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EDUCATIONAL EFFICIENCY BY GRADUAL PERFORMANCES

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ABSTRACT

The general education systems, in particular, the education technologies cannot be described without a penetrative study of its research, the economic, political and social context. A universe of components like objects, persons, events, dynamical phenomena and many other strong relations between them has to be taken into account to carry out such a study as this. These form a complex system usually referred to as the Education System (ES). Therefore, the research on (ES) modelling methodology can provides as consequences strategies to foresight and planning the future development of the corresponding information technologies in (ES) named by us (ITE). At the same time, we appreciate that, indifferently of the existence domain, the performance is a measure of the risk and conversely. "Risk" is a term that was applied initially when the probabilities of the results were known objectively .Although, it was described by "the possibility of something bad", and "uncertainty" is accepted only for the problems in which there are real alternatives with multiple possible effects. Hence, the risk is an essential element to any human project and not only. This is a new proposal to investigate and promote the Science Education following the Educational Efficiency, being based on the gradual performances and useful for all the educational systems in the world. Our study investigates and promotes the Science Education by a gradual mathematical model of the performances, following the practically verified abilities and the proper corresponding implications. It completes our previous research work [4] by the efficiency.

KEY WORDS: Science education, Efficiency, Gradual performance, Risk.

1. Introduction

The general education systems and, in particular, the education technologies, cannot be described without an in - depth study of its research, economic, political and social context. A universe of components like objects, events, dynamical phenomena and strong relations between them has to be taken into account to carry out such a study as this. These form a complex system, usually referred to as the Education System (ES). It is important to examine the details concerning the education system now. But, it is more important to know it, having in view, especially, its future projections, for which the mathematical modelling is essential. Therefore, the research on ES modelling methodology can provide clues to foresight and planning of future development of the corresponding information technologies in ES (ITE) and their applications areas as follows in the next two causal graphs.

2. Premises and their immediate consequences

Following [1] – [4], we specify the main objectives of our investigations.

2.1. Developing a mathematical model concerning the learning interdependencies performance defined as:

A. Learning is the operational capacity of a person to:

- consciously assimilate concepts, information, knowledge;
- create skills and abilities (both cognitive and motric);
- develop skills and competencies;
- adapt his/her attitude and behaviour to the environment, or social context.

B. Competency is defined by the ability of the person to solve issues / theoretical and practical situations or tasks/requirements related to a field (scientific, social, technical, medical, educational, etc. – efficient acting); keeping it brief, "knowing to do".

C. Performance is characterized by the average and high levels of professional achievement, thus by the actual results marked at highest levels, above the average of the subject group. Hence, a psycho-social model of the performance behaviour essentially trains/engages.

D. Determining / identifying the internal and external factors of the learning process and , respectively, of education (be it formal, informal or non-formal);

- the optimal creation of learning circumstances that will involve the psycho – physical resources of the person and that will favour, stimultate and develop abilities.
- the mental (intellectual, emotional, motivational and volitional) and behavioural (actional, motric, verbal) involvement of the subject of learning (children, adults, students, teachers, etc) in theoretical and practical (reasoning, cognition, application, problem solving, etc.) circumstances.

2.2. Concrete validation of the model to show its efficiency through logical reasoning and psycho-pedagogical experimentation.

3. The basis of the mathematical model

Each component (quality) marked by c_i and , respectively, incompetence / inability (defect) marked by d_j (quantifications that cand be made by various sortings, attachments of numerical values following psycho-pedagogical criteria, etc.) receives a "index" ("ratio") of "importance" α_i and, respectively, β_j , n,m∈N* obtained from the performance assessment and including the risks [6]. Let $E=E(t)$ be the competencies set, and let $F=F(t)$ be the incompetencies set at $t \in T=[t_0,t_1]$, $F_1 : E \to R_+$ moment, defined by $F_1(t)=\sum_{i=1}^{n}\alpha_i c_i$ $F_2 : E \to R_+$ resulting following $F_2=\sum_{j=1}^{n}\beta_j d_j$. From our mathematical point of view, the gradual performances in means solving the elements of the system at moment t:

$$(S)\begin{matrix}\max\limits_{t\in T} F_1(t)\\ \min\limits_{t\in T} F_2(t)\end{matrix}$$

Equivalent to each of the next optimization problems:

