need a suitable and functional infrastructure (e.g. equipment, video software, and platform).

Positive experience values of vocational school practice:

- The entire classroom, including teachers, is planned and reflected in the timetable. This results in a clear time frame, fixed learning times and fixed teacher teams. With a future extension of the learning location concrete measures are necessary, which some portions take place in “face-to-face” and some in distance learning. It must be ensured that learners and teachers can change the learning location if necessary (e.g. home if the infrastructure at the school is not suitable).
- Companies are skeptical about distance learning at vocational schools and tend to bring trainees into the company if attendance is not possible. It is therefore imperative that companies are made aware that distance learning is structured and of high quality.
- Personal contact and direct communication/interaction between teachers and students are essential for learning motivation and success. A mere sending of tasks and solutions does not do justice to this, even forums and chats are of limited help here. Therefore, telephone or video conferences must be used in distance learning at vocational school.
- Learning platforms used for distance learning must be used in everyday school life and made familiar to teachers and students. Teachers can thus digitalize their entire classroom management consistently and intrinsically. Students develop a self-conception for learning with digital infrastructures and thus no longer perceive an expansion of school learning environments as an exception, but as a logical and opportune option.

2 For a broader overview of current implementation status and perceptions, please refer to the study by Pittich et. al (2021).

The relevant conclusions were iteratively integrated into the conceptual foundations described above (Section 3.1). Thus, the conceptual idea of HLL was subjected to a "stress test" and optimized in relation to practice. At the current state of the concept, five potential success factors for HLL and its implementation were identified.

3.4 Success factors for the implementation of Hybrid Learning Landscapes

For an effective implementation of HLL, 5 success factors are important (Figure 4).

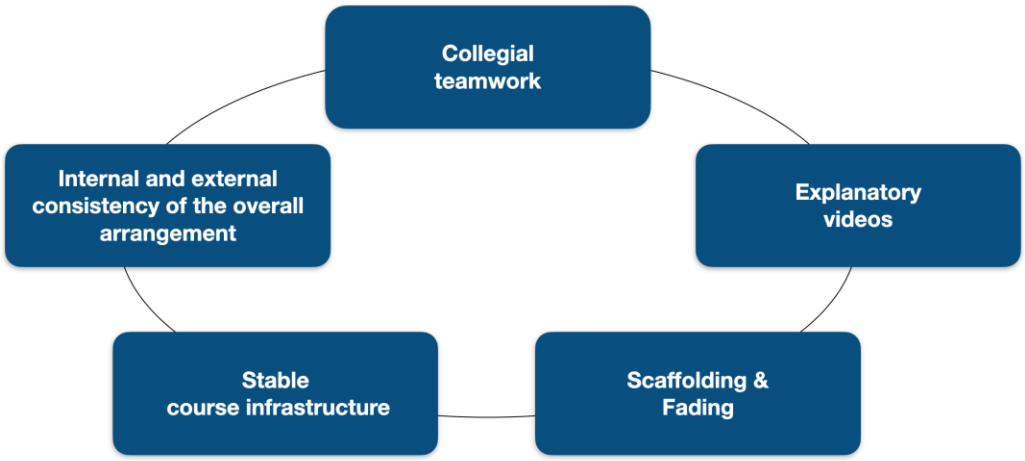

Fig. 4: Success factors of a (vocational) school implementation of Hybrid Learning Landscapes.

Success factor 1 - Collegial teamwork

For individual teachers the effort of developing, updating, accompanying and moderating a HLL is very high. In a didactically and methodologically coordinated team of teachers, the effort is distributed and at the same time, the efficiency is significantly increased in terms of content, media and technical aspects. Once an infrastructure is created, it can be scaled so that large parts of the teaching can be successively transformed into HLL with reduced effort.

Success factor 2 - Internal and external consistency of the overall arrangement

HLL develop their strength from the provision of diverse media elements such as texts, videos, applications, etc. In order for students to be able to handle and implement these independently and in a goal-oriented manner, they must be coherent and consistent with each other. Students must always be able to perceive the connections between the provided media elements, otherwise frustration arises instead of understanding due to missing references. The same applies to the transitions to class in direct teacher interaction: these must be coherent and comprehensible, without breaks or redundancies. Starting with the target competencies of an educational format, the first step is to determine when these are achieved. The tests can be generated from this. The next step is to determine what students can and must know in order to achieve these competencies. From

this, the information materials can be derived and, if necessary, implementation and exercise arrangements.

