



## Supporting Formative Assessment and Appraisal by Smart, Competence-based, Probabilistic Systems

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### Abstract

Despite the fact that the abilities, strength, weaknesses of learners, their knowledge and misconceptions, their needs and goals are extremely broad and rich, when it comes to evaluating learning performance, most often all achievements are summarized by a single numerical value – the school grades. And most often, these summaries are based on superficial, one-dimensional test items. This “over-simple” approach, however, cannot express what learners really and exactly can/know and what not; at best it might suffice basic fail/pass decisions, as argued by [1]. As a consequence, over the past years and increasing shift from summative to formative assessment practices is noticeable. European school curricula are heading towards competence-centered approaches and feedback policies beyond mere grades or achievement degrees. In turn, what is necessary for this conceptual change is leaving the focus on mere tests and approaching an “educationally inspired” assessment with the competencies and skills of a learner in the center. Such assessment, however, must be based on the so-called substantive features, which concern the characteristics of the learning domain and the learning process, and the evidentiary-reasoning aspect, which concerns the information we can draw from the learners’ behaviors [1]. It takes a formal framework that links both. A distinct approach comes from Competence-based Knowledge Space Theory (CbKST) [2], a probabilistic set-theoretic approach that accounts for individual learning paths and that is based on a separation of latent knowledge or ability and observable performance.

While the origin CbKST lies in the field of intelligent tutorial systems, in recent work, we aim at bringing the advantages in the classrooms. With the European Next-Tell project, we are developing smart software solutions to support teachers in collecting information about the learners’ achievements and progress, to aggregate them in Open Learner Models, and to profit from the bunch of information in form of multiple analyses and visualizations. One scenario developed in the context of Next-Tell concerns teaching English in virtual environments such as OpenSim. Without smart software support, a teacher is not able to monitor and interpret all the activities of an entire class in an open virtual environment. It is also hard to evaluate log files manually. The Next-Tell system enables an automatic log file analyses and, subsequently, the rule-based linking of activities in the virtual world with certain competencies and learning progress. Finally, the tool provides the teacher with in-depth analyses on the basis of individuals as well as the entire class and it offers multiple visualizations of results. Due to the CbKST-based logic, the system allows clear statements about individual learning progress and enables suggestions about next educational steps. Other scenarios focus on working collaboratively with e-Portfolios or cloud tools. Presently we are conducting field studies with the prototype software in schools in Austria, Denmark, Norway, and the UK.

### References

- [1] Mislevy, R.J., Steinberg, L.S., & Almond, R.G. (2003). On the structure of educational assessments. *Measurement: Interdisciplinary Research and Perspectives*, 1, 3-67.
- [2] Albert, D., & Lukas, J. (Eds.). (1999). *Knowledge spaces: Theories, empirical research, and applications*. Mahwah, NJ: Lawrence Erlbaum Associates.