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

Wold of Works 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

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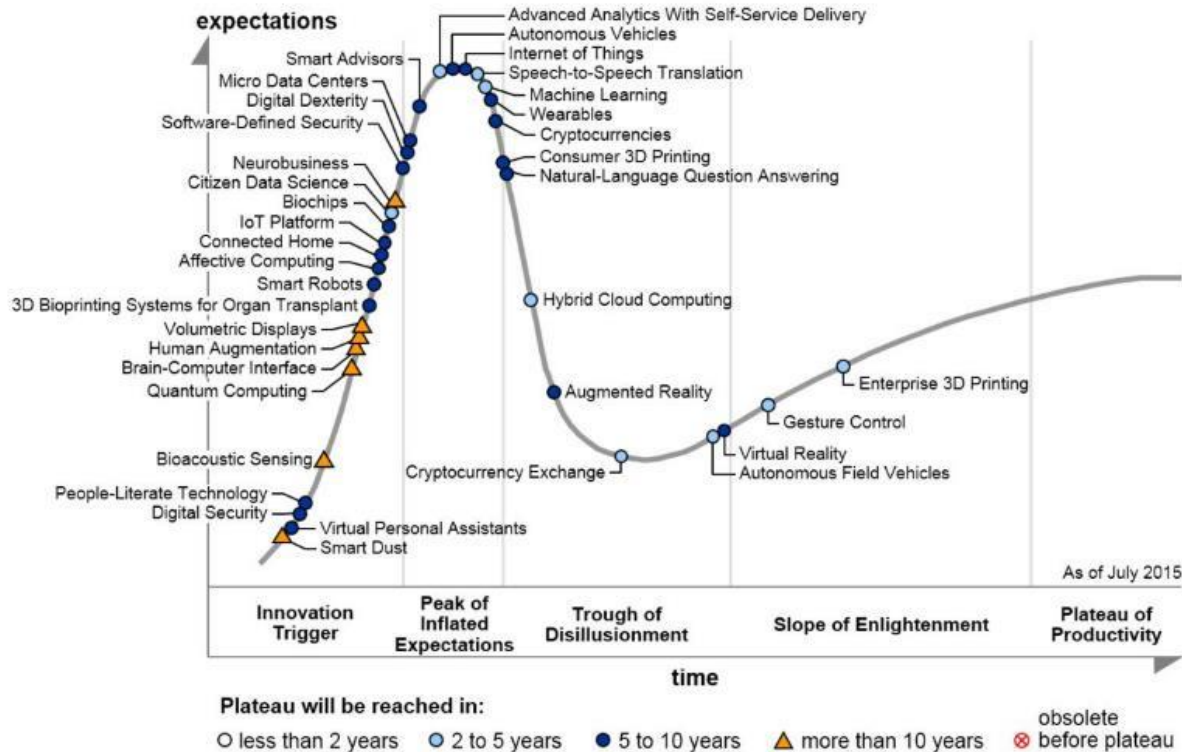
Advancement and increased availability of digital learning and teaching material

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

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

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Material K12 Vocational School Example
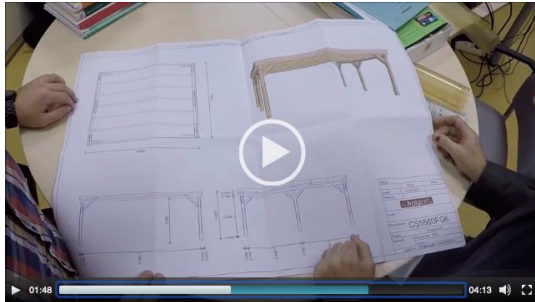
Projektmappe „Frau Lehmanns Carport"

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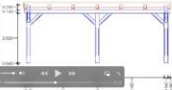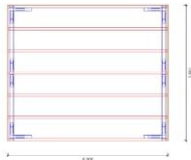
- Providing real world association with the help of video and text material
- Leading through an initally complex problemsolving task
- Providing multiple perspectives regarding the task and setting

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Exapmple Raspberry Pi – Appealing low budget hardware

