Erasmus+

BYOD in VET

Background Paper

ZSL
Zentrum für Schulqualität und Lehrerbildung
Baden-Württemberg

Co-funded by the European Union

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Background Paper: Erasmus+ BYOD in VET

This paper was created in joint cooperation of Zentrum für Schulqualität und Lehrerbildung (ZSL) Germany and Savon koulutuskuntayhtymä (Sakky) Finland.

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Corona situation in general in Germany and Finland

(Lockdowns, time periods, implementation, special regulations/laws for VET schools)

FINLAND

Initial situation at Savo Vocational College (Sakky)

Starting 2020 spring in April schools in Finland, and also Sakky, moved into distance learning mode for approximately five weeks as per recommended by Finnish Health Administration. However, in Sakky, a small minority of students, particularly Special Educational Needs students, remained in school for various reasons such as needs for teacher support etc. Different departments within Sakky had their own specific timetables for the transition back to classroom lessons and full attendance.

Before lockdown, Teams or any similar distance learning / collaboration platforms had not been widely used in Sakky at all, although Teams and Skype had been employed in lieu of telephone etc. group calls for student trainees working in distant workplaces.

Wilma (School's internal communication and scheduling app/management system for arranging schedules, student attendance and parent and student/teacher communication), Moodle (Modular Object-Oriented Dynamic Learning Environment used instead and in addition to books) and Office 365 (cloud storage and Word, Excel etc.) had been used already on many courses and as testbeds for moving forward towards digital learning environments.

In short, in Sakky there were already tools implemented for distance learning. But in smaller scale than was required – and the personnel was inexperienced and required crash courses in using the software. There were two days of time for teachers and staff to learn how to handle the situation when it was mandated that we are to start distance learning only.

Digital tools in classrooms at Sakky

Before the pandemic, there were several IT classrooms with 20+ computers in the school, mostly used for mathematical and IT subjects but also as language labs and there was a growing need for them as teachers implemented more and more digital content.

Some departments also had laptops to loan out to students during classes and there were occasional students who brought their own laptops. Typically, every home in Finland by then had at least one personal computer or several, but not all children had their own machines, or had desktop machines they could only use at home.

Almost all students also typically had smartphones, and those were sometimes used for taking part in Kahoot! And similar simple online games and learning platforms. Some departments also purchased several dozen tablet machines (Android) and some iPads to loan out to students, and there were projects about how to use them in the classroom, but it never became mainstream or took off due to various issues (difficulty in writing texts and lack of mouse for many kinds of tasks).

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GERMANY
Situation in Baden-Wuerttemberg/Germany

Date		
16.03.2020 – 03.05.2020	School shutdown	distance learning
04.05.2020 – 28.07.2020	Partial school opening for graduation classes	alternating lessons with half class no sport
15.06.2020 – 28.07.2020	Partial school opening	alternating lessons with half class no school trips
23.06. – 25.06.2020	Vocational school final exams	Moved from mid-May
28.07.2020	all students are to be transferred to the next grade level	
14.09.2020 – 15.12.2020	regular operation under pandemic conditions	No school trips
since 16.10.2020		mask duty in classrooms distance learning for graduation classes
16.12.2020 – 18.04.2021	School shutdown	distance learning
since 22.02.2021	school-opening for graduation classes	mask duty in classrooms, test strategy with weekly two tests for self-testing
since 23.02.2021		vaccinations for teachers possible
19.04.2021 –25.04.2021	Partial school opening	alternating lessons with half class distance learning (incidence > 200) mask duty in classrooms test mandatory for teachers and students (not for vaccinated and recovered people)
26.04.2021 – 13.05.2021	Partial school opening	alternating lessons with half class (incidence > 100)
14.05.2021 – 27.07.2021	Regular operation under pandemic conditions for region with incidence < 50	mask duty in classrooms (incidence > 35)
since 13.09.2021	Compulsory presence	mask duty in classrooms test mandatory for teachers and students

