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The cycle of understanding physical phenomena: A Tool for Handling Experience, Technology and Technique as decisive knowledge contributors.

Abstract:
It is within the interest of scientific investigation, either as a biological or a sociological process, to fall under a constructive, productive and efficient way of evolving through the steps of experimentation, data collection, and understanding of the phenomena of interest. We are aiming in expressing a structural way of achieving the goal of self-determining understanding, via a tool-based decisive process involving prerequisites regarding the description of the systemic phenomena to be reproduced for investigation and the identification of knowledge gaps through the recommended classification of the existing knowledge and guidelines to adequately design and perform the experimentation. It is our opinion that the whole tool presented in a table-form would be a significant contribution towards a resourceful and minimally wasted researches adding up into the understanding extension and progress in each and every scientific field.

Keywords: experimentation, knowledge classification, human mindset, technology, technique, experience.

Introduction:
The perception of a phenomenon may derive through the context of a hypothesis via the logical combination of empirical observations and conclusive theoretical and practical interpretations. Thus, incidents occurring in the real world could be translated to phenomena when recognized through the human senses and placed within the framework of theory and knowledge, available at the very specific time (Kuhn, 1962).
A theory may explain why some phenomena occur (or do not occur) by modeling the causes or conditions that control itsoccurrence (or non-occurrence) for experimental prediction and control. Alternatively, a theory may explain a lawful regularity among empirical events by providing a model of the causes or conditions that, if fulfilled, necessitate the lawful regularity among these events. Theoretical questions for the researcher formulated into sharp and accurate "technological" questions, may reproduce nature in the lab for to mirror the theory to the reality of the phenomena expression or vice versa. It is the experimenter, who has to formulate certain "technological devices"/experiments, through which a decisive answer to these questions has to be elicited. More questions pending may also follow a gradual implementation into the experimentation unfolding, with an obvious impact on the research subjectivity and its outcome.

Through the explanation and interpretation process, the human engagement is inevitable for understanding via providingthe expressionsof governing principles while, at the same time, humans make sense of themselves, their world, and the manner of being in it (Popper and Ecless, 1977).Summing up the individual characteristics being examined and "adding" them upto make the whole, may not be considered as appropriate compared to total systems' behavior, understood as dialogic, emerging in the interaction between self and other participants (Goffman, 1959).
The step of collecting the existing knowledge foragiven system, includes both the objectivized pre-understanding, as well as the interpreter and inquirer. Potential users of a scientific knowledge,may potentially be sharing a theoretical and practical pre-understanding with professional communities. This variability may be defining the multiple horizons of pre-understanding.Understanding also occurs as an iterated reciprocal movement between (the meaning of) a part and (the meaning of) a whole to which that part belongs. Assuming that a part only makes sense within a whole, yet the whole does not make sense except in terms of a coherent configuration of its parts (Gadamer, 1994).

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Finally, understanding, contains the information-derived-knowledge. Therefore, italso depends on the engineering functionality of the inherent knowledge, which is transforming the existing knowledge, via appropriate justification means, into understanding, which according to Caputo, (1987) isone of the forms of the knowledge technology. According to Lancaster, (1979) and Salton and McGill, (1983), knowledge relevance criteria formulation includes thesystem's relevance and individual relevance or suitable applicability. Froehlich (1994), also added the need for a more productive framework towards modelling systems and user criteria, including usersof the collected information and mediation through the system. Yet, if even so, Capurro (1986) pointed out that the process of interpretation is required for the constitution of meaning.

In order to overcome the issues raised by the complexity of the phenomena, the human factor engagement and the data collection, we propose an independent, engineering based method, which aims in allowing the experimenter scientist to design and perform the reproduction of the phenomena in the lab, within a clearly defined experimentation "device".

For achieving the aforementioned goals, it is our opinion to include the creation of a knowledge database step, along with a classification scheme under strict terminology of the field. That will be actually be an objectivized pre-understanding collection of the phenomena descriptors, following specifically coded classes of data that can be dialectically researched and/or enriched by the scientific community.

