

TOWARD METASYSTEMS MATHEMATICAL LEARNING THEORY

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There are three main trends in the evolution of mathematical learning theory aimed to develop linear, systems and metasytems thinking, respectively [1]. The theories describe early research in behaviorism proved by statistical theory and probability, cellular automata, neural networks etc. (R. Hall, R. Bush, H. Ebbinghaus, F. Norman, F. Mosteller, K. Spence, W. Estes, S. Hellyer, K. Lashley, I. Krechevsky, F. Restle, M. Levin, R. Atkinson etc.).

The theories on systems mathematical learning reject the linear cause-effect relations, rely on cognitivism and, instead of it, explain the behavior of the learning objects through producer-product relations (R. Luce, J. Fodor, V. Arnold, J. Palis, N. Crowder, D. Kolb, A. Newell, A. Guergachi, G. Patry etc.).

The term “metasytems” was defined by G. Klir, A. Hall, Morraet all. Metasytems mathematical learning theory relies on constructivism [2]. From the practical point of view, this approach can be validated by the theory of optimized directed graph (or knowledge graph), the theory of probabilities and statistics. The case study refers to implementation of “Electronic textbook in electronic portfolio technology” [3] in teaching/learning the course “Information and Communication Technology” and statistical analysis of educational data mining. Statistical analysis of 2 independent variables ξ and η allows determining the coefficient of correlation between oral self-assessment and computerized assessment:

$$\rho(\xi, \eta) = \frac{Cov(\xi, \eta)}{\sqrt{D\xi D\eta}} = \frac{M(\xi, \eta) - M\xi M\eta}{\sqrt{D\xi D\eta}}$$

The high values $\rho_1(\xi, \eta) = 0.72$; $\rho_1(\xi, \eta) = 0.79$ and $\rho_1(\xi, \eta) = 0.81$ prove the evidence of needs in digital EQF competence. The statistical analysis of educational data mining allows to remark that for $\xi = 5, 6, 7, 8, 9, 10$, if $min = 5, 6, 7$ and $max = 10$, the mean equals to $M\xi = 8.0; 8.1; 8.2; 8.3; 8.4; 8.5; 8.6; 8.7$. These results were repeated twice with a coefficient of correlation, established in the interval: $0.32 \leq \rho_1(\xi, \eta) \leq 0.47$ at $P < 0.05$.

References

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