



OTTO VON GUERICKE
UNIVERSITÄT
MAGDEBURG

FAKULTÄT FÜR
HUMANWISSENSCHAFTEN

Integration of digitalization into TVET Teacher Training

For the Virtual International Conference "Digitalization and TVET"
jointly organized by GIZ TVET Academy / UNEVOC Centre Magdeburg, Asian Development Bank Education Group, Swiss Federal University for Vocational Education and Training and the ILO

Driving Forces

- World of Work goes digital
- Advancement and increased availability of digital learning and teaching Media
- Increased demand and need to use of digital learning and teaching Media meaningfully

World of Work goes Digital

“We are only starting to capture the opportunities from digitizing economies at the sector and company level (...)

Digitization of the workforce, including worker use of digital tools, digitally skilled workers, and new digital jobs and roles” (McKinsey 2017) are the consequence.

Challenge:

Digitalization must be reflected in curricula of TVET teacher education programs but at the same time be embedded in the vocational domain.

Example: B.Sc. TVET Teaching, Mechanical Engineering (explicit)

- Module: Introduction to Digitalization and Industry-4.0-Applications

Overall goal: The module introduces students to the challenges of digitalization and automation in the context of industrial production and logistics. By means of several case studies, students develop a clear understanding of application fields and the relevant technologies, trends and emerging business models relevant to production companies.

....

Example: B.Sc. TVET Teaching, Mechanical Engineering (implicit)

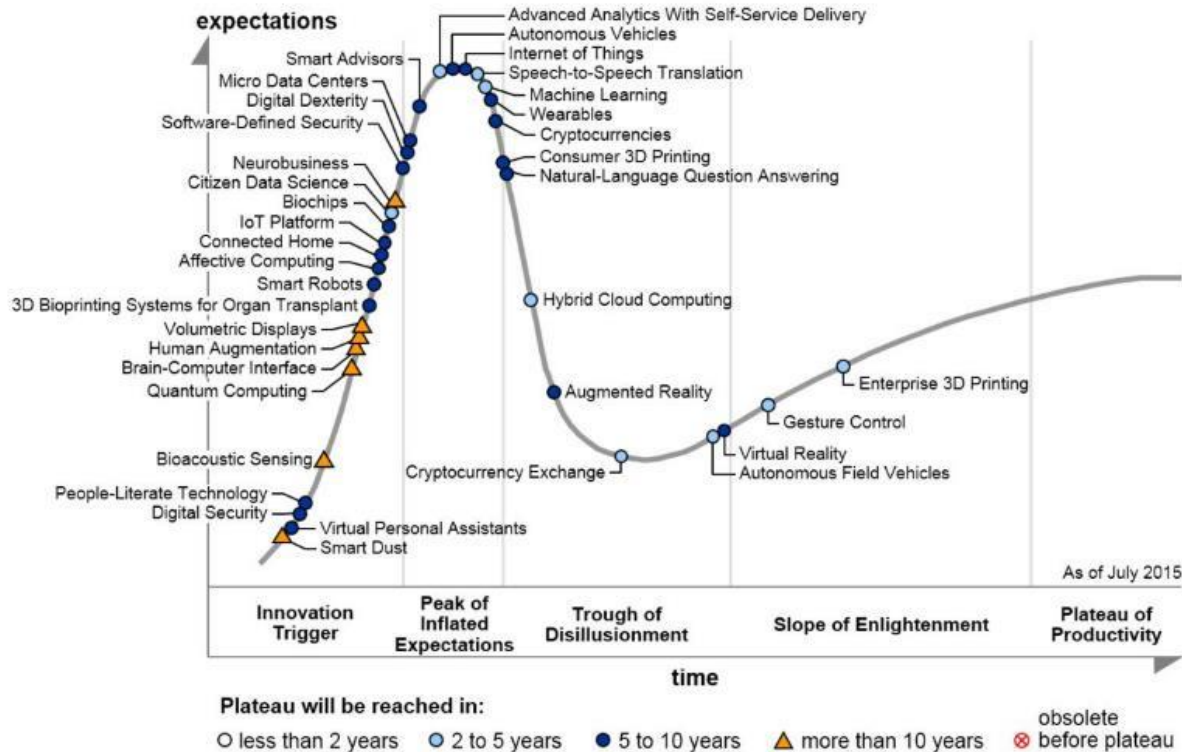
- Module: Foundations of Factory Automation