VET specific situation: March until June 2020: VET online teaching

Communication tools and platforms for smartphone and pc

Platform	Pro	Con
WebUntis „Messenger“ (only used in Germany)	- a High Number of Schools were already using the WebUntis-Webservices (e.g. class-register including presence and supply board/teaching)	- Only Messaging In the first Weeks of March 2020 very unstable because of high load on Webservice infrastructure until the System was scaled out.
MS Teams - Office356 (also in use in Finland)	- Windows based Schools (Win/Office) had already MS Office on their PCs. Additionally most Schools had already an Office 365 Value Licence Agreement with Microsoft. So they had to eventually deploy only one Program -> MS Teams. - Since March 2020 stable and a lot of educational Features were added - Full integration into MS Office Suite (Word/Excel/Windows Explorer) - Includes a File Share per „Team“ - Educational Plugin like Tasks, Feedback and marks - Videoconference including personal Messenger - Worldwide Connectivity (Office 365 Account - if enabled) - combination - APP and Desktop-Client for all Mobile Devices	- The First Week from 16th March severe Load Problems. But this was fixed after one Week - Office 365 has in Germany till today a lot of open privacy concerns. So the use of Office 365 Products is not prohibited. But also not recommended until an decision by educational government.
Zoom (also in use in Finland)	- APP and Desktop-Client for all Mobile Devices	In the beginning of the 1st Lockdown-Season - some incidents have been reported by German press. This was mainly caused by unsecured Zoom-Meeting-Links (e.g. noPin) which has been published to foreign people (outside School Campus). - Only a Meeting tool without any further integration (w/o File/Messenger/ …)
Webex Meeting (only used in Germany)	- APP and Desktop-Client for all Mobile Devices	- Only a Meeting tool without any further integration (w/o File/Messenger/ …)
BigBlueButton & Moodle (only used in Germany)	State BW provides all schools with Moodle instances free of charge including BBB integration	- Web-Based only. No native Apps for Mobile Devices
Nextcloud (only used in Germany)	State BW provides a data secure cloud for saving and exchanging data	- Web-Based only. No native Apps for Mobile Devices

Platform	Pro	Con
WhatsApp (also in use in Finland)	Used for video exercises and task returns to teacher (easy to record videos and send directly to teacher, without the need for a computer at hand, for 'field work' especially)	Privacy/security issues possible; later Kaizala was adopted instead of WhatsApp in Sakky and the use of WhatsApp discouraged. Also there is only a phone number, not user registration, so it can be hard to know who the sender is.
Skype (also in use in Finland)	Used for video exercises and task returns to teacher	Less reliable technology, communication/connections vulnerable; later replaced by Teams.
Jitsi (only used in Germany)	Online-Video-teaching tool	+ Data protection compliant + County internal system - App stutters slightly

Note: Primary method for communication in Sakky is and was Wilma web interface. In addition Moodle messages and email have been used. WhatsApp, direct phone calls to students and sometimes also SnapChat and Kaizala has been used.

Tools used for online materials, supportive offers, games, collection of information, etc.

Smartphone and tablet apps

App	Description / Subject	Pro	Contra
Padlet Note: alternative to the Padlet are task cards (data protection compliant) also via browser (only used in Germany)	• Browser-based pin board on which text, images, videos, links, voice recordings, screen recordings and drawings can be placed • Updates are automatic • Follow every change live from different computers • Working together as a class is possible, there is a comment function • Can be used in all subjects	• Collaboration of any kind in real time → collection of ideas, work results, etc. • Didactic relevance: very high → critical thinking; presentation content, evaluation • Train media skills • Download and save work results as an image or PDF • Can be used in both face-to-face and online lessons • Increased motivation of students	• Teacher must register • 3 padlets are free of charge • Padlet is not 100% EU data protection compliant • the application of padlet is forbidden in BW since March 2022 due to data safety reasons
Simplemind free/Mindmeister (only used in Germany)	Development of mindmaps • politics • business administration • summary of lessons	• visual presentation of results • simple handling with smartphone and tablet	• Data protection • better usability with the pen
Runtastic app or Teamfit (only used in Germany)	app for Sports' lessons/joint running without contact	• joint running in pandemic times • competition option → motivation • KSOE runs around the world	• only with available GPS-signal • Data protection (what happens with the data?) • saving of data
GeoGebra (only used in Germany)	GeoGebra is dynamic mathematics software that is freely available as an open source program for non-commercial use. Application: Mathematics lesson Visualization of calculations	• Open-source programme • linking of geometry and algebra • experience Maths visually (addresses all senses) • usable in distance and classroom learning	• data protection • usability with tablet (depending on manufacturer)
QR Code Generator (also in use in Finland)			
Oncoo (only used in Germany)	Oncoo is used to structure some methods in the classroom. Possible uses are, for example, digital map queries, the placemat method and a target for opinion polls.	• Tool for start of lesson or motivation • Tool for feedback • free of charge	• If there are many answers from the students or if the answers are duplicated, Oncoo does not pre-sort or sort them out.