$$(P_1)\max\{F_1(t): t\in T, F_2(t)\geq F_2(t_*)\}$$

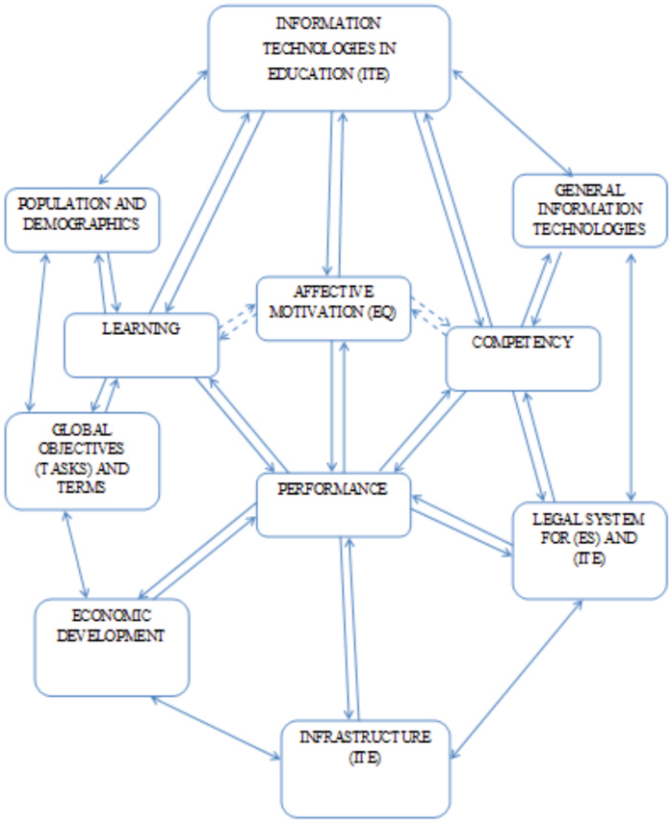
and, respectively,

$$(P_2)\min\{F_2(t): t\in T, F_1(t)\leq F_1(t^*)\}$$

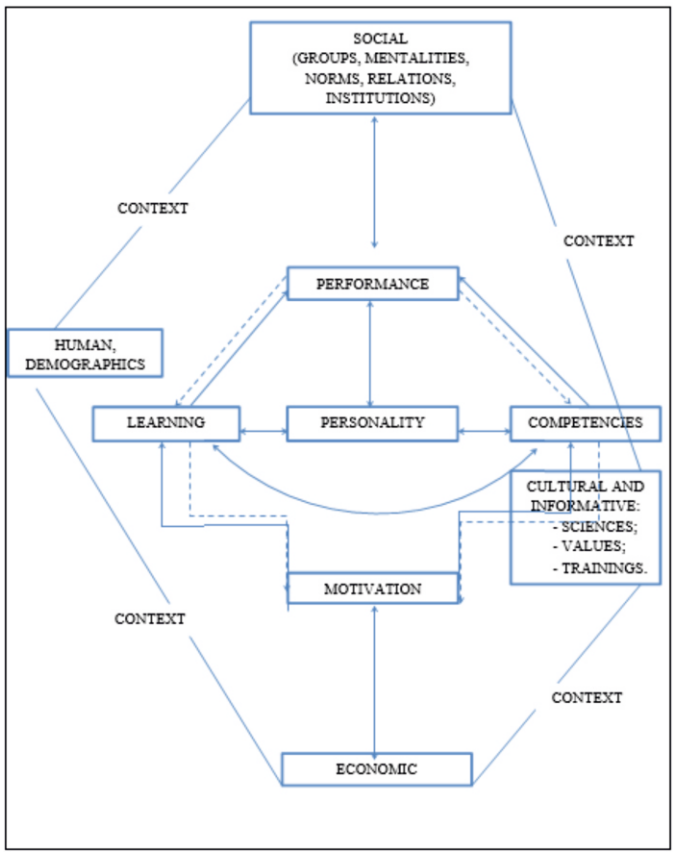
where t_*, $t^* \in T$ are minimum and maximum performance moments, respectively, whith a proper synchronization between the solutions of the above mentioned problems. The model's complete and, obviously, more complex version is obtained for $\alpha_i=\alpha_i(t), c_i=c_i(t), i=\overline{1,n}, \beta_j=\beta_j(t), d_j=d_j(t), j=\overline{1,m}, t \quad R$. In terms of the general efficiency in the ordered vector spaces [5] this means that $Eff(A,R'_+)=MAX(A,R^2_+)\cup MIN(A,R^2_+)$ is non empty, where $A=\underset{t\ T}{}(F_1(t),-F_2(t))$ when looking for maximum performance or, equivalently, $A=\underset{t\ T}{}(-F_1(t),F_2(t))$ for minimum, respectively, with $a_0 \in MAX(A,R'_+)(MIN(A,R^2_+))$ iff $A\sim(a_0 \pm R^2_+)=a_0\}$

Following our opinion, the hierarchical, strategical and geometrical relations

description for the performance in the education are as follows [4]:



with the next concrete connections and implications:



4. Some conclusions and future projects

Our proposal represents a new mathematical way to tackle the gradual performance in the education systems, that is, following the educational efficiency step by step, in order to construct and obtain the educational efficiency on the whole.The general applications of the model in determining the competencies of the science education and its immediate implementations will be presented and developed later on.

REFERENCES

1. Fishburn, P. C., (1984), Foundations of Risk Management Science I.Risk orProbable Loss. Management Science, 30, 1984, p. 396 – 406.
2. Lupu, C., (2013), Epistemological and Psychological Fundamentals of the Didactics of Science, Procedia Social and Behavioral Sciences Volume: 92 Pages: 490-494, http://www.sciencedirect.com/science/article/pii/S1877042813028371
3. Lupu, C., (2014), The Model Object-product-cognitive Operation Through Mathematical Education, Procedia - Social and Behavioral Sciences, 163, Pages 132 – 141, http://www.sciencedirect.com/science/article/pii/S187704281406399X
4. Perrenoud, Ph. (1997) Construire des compétences dès l'École. Paris, ESF.
5. Postolică, V. (2011) The Romanian Mathematics Education 2010-2011. International Association of Technology, Education and Development IATED, Valencia, Spain, pp. 3375-3385.
6. Postolică V., Dumitriu Gh., (2014), A Mathematical Model for Performance and Risk in the Science Education. North American Open Educational Research Journal, Vol.1, No.1.
7. Postolică V. (2014) A Coincidence between the General Efficiency and the Approximate Dominance. ROMAI Journal, Vol. 10, No. 2/2014, p. 101 – 120.
8. Zimmermann, H., (2000), An Application - Oriented View of Modeling Uncertainty. European Journal of Operation Research, 122, p. 190 - 198.