Assuming that the new content needs to be well explained, explanatory videos are produced. These do not convey everything that is contained in the information texts, but rather refer to core and focal points. Finally, theoretical and practical tasks are developed with regard to the target competencies and sample solutions are provided. Once this overall package is complete, its communication is coordinated. Depending on how much of it is to be taught in presence and how much virtually, this can look very different.

Success factor 3 - Explanatory videos

In student-oriented teaching concepts, the multifaceted explanations were mostly adopted by teachers. In the course of integrating digital media, there is currently a recognizable trend to make greater use of explanatory videos created in-house or made available on the Internet. With this shift in the use of media, the role and range of tasks of teachers in the context of teaching-learning interaction is also changing, but without abandoning it. This is because the media-initiated teaching-learning interaction and explanations give rise to additional approaches to understanding that lie outside the direct teacher-student interaction and can thus be shifted to virtual or digital learning environments. This additional offer of indirect explanations relativizes the asymmetry between teachers and students, accentuates their independence and expands their cognitive accesses with additional moderation possibilities through media processing. In addition, explanatory videos can be watched by students when it is appropriate for them in terms of time or learning. Explanatory videos can also be paused and viewed several times. In the concrete learning situation, this produces predictably better learning effects, both motivational and comprehension-related. Beyond the learning situation, the confirmed perception of effectiveness in the learning process increases the expectation of self-efficacy. On the part of the teachers, the production and provision of explanatory videos causes an accentuated examination of the central contents and composition of the respective topics and an explication of their normally largely implicit instructional methodology.

Success factor 4 - Scaffolding & Fading

Even with high quality information and explanation media, it must be assumed that accesses, explanations or tasks are not or not fully understood. Finding and following one's own learning path requires - depending on the type of student - more or less introduction, guidance and support. Scaffolding here means building up individual support structures that only help where necessary, but do not compensate for the learning or orientation achievements of the students. Fading is part of scaffolding by gradually reducing it to a minimum and thus opening up adequate environment for the growing independence of the learners. Learning environments outside the classroom should not be left completely open for communication, but rather structured in terms of time and supported by teachers. This means that concrete working hours have to be planned and handled here and that during these times the teachers are available for questions, comments and assistance. Time shifted approaches are rather difficult to assess.

Success factor 5 - Stable course infrastructure

A digital infrastructure that is optimally adapted to teaching-learning requirements is demanded for a clear provision and simple handling of the various media elements of a student-independent learning environment. This includes possibilities for the presentation of content, the reflection of learning processes and results, but also for teaching-learning communication (e.g. Moodle). In addition, the data and media offered must be available and manageable securely and quickly. This requires cloud structures with all relevant role and security aspects. Finally, it must be possible to develop, support and implement the courses on site, which requires end devices with corresponding performance and stability for both teachers and students.