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App	Description / Subject	Pro	Contra
		• simple handling for students and teachers	• data protection
Kahoot also via browser (also in use in Finland)	Feedback tool, tool for testing of knowledge	• fast feedback • good starting point for collecting arguments • applicable in many subjects	• data protection/ server location
Quizlet also via browser (also in use in Finland)	Tool for testing of knowledge („Learning cards“), good for training of vocabulary, can be used differently, too	• lots of opportunities to practice, also in a playful way • query "direction" adjustable	• free of charge version with ads • data protection/ server location
Quizacademy app only for student refresher courses operation via browser (only used in Germany)	Tool for testing of knowledge Cards (similar to Quizlet) or quiz questions are stored in “courses”	• very diverse formatting options • safe data protection, server in Germany • well-suited for exam retakes or live quizzes	
learningApps (only used in Germany)	Interactive exercises (Create it yourself or use it from a large collection)	• easy to handle • wide variety of exercise options • server in Germany	• GoogleAnalytics should/can be deactivated
zumpad (only used in Germany)	collaborative editing of (text) documents	• no log-in • server in Germany	• automatic deletion of account after 6 months of inactivity
Wilma (only used in Finland)	Extensively used for all student communication. Often replaces email services; students acquire their course keys and information via Wilma, also student’s guardians can monitor attendance in real time and send and receive messages, see grades; full integration with student data services, their diplomas, grading and all class schedules and timetables. Primary communication and data management tool in Sakky.	• Smartphone app limited in functionality.	

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App	Description / Subject	Pro	Contra
Hot Potatoes (only used in Finland)	Used for creating simple exercises and crosswords (also embedded in Moodle)	exercises are simple and mechanical	Exercises cannot be edited without the HotPotatoes app
Planet eStream (only used in Finland)	Used for making videos and video exercise returns by students and instruction videos / screen capture videos by teachers.		Requires a lot of bandwidth
Goodnotes (only used in Germany)	Adminstration of lessons/courses	• generating digital note books: you can write texts with keyboard or draw with your pen or finger • import and work on files and pictures • administration of documents • as many subfolders as you like • you have all your notes always with you • the latest changes are synchronized via iCloud	• only available on iPad • data protection data saving only on iCloud
OneNote (also in use in Finland)	Alternative to Goodnotes	• notes are sorted and always available • digital storing available • app as knowledge library and documentation platform • usable worldwide • Microsoft app (free of charge within the Office 365 license) • can be used across platforms (additionally browser-based)	• data protection • no import of pdf files
Google Docs (also in use in Finland)	Online collaboration tool	• Allows for simultaneous working on spreadsheets and documents	• No registration needed, allows for destructive behaviour

Online teaching materials in Baden-Wuerttemberg:

- LMZ → Landesmedienzentrum bzw. Kreismedienzentrum (State media centre): Here the teacher receives free access to all media (films, etc.) via the school. Working materials for teachers, including solutions, are available for many media. Large selection, prepared didactically, free of charge, suitable for many subjects (partly few business administration tools), see also: https://www.lmz-bw.de/.

- Edu-Pool: https://esslingen.edupool.de/home?pid=s5fo5ptamd25omtlgntuf3ul75

Lessons that were not taught during the COVID pandemic

In Finland - at Sakky

There are no exact, collected and generally available records of lessons held or whether classes have been postponed or cancelled; for the five-week lockdown period all classes were held by distance learning methods, but since then departments gradually returned to normal.

