TOWARDS A WITTGENSTEINEAN LADDER FOR THE UNIVERSAL VIRTUAL CLASSROOM (UVC)

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ABSTRACT: The aim of this work is to move from the foreign dominated to the self-dominated by encouraging people to draw their own conclusions with the help of own rational consideration. Here a room as an environment that is encouraging innovation, which can be denoted as “Innovation Lab”, and making processes as can be regarded as “Smart Lab” is an essential base. The question related to this generalized self-organizational learning method investigated in our paper is how a UVC, which is a room that connects people from different physical places to one synchronous and virtual perceivable place, which is built on these preconditions, can be operated both resource and learning-efficient for both the course participants and the educational organization. A practical approach of implementing a virtual classroom concept, including informative tutorial-feedback, is developed conceptually that also accounts for and implements the results of reinforcement machine-learning methods in AI applications. The difference that makes the difference is gained by reimplementing the AI tools in an AI instrument, in a “Smart Lab” environment and that in the teaching environment. By means of this, a cascaded feedback-loop system is informally installed, which gains feedback at different levels of abstraction. By this learning on each stage, in a collaborative and together decentralized and sequential fashion takes place, as the selforganizational implementations lead implicitly, also by means of the in the course implemented tools, to increasingly self-control. As such in the course, a tool is implemented, as generalizations by means of reinforcement learnings are to be emergently foreseen by this method, which goes beyond the tools, that have already been implemented before. This AI-enhanced learning co-evolution shall then, predictively, as well increase the potential of the course participants as the educational organization according to the Wittgensteinean parable: A ladder leading into a selfly-organized future.

1 INTRODUCTION

In the Western tradition of the world view the “causality principles” that can be rooted back to Aristoteles who regarded four causes, the “formal cause”, the “material cause”, the “causa efficientis” and the “causa finalis” (see Figure 1). Mainly Aristoteles has a focus on the causa finalis (“Alles dient einem Zweck.”) and Kant on the causa efficientis (“Alles Geschehen hat einen Grund.”) [q.v. 1]. The causa efficientis is the means of how something is happening. The techniques used for education for example. The books, the presentations, the kind of conversation and last but not least the physical surrounding, the room pupils are in, the classroom. The causa finalis is that what is related to a *will*, to a person who wants something

and can decide it, according to the personalization maxime in a society that is highly productive or efficient according to the causa efficientis. Nowadays the role of the person seems to be underrepresented when looking at "objectivity" demands according to science.

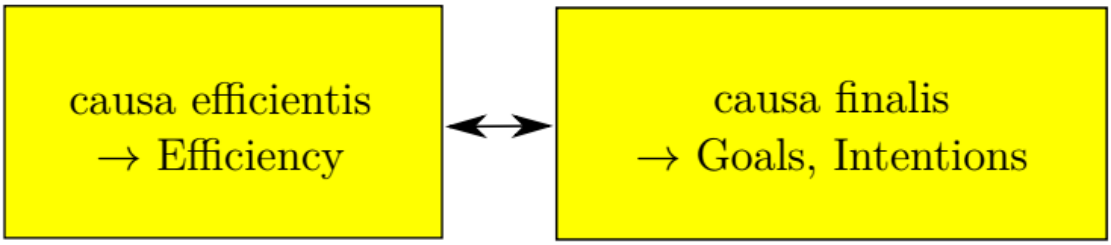

Figure 1:Relations due to Aristoteles according to [1] expressed with modern language equivalents

In a new world view, that connects mental states and machines closer together the "traditional splendid isolation" shall be more connected [2]. Worlds shall be more connected, meaning that increasing connectivity of knowledge production and knowledge of reality generation and reality takes place [2]. That means that environments like the Smartlab [3], which includes production facilities, are learning environments for self-enhanced and self-controlled production by means of rapid-prototyping technologies like 3D-scanners, Computer Numerically Controlled (CNC)-milling machines, lasercutters, and 3D-printers. The tooling machinery has implicit Artificial Intelligence (AI) characteristics, as they are a kind of reality extended implementation of accelerated *information flow* and "information" can be regarded as the "central category" in the knowledge paradigm [q.v. 2]. Finally, efficient and intentional needs have to be merged practically. This is done by means of personalized production or prototyping, which leads to immediate feedback.

1.1 RESEARCH QUESTION

The research question of this work can be formulated as: 'What comprises a "Universal Virtual Classroom" (UVC) and what are some of its core properties?'

1.2 GOAL OF THIS WORK

The goal of this work is to show what can be regarded as a UVC, that (a) has an integrated systematic and systemic learning environment incorporating a space for making, creativity and virtuality, that (b) needs technical infrastructural virtuality, that (c) this virtuality is an extension of natural intelligence as artificial intelligence and that (d) the close material, energetic and informational linking can be both a driving force and a holistic explanation model for a self-transforming and increasingly virtualized learning environment.

