

Do it Yourself Kits (DOK) for Additive Manufacturing (AM) for Educational Use

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ON ADDITIVE TECHNOLOGIES**



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Motivation and Introduction:

- Increasing trend of do-it-yourself movement (maker), producing entrepreneurs or prosumers, etc.).
- Open source and low cost control.
- Need to learn faster and thoroughly.

Method and Goal:

- Integration of senses, different tools (microcontroller, microcomputer, mechanical construction, programming, networking).
- New learning method → for learning CNC and AM processes, with practical own experience.
- *Human deep learning.*

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(manifest, explicit)

Axiom 1

The maker is the driving force for creativity or new technology emergence. This process is triggered by open source

- *production,*
- *measuring, and*
- *sensing.*

This is a model for new freedom by, – cost reduction, – mass individualisation, and the – potential of **creativity** (humanity).

(latent, tacit)

Axiom 2

Belief is the unquestioned.

- Selforganisation process, of asking questions (e.g. how to solve a function - here CNC/AM Machine).
- Multilevel answer by sensor and actor integration of learning students.

(latent, tacit)

Axiom 3

Novelty generates reward.

- Equal distribution of tasks $\wedge$ each part/person is necessary.
- Maximises creativity potential (newness).

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① Process Set-up

- Time frame, etc.

② Group Process

③ Principle of Integration

④ Identification Process

- Person/Machine Part

⑤ Electromechanical Process

- Interfaces (Power World 2 World Adapter, USB, Lego, Built Hat, Monitor, HDMI, Remote Control, Network Connection, ...)

→ **standardisation** process

- Mechanical Design (Lego)

⑥ Further Steps (e.g., G-Code Process...)

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Table 1. Group-Elements Identification Process of the square drawing example.

<i>sub-process</i>	<i>person</i>
clamp tool	L.
pen guide	M ₁ .
calibrate	P.
move-x (pedometer)	R ₁ .
move-y	C.
take-off	M ₂ .
quality control right angle	F.
quality control straight line	R ₂ .
tool clamp out	K.

Figure 1: Sub-process vs. person (Process Nr. 4).

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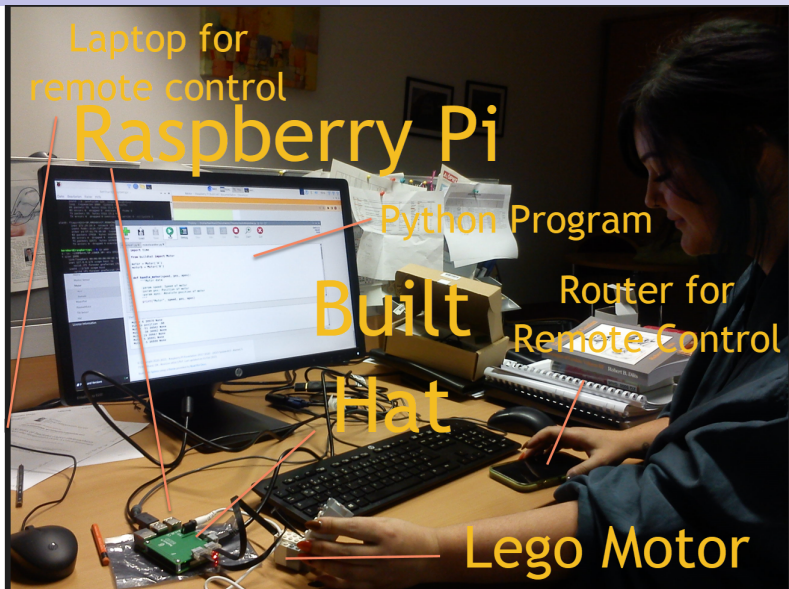


Figure 2: Single-Lesson/Group Lesson (Process Nr. 5).

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Limits:

- Creativity is an open question (programming, mechanical construction).
- Group Dynamics (selforganisational) → unpredictability.

Summary:

- Three Axioms: (1) Maker, (2) Belief, and (3) Novelty.
- Human deep learning: ... (4) Identification Process (Part/Human) (5) Electromechanical Process ...

Outlook:

- 3D-Printing Head or Laser-Controlled Melting.
- Increasing higher standards.
- (Systematic) Integration of Artificial Intelligence (AI) into the process-steps.

Thank you cordially for your attention!



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PS.: The presentation can later also be found at:
<http://www.dr-heiden.com/Vortraege.htm>



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