However, in Sakky in particular the move to new campus at Savilahti caused specific issues with sports lessons often carried out with students attending different locations around the town, because there were not enough sports facilities available especially with regards to keeping safety distances.

In Baden-Wuerttemberg

Date	Sports	Music
27.05.2020	Sports only for graduation classes in sport	Prohibited: Singing and playing brass and woodwind instruments
31.08.2020	Allowed under pandemic conditions: distance and additional regulations	Allowed under pandemic conditions: distance and additional regulations
04.06.2021	Incidence > 100 Sports only for graduation classes in sport Incidence > 50 Sports only outdoors without physical contact Incidence > 35: without physical contact in sport halls, outdoors allowed Incidence < 35: without restrictions	
30.07.2021	Incidence > 100 Sports only for graduation classes in sport Incidence > 50 Sports outdoors or without physical contact Incidence < 50: without restrictions	
13.09.2021	regular operation under pandemic conditions	
26.11.2021	alert level and alert level II without physical contact in sport halls	alert level and alert level II only outdoors or in big rooms
23.02.2022	alert level without physical contact in sport halls	alert level only outdoors or in big rooms

Date	Sports	Music
28.02.2022	Sports for exam preparation/examination is allowed even if the case is positive in group indoors and outdoors without contact restriction and distance obligation.	singing is now available at the warning level without meeting the minimum distance requirement if a mask is worn. The masking requirement does not apply to participation in practical examinations and to the examination preparations required for this purpose, nor to the school performance assessments required for the purpose of assigning grades.

Successes and failures

In Finland - at Sakky

The successes or failures of online training during the pandemic phase largely depended on the factors of technical expertise on the part of the teachers and the students as well as the equipment in the two groups. Teachers in Sakky all had the necessary equipment and they were also able to go to school facilities to have distance lessons from there, but the rapid transition proved very difficult with a steep learning curve to handle. For the students there were several cases where they had trouble accessing network or having the required hardware such as for video calls. Some resorted to using their cell phones. In short, technical difficulties were a large factor. Furthermore, sharing answers and generally cheating on tasks was common as well as false attendance (present in call but not really following at all). Also sometimes the pupils disrupted the class with inappropriate messages and pictures and/or noises; general bullying and such issues sometimes took place. Students also proved unwilling to participate by speech on camera, and it was hard for the teacher sometimes to get feedback from the students, which made lessons often tedious lecturing and leaving the teacher unsure if the students actually listen or understand. All in all technical issues soon proved less of a problem than the readiness of students to communicate in the new media as a group.

In Baden-Wuerttemberg

The successes or failures of online training during the pandemic phase largely depended on the factors of technical expertise on the part of the teachers and the students as well as the equipment in the two groups.
Many of those involved, including teachers, did not have the necessary equipment to conduct online lessons. Also, some of the end devices/terminals didn’t and still don’t have sufficient power to conduct a video conference in a stable manner. Furthermore, there was a lack of external hardware such as a camera, microphone, etc. to be able to hold adequate didactic lessons as a substitute for face-to-face lessons. In many places, the spatial conditions (many people in the household with too little space or too few end devices) were also a problem in this phase. The same problem, only much more pronounced, was also evident among the students. In many places, the Internet access was not designed for such a load with video conferences or the programmes used for this were e.g. not tested enough or did not run reliably.

In many places, attempts were made to counteract the technical problem by using subsidies to try to purchase the appropriate equipment for online lessons at schools and make it accessible to the students on a loan basis.

Final exam results during the COVID pandemic

In Finland - at Sakky

There are no final examinations in use in Sakky, and while in 2020 there were 76 situations where graduation of students was postponed due to not being able to carry out their tasks requiring personal attendance, there were no real long-term effects on the numbers of students graduating over a longer period. 2252 students received their diplomas normally. In comparison with the Finnish average, Sakky managed better because lockdown was shorter in Savo area. Final examinations are replaced in Finland with workplace evaluation and diploma works in companies, evaluated by a trifecta of teacher, student and company representative.