1.3 CONTENT

In this work in section 2, the Wittgensteinean ladder is introduced as a metaphor for a circular thought 3-dimensional learning out of a "planar description". In section 3 a dependency structure of the basic learning process is linked to the information flow as a combinatorial driving force of intentional human wills. In section 4 the feedback looping of the informational structures is extended to the material and energy flow of making, innovating and virtualizing labs, demonstrating their structural interdependence and induced forces, resulting in the

Flatland Model of the UVC. In section 5 finally, the work is concluded, how to understand and use the Wittgensteinean ladder in praxis in a nutshell.

2 WITTGENSTEINEAN LADDER

Wittgenstein's ladder has always been part of mankind's innovation process; whenever new technologies replaced old cultural techniques, the new generation could not imagine how the old could ever live without these achievements. Today no child can imagine what it is like to live without mobile phones, smart devices, e-mail addresses and that any form of Internet access is available and this can be assumed for everyone. One would be considered a digital illiterate if one didn't have all that, and one would gain the mistrust of others. What Wittgenstein has presented in his “Leitertheorem” is that the beginnings are forgotten and taken for granted [4, § 6.54], and each generation builds on the previous one without going through all the phases of learning itself again. For innovation it is enough to stand on the shoulders of the predecessor, it is not necessary to stand on the shoulders of all predecessors. Innovation connects to what is currently in place, not with its predecessors. Whoever wants to bring an innovation must attach it to an existing cultural technology or even revolutionize it, i.e. completely renew it, such as cars instead of horses [compare also 5]. Whoever wants to be innovative today cannot improve the telephone of the last century, but must improve the smartphone of today. Wittgenstein's ladder also says that you can get higher step by step, perhaps you can skip steps, but not that innovation means going back to previous steps. With one exception: cognitive innovation. While material innovation climbs step by step, cognitive innovation is quantum-technically an information, transformation and communication process independent of time and space. Therefore one can learn just as much from old philosophers as from contemporary ones, and in this sense, if one regards inventors (today is the day of the inventors - Austro-American female wireless LAN inventor Hedy Lamarr’s birthday) as philosophers, and goes through their cognitive process in their writings, one can discover the genius in it and connect to it cognitively, not culturally, and thus let them participate further in the earthly immortality of the polis [compare also 6], an eternal earth citizenship.

> *Wittgensteinean Leitertheorem*:
> *„Meine Sätze erläutern dadurch, dass sie der, welcher mich versteht, am Ende als unsinnig erkennt, wenn er durch sie - auf ihnen—über sie hinausgestiegen ist. (Er muss sozusagen die Leiter wegwerfen, nachdem er auf ihr hinaufgestiegen ist.)*“ [4, § 6.54]
>
> *Wittgensteinean ladder theorem:*
> *„My propositions are elucidatory in this way: he who understands me finally recognizes them as senseless, when he has climbed out through them, on them, over them. (He must so to speak throw away the ladder, after he has climbed up on it.)*” [4, § 6.54]

3 INTELLIGENCE, ARTIFICIAL INTELLIGENCE, AND EXTENDED ARTIFICIAL ENVIRONMENTS

In the following two theses from Götschl are presented as a basis for the following argumentation:

"Thesis 1: The relevant relation as a precondition for the *emergence of new creative knowledge* and *learning* is the relation of *correspondence* between natural contexts and *natural symbolic and virtual contexts*. "[7]

"Thesis 2: The fundamental relation of correspondence between natural and symbolic contexts is to be understood as being *dynamic and evolutionary*. Only the criteria for sufficiency and truth can be derived." [7]

According to Götschl "thesis 1" is stated as a correspondence principle between learning and creativity, as a close connection. This can be regarded as an "information proximity" of symbolic and virtual contexts.

That means as a practical application that a virtual copy that is "at the same moment" virtually at the same place creates information proximity, especially the more senses are incorporated, or the mind is immersed.

"Thesis 2" according to Götschl can be understood as a double-sided system coupling, to regard the system as virtually one.

The following thesis can be now introduced:
Thesis 3: Intelligence can be defined as $\dot{I} = Intelligence\ Flow = \frac{Unterstanding}{Timeunit} \approx Information\ Flow$ which can be seamlessly interpreted as information flow. By this, the extension of intelligence of a biocybernetic machine, a human being, can be augmented and extended by cybernetic machines characterized by Artificial Intelligence as $\dot{AI} = Artificial\ Intelligence\ Flow$.

In a broad sense, then an environment that extends the information flow can be regarded as an AI enhanced environment. The primary criterion is to increase the information flow, which means from a systemic standpoint, that the system according to "thesis 1" and "2" is more closely coupled. This can be also described as cybernetics of cybernetics and is, according to Heinz von Foerster, an essential part. The two sided coupling can also be stated in the form of Humberto Maturanas theorem "All said is said from an observer" and Försters theorem "All said is said to an observer" [1].

4 AI-TOOLS IN AI-ENVIRONMENT-SMARTLAB AND CASCADED FEED-BACK LOOP AS A FORM OF AN INFORMATIVE TUTORIAL FEEDBACK

Remote and informal connected learning can be achieved when different labs are coupled informationally, by this getting virtually "one" room. The time delay can be neglected. The essential prerequisite for learning is the learning with the AI enhanced environment leading to increasing informational flow $\dot{AI}$.