Contents:

- Architectures for the control of production systems
- Basic knowledge of decisions to be made in production systems on different control levels
- Basic knowledge of the control and communication technologies used at different control levels

....

Advancement and increased availability of digital learning and teaching material (co. Gartner 2015)



Advancement and increased availability of digital learning and teaching material

In 2019, 67% of US companies offered learning opportunities via smartphones. (*eLearning Industry 2021*)

Challenges:

TVET Teacher programs must prepare graduates to use and enhance digital learning media.

Example: Cosito – the Learning platform for situated Learning approaches

Hinweise und Musterlösungen finden Sie [hier](#).

Dunkel war's...

Hallo lehrer!

Wir sind Lea und Daniel. Neulich haben wir uns einige Fragen gestellt, die alle irgendwie dadurch entstanden sind, dass beim Lernen die Schreibtischlampe ausgefallen ist und wir im Dunkeln saßen. Aber schau dir doch mal im Video an, worum es genau ging!

Worüber sprechen Lea und Daniel eigentlich? Geht es nur um eine kaputte Glühlampe? Was zweifelt Daniel eigentlich an? Warum ist er skeptisch? Was sind LEDs? Worüber sollte er sich noch informieren? Welche Argumente liefert Lea ihm bereits? Was hat das alles mit der Umwelt zu tun? Kannst du die Fragen schon beantworten? Wenn nicht, schau dir das Video erneut an oder lies die Problemstellung hier nach.

Problemstellung

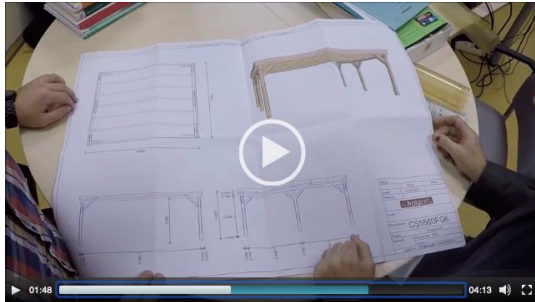
Lea und Daniel sitzen am PC und unterhalten sich. Plötzlich ändern sich die Lichtverhältnisse. „Was ist denn jetzt los?“ Daniel tippt auf Stromausfall. Lea erwidert: „Quatsch, mein PC läuft ja noch!“ Lampe kaputt? Klar, die Glühlampe ist durchgebrannt. Doch die kann man ja nicht mehr nachkaufen, weil Energiesparlampen die Glühlampen ersetzen sollen, damit die Umwelt geschont wird. Doch davon gibt es viele und sie alle sind beim Kauf teurer als Glühlampen. Stellt sich die Frage, worin der Spareffekt dann liegen soll.

Lea meint, dass die längere Lebensdauer ein Argument sei. Daniel will es lieber mit Formeln aus dem Tafelwerk und dem Taschenrechner nachrechnen. Lea rät, besser eine Exceltabelle zu nutzen, um die Ergebnisse besser vergleichen zu können. Daniel schlägt außerdem vor, die LED-Leuchte seines Handys als Ersatz zu nutzen. Das wiederum zweifelt Lea an, weil das ja dann nicht lange hilft. Daniel will auch das untersuchen.