Theory:

Towards developing this concept, weshall followSeely's(1984) point that for facing the problem of the adherence among thehuman behaviors and experimental procedures - considered to be typically scientific –we shall be potentially obstructing the development of practical answers to engineering problems, while at the same time might have failed to improve the theoretical understanding of these problems. Thus, it is the collection and analysis of data via a repeated sequence of reproducing experimental "devices", an essential step to the apparent problems still to be identified.It is indeed the data collection and analysis that unfold of experimentation, connectthe analogous unfold of knowledge and hence, leads the understanding of nature. This anticipating process constitutes a*circle of understanding*, holding normative implications for research. The factscollected regarding the phenomena and thus, the development of knowledge, signifies the integrated details within a phenomenon that shall provide a coherent and meaningful whole of the world of the phenomena. Every new finding has to be accepted and embedded in the pool of the existing experience (a potential"barrier") while on-the-other-hand may improve the value of this existing knowledge after its acceptance (a promising"advantage"). After being a part of the existing knowledge, each new discovery becomes one step beyond the subjection of the circle of understanding.

A consequence with regard to the understanding and design of experimentation systems is that in setting up a knowledge database, the fragmentation of information forces us to create the conditions of possibility for the retrieval of the knowledge pieces.

In order to move towards a precise reveal of an empirical-theoretical system, the experiment will have to satisfy three requirements.First, it must be synthetic, so that it may not represent a contradictory but rather a possible world. Secondly, it must satisfy the criterion of demarcation, by not being metaphysical instead of representable of a world of possible experience. Thirdly, it must be distinguished as a system representing our world of experience compared to other such systems for to be submitted to tests, to which it has to be stood up against (Popper, 1959).

Results & Discussion:

When considering phenomena's capability to engage in the experimental "device" we are thinking from a deterministic stance towards a potential approach, by focusing on the classification of the systemic organization, through its categorical descriptors, (Kanavouras andCoutelieris, 2016a). This conception does not simply judge the

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potentiality of the phenomena, but rather helps us to understand how the environment influences the phenomena's progress, and the systemic capability to withstand the potential of disclaiming a hypothesis and ultimately pursue a particular evolution roadmap.

The consequent usage of the operational profile of a system, justified through, among others, the physical and mathematical theories, the cognition on optimum alternative solutions, benefits, risks, factorization and analysis of means and targets, will lead to a methodology concept for an engineering based design of the systemic descriptors. A potential replacement of longstanding techniques by new ones nevertheless obeying to comparatively different principles, allows the potentials of those research community members that wish to reaffirm the substantial rationality of scientific approach and results, to advance.

	IN	PROCESS	OUT
The World of Phenomena	Categories	Hypothesis	Systems
Scientific Knowledge	Measurements	Knowledge	Phenomena
Similarity of Knowledge	Criteria	Similarity	Rules
Classification of Knowledge	Values and Cognition	Classification	a-priori Combinations
Experimental Design	Conditions	Classes	Disimilarities
Experimenting Engineering	Mathematics	Experimentation	Values and Parameters

Table 1. The process summary for realizing physical phenomena in a step-by-step presentation.

The perception of a physical phenomenon, as an awareness perceived by scientists is included within the first two rows of the above Table 1 (namely, "The World of Phenomena" and "Scientific Knowledge"). The following two rows (namely, "Similarity of Knowledge" and "Classification of Knowledge") correspond to the compulsorystep-wise procedures need to be satisfied for to guide the resulting decision regarding the experimentation outcome as presented in the last two rows (namely, "Experimental Design" and "Experimenting Engineering"). Furthermore, Table 1 is indicatively describing two transition occurring in the experimentation phase, i.e. from experience to technology, through the classification of the existing knowledge, as well as from technology to technique, through the experimental design. The first transition is the starting point of the cognitional experimental design process, while the second one is supporting the practical experiment execution. The common operator in all of the above procedures is the human as a critical factor that perceives the phenomenon under investigation, categorizes the existing knowledge, identifies the lacks (i.e. the potential field for further but necessary research), detects the internal and external similarities of the phenomenon and, finally, integrates all of the above within the appropriate experimental design before selecting and technological available means to potentially fulfill the aforementioned shortages.