A flatland model of the virtual connected and interconnected classroom as UVC can be seen, out of the above given premises, according to Figure 2. There is material, energy, and information-coupling by a cascade of AI learning environment, by AI enhanced feedback loops for an extended self. The cascaded feedback loop, including materialized logic in form of the environment, is increasingly ordered, self-enabling order by means of the ordered feedback loops, by this implementing an informative "tutorial" feedback loop [compare also 8], by means of the AI-tool-enhanced environment. This can also be explained generally by a potential increasing order increase according to the fifth main sentence of thermodynamics [9], as a feedback loop of energy itself, leading to a potential higher efficient energy state by means of potential self-organizational order increase.

The problem of education can be regarded as a "two brain" problem, a brain is learning from another brain. According to von Förster [10], this is usually done by a "trivialization" of the to be educated individual. This means that the "individual" is according to the Turing machine concept trivial, i.e. has defined predefined input-output relations. Humans regarded as non-trivial machines, do not have predefined results, the result is then defined by the outer state, the environment of the educational system and the inner state, the person connected to its will. This gives then the opportunity to open questions, with not yet known answers. In this context, the task can be to solve problems, that were never solved before. For this, the very own rationality has to be used. These kinds of prototypes can be regarded as inventions, and when introduced into the market as innovations. In this context, the connection to the "Innovation Lab" at Carinthia University of Applied Sciences, can be regarded as an integral constituent of the creativity enhanced learning environment, increasing creativity in the applied knowledge context according to Götschl theses 1 and 2.

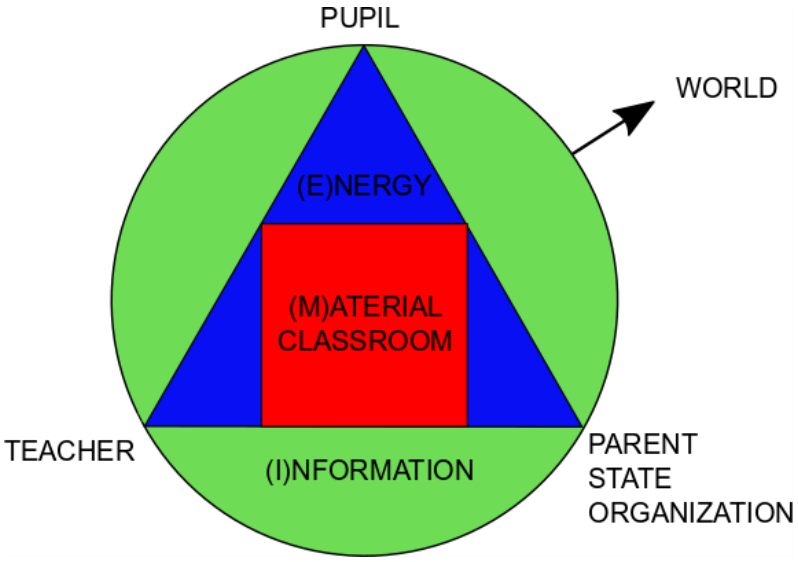

Figure 2: Flatland Model (compare also [11]) of a Universal Virtual Classroom (UVC) with Plato - Aristotelic Categories - Sphere, Prism and Cube.

From the definition "A UVC is a room that connects people from different physical places to one synchronous and virtual perceivable place", we see that the Flatland Model has universal

characteristics, as it comprises the systemic connection between people in a learning hierarchy (e.g. parent, teacher, pupil). Parts of this person-ensemble can be “virtualized”, i.e. made available elsewhere physically, while sustaining the virtual same room. Leaving the “Flatand" according to Abbotts Book [11] means gaining dimensionality and hence extending the whole environment, making it richer in perceivability. On the other hand the inner virtualization, as an inner mental room, is enriched by an “Innovation Lab” and “Smart Lab” environment, that is connected to the UVC. Those material higher dimensional room (“Smart Lab”), with regard to the Flatland Picture, make available a richer learning-experience. The core properties of the UVC investigated here are self-enhancing, dimensionality open environments:

(1) “Smart Lab”, enhancing the making or material dimension of education

(2) “Innovation Lab”, enhancing the imagination or inner room dimension of education

(3) “UVC”, enhancing and integrating the outer room dimension of education.

Those three core properties resp. sub-environments may be combined manifoldly, leading to UVC’s of a higher order, which is quite consistent with Rosenblueth’s [12] higher order organization in perception and purpose driven activities.

5 CONCLUSION AND OUTLOOK

An increasingly ordered environment by means of AI makes the world unified. Through the proximity of potential pupils, teachers, and predecessors like parents, etc. the creativity flow is intensified, leading to AI-enhanced and multiplied innovation activities, that are closely connected to the multiplicity of nested self’s. By means of this learning, and learning outcomes are connected to increasing non-triviality of all involved, pupils, teachers and predecessors. That means that the inner states of all virtual connected ones, materially, energetically and informationally are strongly increasing, leading to ever new content: The Wittgensteinean ladder will be there for all newcomers to join in the process of increasing meaning to involving worlds into the world.

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