In Baden-Wuerttemberg

Final secondary-school examinations/general qualification for university entrance:
The Ministry of Education, Youth and Sports Baden-Wuerttemberg reported that the lockdowns during the COVID pandemic had no measurable effects on the results in the final exams (Abitur).
Nevertheless, every student had been allowed to choose freely whether they wanted to write the exam on the primary, secondary or third official date in school year 2019/20. Normally this is only possible with a medical attest. Additionally, the exam time per subject had been extended up to 30 min for all students.

VET specific situation: after re-opening of schools and teaching in school year 2021/22

Situation in Finland - at Sakky

Immediate partial reversal

After moving into distance learning (lockdown period in Finland) it quickly became apparent that special education students were not able to attend teams sessions or manage their learning without supervision and help. The lockdown period in Finland, and also our college lasted only for five to six weeks in total, but there were departments that wanted to stay in distance learning also for the following fall period, in order to maximize quarantine success.

Special education is always done with classroom lessons and personal aid; teaching is facilitated by pen and paper and spoken word. It is very rare for special students to complete Moodle courses because they are simply too complex and demanding (there are no special education level simple, basic level courses made and designed to achieve the passing grade only for mathematics). Thus, special education students dropped out of distance learning and were in danger of dropping out of school entirely.

To remedy this, special education was almost immediately decided to be held at school as per normal situation, while all other students remained in distance learning. Since then it has been going on like this for special education, and the whole school returned to school two weeks prior to the start of summer holidays.

Moving on with COVID

The school has remained in normal teaching, but the effects of the pandemic and the distance learning period have profoundly changed the way students learn.

- Moodle has become the extensive, almost only, singular tool for exercises and saving the projects and tasks. Using books has given way to everything being moved into Moodle as exercises and projects have been running constantly to build and improve online materials for courses. This affects both core subjects and vocational subjects with a slight delay. The process is further expedited by the school moving to new facilities and there are clear instructions that no paper materials are to be moved to the new premises, but everything is to be made digital.

There have been organizational changes and large changes in the way courses have to be presented to students; they need to be available also to students working in companies, training etc. and there is no possibility to provide classroom teaching for all groups studying in the school. Classroom teaching is primarily meant only for the people coming to school from comprehensive school directly (ages 15-16) and requiring teacher supervision and attendance checks and so on. Adult students and trainee students must be able to study online.

- Teams has also become staple especially for staff meetings and collaboration sessions as well as many other company-level events (graduation events, training, staff fitness sessions

during recesses and so on). Also, Teams classrooms are still arranged occasionally, when the class or teacher have difficult hours to access school physically, and it is even encouraged in some situations, such as during quarantine periods for suspected COVID cases and so on. And as mentioned before, the commuting of teachers between department facilities and sites was discouraged in order to reduce chances of transmitting the virus unknowingly, and because of that, some teachers held some of their lessons in person and some via Teams.

- Kaizala, SMS messages or WhatsApp or even Snapchat etc. have also become more commonplace as a way for students to hand in their oral exams or presentations, and overall, hugely more popular for communicating between students and teachers, because absolutely everyone by now has a smartphone.

Situation in Baden-Wuerttemberg/Germany

Before the first lockdown:
In the field of part-time vocational schools, very few institutions had technical equipment that would have made comprehensive digital teaching possible for all learners. Many classrooms were already equipped with projectors or smart boards, document cameras, teachers' notebooks and loudspeakers. However, there was a complete lack of mobile devices for the students. Not all teachers were in possession of their own mobile devices at the time.
In addition, there was often no comprehensive and trouble-free WIFI in schools, which is a basic requirement for digital teaching.
At that time, the digital component of teaching was limited in most cases to digitally projecting teaching content and teaching materials in the classroom using a projector and tablet or document camera. The students, on the other hand, mostly continued to work with pen and paper.

After the first lockdown in March 2020:
The first lockdown caught many schools completely unprepared, as the digitization of everyday teaching played a subordinate role in school development. The cultural administration also initially had no clear specifications as to the form in which the digital implementation of distance learning had to take place. This meant that every school had to create its own concept for designing distance learning very quickly. During the first lockdown, many schools used video conferencing software from Zoom, WebEx, Microsoft Teams or BigBlueButton. The learning and working materials were usually sent to the students by e-mail, made available in software packages or available for download from a cloud provider.
The big challenge for many schools was to create the technical prerequisites for a comprehensive digitization of lessons (WIFI and end devices) in a very short time.