Schließlich tauscht Lea die kaputte Glühlampe gegen eine moderne Energiesparlampe aus. Daniel stellt dabei fest, dass rein äußerlich zwischen der Glühlampe und der Energiesparlampe kaum ein Unterschied besteht. Umso mehr bestaunt er die Helligkeit der neuen Lampe. Jetzt zweifelt er erst recht den Spareffekt an, was nun in Experimenten untersucht werden soll.

- Open Source Material for Anchored Instruction
- Interactive Website for teachers and students
- Browser based offline Material for regions with poor infrastructure

Material K12 Vocational School Example



Projektmappe „Frau Lehmanns Carport“

Name: _____ Klasse: _____ Datum: _____

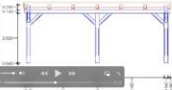
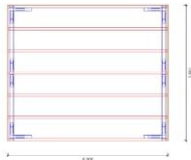
Inhaltsverzeichnis

1. Fundamente aus Beton

- Besonderheiten der äußeren Bedingungen aus bautechnischer Sicht
- Durchführung einer Betonprojektion
- Bautechnische Laborversuche – Beton
 - Siebversuch
 - Ausbreitmaß
 - Druckversuch am genormten Probewürfel

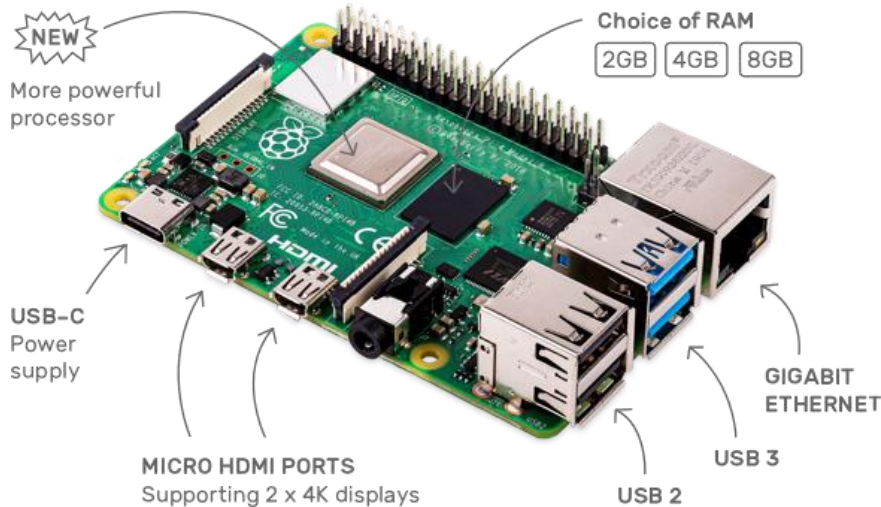
2. Konstruktiver Holzbau am Carport

- Übersicht zu regionalen Holzarten und Einschätzung aus bautechnischer Sicht
- Bautechnische Laborversuche – Holz
 - Quell- und Schwindverhalten
 - Biegezugfestigkeit
 - Spaltfestigkeit
 - Druckfestigkeit



- Providing real world association with the help of video and text material
- Leading through an initially complex problemsolving task
- Providing multiple perspectives regarding the task and setting

Example Raspberry Pi – Appealing low budget hardware



Raspberry Pi

- € 35 -70 single board computer
- Linux Debian Based OS with integrate Python 2.7 and 3.5
- 40 GPIO pins for experimental Breadboard setups
- LAN and Wireless LAN Capabilities
- Flexible OS with integrated OER (e.g. MITs Scratch, Libre Office, etc.)