The interaction of the above matrix with human factor is bidirectional: understanding is the one way from matrix to human factor while action is the reverse pathway from human factor to matrix. Conclusively, understanding advances technology that leads to better techniques, so increases pure experience of the community (via scientist's work to be accepted), which feeds-back to consequent, following research.

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An important note to make here is that an experimental design should be adequately available, if and only if, the rows named "Similarity of Knowledge" and "Classification of Knowledge" are suitably filled. Evidently, the first two rows ("The World of Phenomena" and "Scientific Knowledge") must be filled first, as elsewhere has been stated(Kanavouras and Coutelieris, 2016b).

A fully and acceptably filled matrix, as in Table 1, may describe the adequate realization of a physical phenomenon under investigation, identify the potential areas of shortened information (i.e. the fields where the research should be directed) and guide the experimenters towards satisfying the research inquiries.

Apparently, several pathways might produce analogous results for specific questions. Nevertheless, Coutelieris and Kanavouras(2016), demonstrated that all of the potential matrices are similar, thus, producing equivalent outcomes, given a specific phenomenon. The cross-section of the matrices filled per scientific hypothesis,does not constitute a theory regarding this phenomenon. Since infinite matrices may be necessary to produce a new theory cross-section, each filled matrix (see Table 1) either further supportively completes an existing theory or actively argues its validity.

Essentially, the proposed matrix of Table 1, highlights the way that the circle of understanding a phenomenon under question runs. Every innovative observation, simulation result, idea or whatsoever, shall inevitably need proofs that can be justifiably obtained through asuitably filled matrix. Also, Kanavouras and Coutelieris (2016c) described in details a methodological approach to define a specific and well-posed transitionroadmapfrom the description of a system as far as the formation of a predictive model.According to the authors, observable incidents can be studied trough observations and/ormathematical simulations, rather focusing on the cohesions among the systemic quantities(variables, parameters, etc.) rather than on the quantities themselves.

Since the circle of understating is particularly referred to a specific phenomenon, Kanavourasand Coutelieris(2016d) showed that is possible to methodologically approach the supportive evidential backgroundof a theory. That may be achieved through the validation of the similarity of the phenomena tested and the consequent similarity of the conclusive understandings. According to the same work, similarity was defined through a linear mapping over the vector space of four-component vectors describing a specific perception of a physical phenomenon. In this context, each new circle of understanding might put in question an existing theory and, consequently, generate a new one instead.

Conclusions:

This work evidently provides an opinion on a tool for reducing the impact of the human factor on the circle of understanding, obtained via the classification of existing knowledge regarding a specific phenomenon along with a disclaiming hypothesis.

The tool, as presented in a handy table format, contains prerequisites of the description of the systemic phenomena to be reproduced for investigation (Rows I and II), prerequisites for the identification of knowledge gaps through the recommended classification of the existing knowledge (Rows III and IV) and guidelines to adequately design and perform the experimentation (Rows V and VI), in order to not simply to add fragments of knowledge in the field, but more over to embed the entity as a researcher himself in a dialectic relationship with the holistic and sustainable understanding of the world of phenomena in question.

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Authors & Affiliation

Antonis Kanavouras[1]and Frank A. Coutelieris [2*]

1. Department of Food Science and Human Nutrition, Agricultural University of Athens, 55 Iera Odos Str., GR-11855, Athens, Greece.
2. Department of Environmental & Natural Resources Management, School of Engineering, University of Patras, 2 Seferi Str., GR-30100 Agrinio, Greece.