Before and after the second lockdown in December 2020:
In contrast to the situation described after the first lockdown, the schools started the school year 2020/2021 well prepared.
The basic technical requirements for the success of digital or hybrid lessons had now been provided. Both, the learners and the teachers, received multi-layered training within half a year and had acquired the necessary knowledge and skills to proactively design digital or hybrid lessons or to participate profitably in the lessons.

A challenge for many schools was compliance with the applicable data protection regulations and the implementation of uniform school digital systems and platforms.

Situation today:
Accelerated by the COVID pandemic, the technical and didactic foundation for digital and hybrid teaching at vocational schools were successfully laid. The vast majority of teachers are currently using these options in their everyday teaching. This happens in different forms from case to case and ranges from working with digital worksheets to the use of more complex learning solutions and software packages such as Moodle.

Information on published German and Finnish teaching modules for learning in the classroom

In Finland - at Sakky

Moodle courses used and made in Sakky are also used by YSAO, another vocational college in Savo. Moodle in general is adopted in practically every vocational/polytechnic level school in Finland.

Already before lockdown, in 2018 - 2019, a decision was made in Sakky to move into entirely digital materials (except for special education and needs), and all students were designed to have access to a computer, either a laptop given to them by school to keep or loaned for lessons. Plans are that starting 2023 all students should have their own personal laptops provided by the state, as the law states that all materials and access to materials must be free of charge to students and thus the school must arrange for the required technology.

In Baden-Wuerttemberg

In the second half of 2020, the "Lernen trotz(t) Corona" (Learning despite (defies) Corona) project was launched and financed by the Baden-Wuerttemberg Ministry of Education, Youth and Sports. The project was carried out by the Center for School Quality and Teacher Education (ZSL) Baden-Wuerttemberg in cooperation with interested teachers.
The aim of this project was to offer "ready to use" Moodle courses for download. These Moodle courses should offer quality-assured and curricula-compliant Moodle courses for different types of school, subjects and topics, for example for learning field lessons in dual training.
The teachers were thus shown possibilities of how they can independently set up and carry out digital subject lessons during lock-down times with the help of Moodle.
All Moodle courses are designed in such a way that they depict finished teaching sequences for subject specific teaching for at least two weeks. Since the Moodle courses are "ready-to-use", the teacher only has to download these courses from the website and import them into the school's own Moodle system and transfer them to their own lessons.

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The Moodle courses have also integrated external exercises, such as H5P: https://h5p.org/.
In school year 2020/21, around 15 Moodle courses for various professions and school types were created in two tranches.

This project with the various Moodle courses was well received by schools and teachers and was therefore very successful, so that the project could continue and be funded seamlessly even after the lockdowns.
The project is currently running under the project name: Moodle-Moove: https://zsl-bw.de/,Lde/Startseite/ueberfallende-themen/Moodle-MOOVE and is in the sixth tranche.

Project tabletBS.dual

At the beginning of the school year 2016/17, a pilot project for the use of tablets in dual training started. Depending on the content-related requirements of the training occupation and the job-specific didactic-methodical considerations, the use of digital terminals and access to the Internet in the classroom usually take place in special computer rooms in schools. These rooms include the necessary equipment for the use of cross-industry and industry-specific application software. They enable work to be carried out on stationary terminals, but at times that are limited and not very flexible, and which are also to be organized well in advance. The development of the now consolidate internet and multimedia-capable mobile devices in the form of tablets offers new opportunities for pedagogical work in schools, especially in dual training at the vocational school as a place of learning, because they can be used in principle in every classroom can come.
As part of this project, the possible uses of tablets in teaching vocational skills are to be tested. For this purpose, teaching units are developed, the implementation of which is expected to add pedagogical value (e.g. with regard to motivational aspects, greater self-control, greater media competence, greater cooperation and greater cognitive complexity). Involving the training companies opens up additional opportunities for learning location cooperation.
After three years, the project should include ten dual training occupations and involve up to 50 schools. In this way, around 10,000 trainees were involved in the project within five years. The testing related primarily to the use in vocational „learning field“ lessons.