Increased demand and need to use digital learning and teaching media meaningful

Digital learning and teaching media is not per se an innovation to the classroom. After 25 years of computers in schools, we still may lack a systemic approach ensuring that teachers truly understand the benefits and appropriate uses of computers for instruction and that ensures that teachers actually use technology as part of teaching and learning. (Burns 2010)

Challenges:

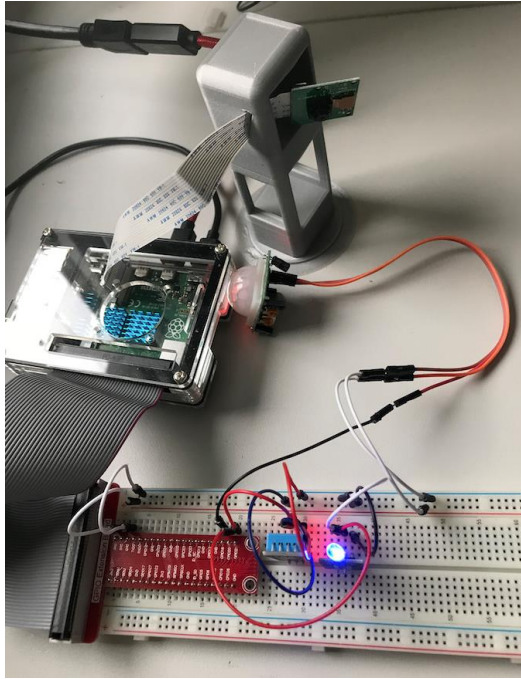
Future TVET teacher need to be prepared to use digital media meaning full, focus has to be on didactical/learner centered concepts.

Using Physical Computing in Teacher Training

Physical Computing units such as the RB Pi and Arduino are used by out teaching staff in Teacher Trainer setups such as (among others):

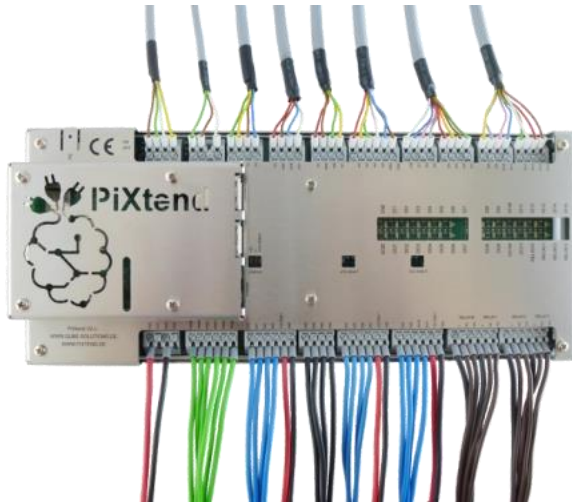
- Project Based Teaching and Learning Settings
- Learner Centred Approachs (Problem focused -> Skills for the 21st century)
- Simulations
- Flipped Classrooms (Remote Lab) and cooperation of leaning sites (e.g. with companies)

Flipped Classroom - Remote RB Pi Lab (experimental proof of concept)



- Using Existing and self-developed OER to provide Background content and Material for learners (videos, podcasts, web content, code)
- Simple to use and manipulate Hard- and Software
- Allowing access to a remote controlled Pi to set up and access installed sensors and camera
- TVET Trainer example - scaling up for TVET classroom activity is in development

Raspberry Pi in industry



- Embracing the Internet of Things for the Industrie 4.0 as industriell IoT Gateways and embedded computers
- Able to run industry standard serial communication protocols
- Enabling rapid electronic prototyping within different industry sectors
- Enables Sandbox Environments for VET setups at in company trainings for in the fields of robotics, AI and Logistics

Digitalization and TVET Teachers - Conclusion

- TVET teacher education programs must intergrade digitalization, but embeded in the vocational domain
- TVET teachers must become proficient in the use of digital teaching
- and leaning media development
- TVET teachers must be prepared to use digital media to foster learner centered approaches
- TVET teachers must be prepared to use digital media for efficient in house/ school communication/ school management

In conclusion: Challenges for TVET education programs.



OTTO VON GUERICKE
UNIVERSITÄT
MAGDEBURG

FAKULTÄT FÜR
HUMANWISSENSCHAFTEN

THANK YOU FOR YOUR ATTENTION

www.ovgu.de