Choice of RAM
2GB 4GB 8GB

NEW
More powerful processor

USB-C
Power supply

MICRO HDMI PORTS
Supporting 2 x 4K displays

USB 2

USB 3

GIGABIT ETHERNET
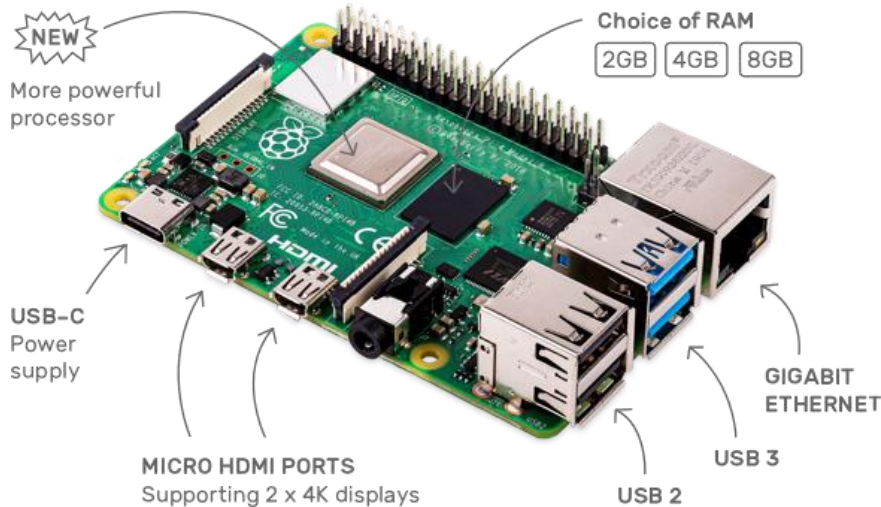
Raspberry Pi
- € 35 -70 single board computer

- 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.)

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

Digital leaning and teaching media is not per se an innovation to the class room. 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)

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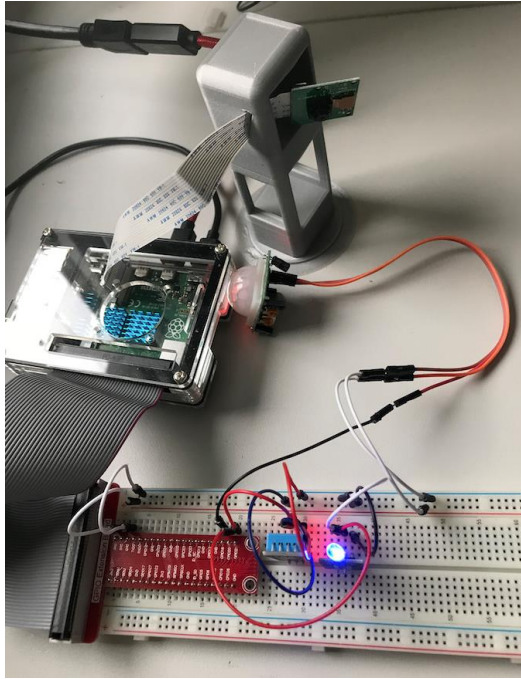
- Using Existing and self-developed OER to provide Background content and Material for learners (videos, podcasts, web content, code)
- Simple to use and manipulate Hard- and Software
- Allowing access to a remote controlled Pi to set up and access installed sensors and camera
- TVET Trainer example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

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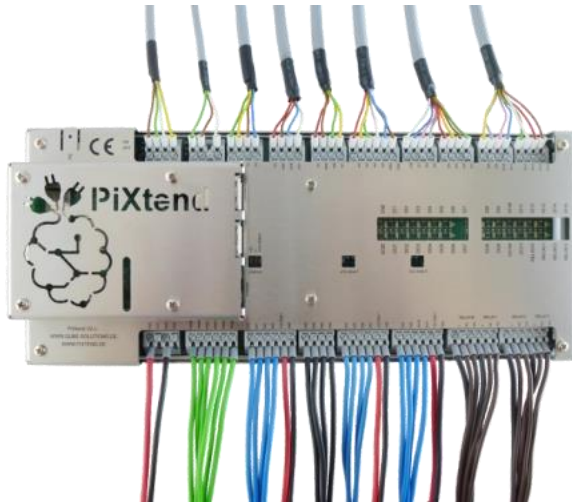
- Embracing the Internet of Things for the Industrie 4.0 as industriell IoT Gateways and embedded computers
- Able to run industry standard serial communication protocols
- Enabling rapid electronic prototyping within different industry sectors
- Enables Sandbox Environments for VET setups at in company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

THANK YOU FOR YOUR ATTENTION