At the beginning of the 2016/17 school year, 14 project schools started for the professions of office management clerk, motor vehicle mechatronics technician and mechatronics technician. In the 2017/18 school year, 13 additional project schools were added for the professions of electronics technician for automation technology, industrial mechanic and clerk for insurance and finance. In the 2019/20 school year, 25 more project schools came from the professions of plant mechanic for sanitary, heating and air-conditioning technology/plant mechanic for sanitary, heating and air-con-

ditioning technology, electronics technician specializing in energy and building technology, industrial clerk and cutting machine operator/ cutting machine operator added.

From 2018 to 2020, the project was scientifically monitored and supervised by the Otto-Friedrich-University of Bamberg with a final evaluation. The following points can be mentioned as central results.

- The tablet lessons promote the development of the students.
- The students feel positively activated in tablet lessons and have a stable state of mind.
- The extent of the effect of the tablet lessons is related to the didactic implementation quality in the schools.
- The teachers still find it challenging to draw and implement didactic consequences for the use of tablets based on the changes in the professional fields.
- With regard to school development, tabletBS.dual has led to the project schools taking measures on the levels of organizational development, teaching development, personnel development, cooperation development and technology development.

See also: https://tabletbs.kultus-bw.de/,Lde/Startseite/Schulversuch/tabletBS_dual.

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National definitions of effective digital teaching/learning

Features of successful e-learning (Finnish National Agency for Education oph.fi):

- Supporting community aspects and co-operative working. At best, co-operative work means working on a joint effort, such as editing a text, video, publication or research together. Even when e-material in itself could not support such function, it can be used to guide to making such exercises and projects with co-operation in central role.
- Supporting learning skills of the student. E-material can help the student to develop learning skills for instance by giving guidance for he/she or the group as to evaluate their own performance and task, planning and designing how to carry out a task or pondering what do the students already know about the issue at hand.
- Supporting student activity in the subject of class. Exercises in e-materials need to have some appropriate, meaningful activities. Simple checkboxes or yes/no questions do not suffice, but rather there should be possibilities to compare, evaluate, choose or contemplate in various tasks. Activity in thinking should be required from the user, not the program used.
- Learning tasks should be challenging, open and authentic, because these features make the exercises motivational and interesting. Student or a group can work on the subject being studied and has the ability to get excited about it so that it creates motivation and provides results, and the student does not have to battle secondary issues or problems not related to pedagogical goals.

The ZSL in Baden-Wuertemberg, being responsible for curricula and support materials for all schools in Baden-Wuerttemberg in cooperation with universities and experts in education put up a guideline for effective teaching and learning:

A school lesson

• should pursue multiple goals (e.g. cognitive and motivational goals, multi-criteria).
• is an offer that should be used by students and its effect depends on various factors, e.g. on the use (learning activities) of the learners, their individual requirements (e.g. cognitive learning potential), and the context (e.g. general school conditions) (offer-use model).
• is a complex event.

Teaching is about creating

• Learning opportunities (offer) and the successful interaction of visible and deep structures.

• *Visual structures (surface structures):* They provide the framework for teaching processes and are comparatively easily observable from the outside and include
- forms of organization (e.g. class lessons),
- Social forms (e.g. group work) and
- Methods (e.g. project work) of teaching.
• *Deep structures:* They refer to the teaching-learning processes that take place below the visual level and include the quality of the interaction of the learners with the learning material and the quality of the interaction between the learners and the teacher as well as the learners among themselves.

The **deep structures** can be classified into three basic dimensions, which are also known as the basic dimensions of "good" or "effective" teaching or characteristics of process quality of the lesson are called:
- class management,
- constructive support and
- cognitive activation of learners.

Concerning teaching and learning with digital media in the classroom, the ZSL refers to another guideline pointing out the following criteria:

1. Provide clear course materials and websites.
2. Pay attention to frequent communication and presence.
3. Help learners connect with each other.
4. Support learner self-regulation.
5. Teach learners digital learning skills.

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