| Überschrift | Thema | Bemerkungen | min | Backg Image |
|---|---|---|---|---|
| Intro | Presentation: school, names, functions | Katrin + Thomas<br>QUESTIONS AT THE END IN THE CHAT | 2 | Wemakers |
| Main actors | "The two main actors": biosensor station and emotion cube | rough description, 18 pupils, 13-17, one year ago | 2 | Wemakers |
| Provided 3D Data | Information: 3D printing with the Prusa printer | show STL-data with STL-View prepared on SD-card, running in the background | 1 | STL-View |
| Warning: | It is only allowed to work with batteries (laptop or powerbank) – no current electricity!!! | background picture of documentation | 2 | Verbot-Bild |
| Motivation | What for? – You can measure simple body functions with sensors. Wearables computing is very fashionable at the moment: How does it work, What are possible dangers? – sensor data allow to tell about psychic and physical states | Show wearable watch, adequate picture in the background | 4 | Wearables-Bild |
| | short presentation of LED analogue pulse sensor, only on plotter (NO scripts / Arduino environment, only result | Before we get down to the topic, we want to show what you can see here. | 1 | Wearables-Bild |
| Biosensors all | helicopter perspective : station as a whole. All in all you can have a complete learning unit of one to one month and a half. All general body functions are tested. It consists of 4 sensors, 1 Arduino, 3 contacts with the outside world | with macrocamera: show parts with fingers (big). Attachment to the 3D-Printed parts to fix them all together; can be stored easily and: It's robust! | 1 | Blank |
| | we use the grove system because it is very user friendly | no surreptitious advertising | 1 | Blank |
| Biosensor one by one | show single parts (1): the sensors<br>- analogue LED Finger sensor ("we had it before")<br>- digital finger sensor (on laptop-TFT)<br>- GSR / EDA-sensor analogue (""extra"")<br>- EMG-sensor with connections | "put sensors on the desk next to each other: | 3 | Blank |
| | show single parts (2): communication actuators<br>- OLED-display I2C(energy saving)<br>- WEMOS WiFi (complex, extra topic) | Then the communication actors | 2 | Blank |
| | show single parts (3): Arduino & Base Shield | Then the Arduino Uno with Base-Shield: "The best documented muC in the world!" | 1 | Blank |
| 3D print/standoffs | entire 3D printed single parts plus nylon-spacer | Nylon spacers absolutely necessary, not expensive. But 3D prints might be replaced by wood if no other possibility | 2 | Blank |
| assembly | assemble all single parts, roughly, to show how parts are built together | no screws, just pins. cable connections are important | 2 | Blank |
| coding the finger sensor | Presentation of script of the LED finger sensor on laptop<br>- explain<br>- upload<br>- check baud rate (frequent source of error)<br>- first serial screen, then serial plotter | Important: not too many sensors (=frequent source of error), only as many as you need | 4 | Blank |
| Theory finger sensor | Photoplethysmogram<br>not clear up to today: The green LED is better reflected by an inflated artery and better absorbed by the connective tissue | https://en.wikipedia.org/wiki/Photoplethysmogram<br>https://www.sciencedirect.com/science/article/pii/S0960077918309810<br>In the manual: Lesson 3 & 4. show in the document | | PulseSensor |
| transition/presentation STM32 | Problem: How do you count these peaks? If you only need the number of pulses, you have to calculate.<br>Presentation of fingerclip-STM32:<br>sensor plus evaluation computer, running over I2C, also standard protokoll | The maths is too complicated for students (Fourier Transformaton). Short mentioning of I2C, furthermore the OLED is also I2C<br>(show Samsung-Smartwatch) | 4 | PulseSensor |
| Coding STM32 | upload script, present, explain:<br>single parts with OLED, serial connection, D2/D3-characteristics | SHOW implimented libraries<br>Softwire, OLED, SoftI2C<br>numerical value over serial monitor | 6 | PulseSensor |
| Explain biofeedback | Body functions that cannot be influenced directly, e.g. Stress levels via heart rate can be learned to control using sensors. | Mention US military / clinical applications<br>https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4911859 | 2 | PDF-Seite |
| show biofeedback | open processing-app CAUTION: stop serial connection in Arduino-environment! Start app, wait for feedback | rest pulse + image,<br>"trample" + image | 5 | PDF-Seite |
| EDA-sensor | GSR ("galvanic skin response"), bzw. EDA ("elektrodermal activity"), measures skin resistance by placing a low voltage on your fingers and measuring the current | Simple Theory: The skin reacts to excitation from sweat within seconds, but it disappears just as quickly. Therefore, emotions can be made visible. | 2 | EDA Clipart with Hand |
| basic circuit EDA | Circuit with Operational Amplifiers | It is important here that there is no connection to the normal socket voltage:<br>https://wiki.seeedstudio.com/Grove-GSR_Sensor/<br>Explain Eagle-File: Where is which voltage present? | 3 | Circuit with OpAmp |
| EDA example: Cube | Explain EDA script, and then script of the cube | short demonstration of the cube with green / red light | 1 | EDA Cube |
| | Explain Main parts of EDA | | 1 | Electronic |
| | Explain Script of EDA | | 1 | |
| take 3D print off | short note that the EMG sensor cannot be presented anymore, but you can find it in the learning scenarios | take 3D print from printer and show it | 2 | |
| **Time for questions** | | | | |