4 Outlook

The concept of a Hybrid Learning Landscape can be understood, in accordance with the reference backgrounds outlined above, as a possibility for the consistent expansion of the competence claim of vocational instruction and conclusive transfer into virtual environment. HLL make it possible to implement the current teaching paradigm of student-active, action-oriented teaching in digital-supported learning. The integration of learning platforms will lead to foreseeable improvements in access and interaction possibilities between teachers and students. In order to be able to make full use of the possibilities of HLL in vocational school teaching practice, it is first necessary to create an adequate infrastructure. This varies in complexity and challenge from state to state and from school to school, but can generally be solved with the appropriate use of resources. However, this technical development is by no means sufficient, because it only creates the basis for an innovative didactic-methodological transformation that only teachers can carry out. It is therefore necessary to implement HLL through specific didactically accentuated training and support measures. In the German states of Hesse and Bavaria, the Ministries of Culture have reacted in this regard. Hessian teachers will be introduced to HLL from October 2020 through a broad-based approach consisting of a) practical implementation assistance including self-development courses and b) a corresponding series of further training courses. Parallel to this, the (university) school network of the TUM School of Education - in coordination with the StMUK - will work together with vocational schools on implementation strategies and exemplary HLL teaching scenarios in a pilot project. The entire implementation and pilot processes as well as the resulting teaching concepts and documents are scientifically accompanied. HLL concept and implementation strategy are continuously developed further through lessons learned reflections and audits. By the end of the school year 2020/2021 it will then become clear whether and how it is possible to digitally expand or enrich vocational school teaching by means of the HLL approach. If the success factors are read critically, potential barriers and challenges can be identified that need to be worked on together with educational practice. As was shown in initial pilot training courses, success factor 2 ("internal and external consistency of the overall arrangement") is particularly important here, because every methodic innovation and further development is also accompanied by a didactic one. In the present topic of HLL, this means that an implementation of digital or hybrid learning environments once again requires coherent and well-founded concepts for competence-oriented teaching. This means that the methodological design of a HLL is sometimes closely linked to the consistent implementation and adequate concretization of the competence requirements in vocational school learning.

In addition, the demands of collegial teamwork (success factor 1) and scaffolding & fading (success factor 4) are two aspects of professionalization that have long been central to the 1996

curriculum reform (KMK 1996) but have not yet been implemented throughout our vocational schools. In contrast, the two digital challenges, i.e., the development of explanatory videos (success factor 3) and the handling of a secure IT infrastructure (success factor 5), are less complex because they are relatively free of didactic-methodological convictions and paradigms. Thus, the HLL approach integrates old and new challenges to professionalization and (vocational) school development, with all the opportunities but also risks. With the HLL concept and training courses, elaborate initiatives are introduced to further develop vocational teaching in a meaningful and forward-looking way. The innovative and development-intensive teachers will decide whether this is successful in our school practice.

Literature

Eickelmann, B., Bos, W., Gerick, J., Goldhammer, F., Schaumburg, H., Schwippert, K., Vahrenhold, J. (2019). ICILS 2018 #Deutschland. Computer- und informationsbezogene Kompetenzen von Schülerinnen und Schülern im zweiten internationalen Vergleich und Kompetenzen im Bereich Computational Thinking. Münster; New York: Waxmann.

KMK (1996). Handreichungen für die Erarbeitung von Rahmenlehrplänen der Kultusministerkonferenz (KMK) für den berufsbezogenen Unterricht in der Berufsschule und ihre Abstimmung mit Ausbildungsordnungen des Bundes für anerkannte Ausbildungsberufe. Bonn.

KMK (2008). Handreichungen für die Erarbeitung von Rahmenlehrplänen der Kultusministerkonferenz (KMK) für den berufsbezogenen Unterricht in der Berufsschule und ihre Abstimmung mit Ausbildungsordnungen des Bundes für anerkannte Ausbildungsberufe. Bonn.

Pittich, D., Bark, R., & Pappa, C. I. (2021). Digitalisierung des beruflichen Unterrichts – Eine empirische Studie des Implementierungs-stands (Arbeitstitel). Zeitschrift für Berufs- und Wirtschaftspädagogik, (In conception).

Tenberg, R. (2020a). Banging on the chicken house - Ein Pamphlet über die Digitale Bildung in Deutschland. Zeitschrift für Berufs- und Wirtschaftspädagogik, 116 (2), pp. 318–327.

Tenberg, R. (2020b). Editorial: Grundständige digitale Lehrpersonenbildung – nicht in Sicht. Journal of Technical Education, 8 (1), pp. 16-32.

Tenberg, R., Pittich, D., & Bach, A. (2020). Didaktik technischer Berufe Band 2 Praxis & Reflexion.

PROF. DR. DANIEL PITTICH
Technical University Munich
TUM School of Education
Professorship for Technology Didactics
Arcisstrasse 21, 80333 Munich
daniel.pittich@tum.de

PROF. DR. RALF TENBERG
Darmstadt University of Technology
Didactics of Technology
Alexanderstrasse 6, 64283 Darmstadt
tenberg@td.tu-darmstadt.de

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