

Cummulative Knowledge Gain Modelling in Education for Sustainable Development

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Abstract

Cummulative knowledge gain is a crucial factor for evaluating the new knowledge acquired according to such innovation-defining documents as Frascati Manual 2015 (Guidelines for Collecting and Reporting Data on Research and Experimental Development) and Oslo Manual 2018 (Guidelines for Collecting, Reporting and Using Data on Innovation) that are being treated as references for assessing the innovation leading the sustainable development. Therefore, considering education for sustainable development (ESD) guides us to reconsider the measurability criterion for gaining new knowledge and competencies necessary for innovation development after the knowledge transfer.

Moreover, the learning ground-truth models remain uncertain, or their feedback information is not yet commonly referred to during training.

In this study, we construct the learning knowledge gain model based on AI machine learning principles. We anticipate that such an initiative can later help to determine the novel gain model patterns that serve as a digital twin for sustainable cumulative knowledge gain. We concentrate on the knowledge gain versus the existing results assessment system in high school and higher education institutions. Such digital twin mode training will enable the approach which will disclose what shape learning models try resolving two challenges after the finite (yearly) learning process finishes: a) what is the remaining cumulative knowledge gained after the learning course; b) what model shapes potentially lead to a more prolonged knowledge gain than others.

In other words, we investigate what learning model patterns lead to which effects. Considering that, based on the ESD requirements, it is not necessarily the maximization of the cumulative knowledge gain that makes the development sustainable in the long term. For this research, we incorporate the concept of fed-batch bioprocess, but this time for human beings, i.e., a few youth generations, which we will treat having in mind the fundamental accumulated learning model consisting of lag-phase, the exponential accumulation growth, and the saturation phases. We will analyze and discuss what shapes of models potentially have long-term effects on the ESD.

Keywords: cumulative knowledge, knowledge gain, sustainable development, learning models