E.4 Forecasting EduTech for the next decade. Scenario development teaching patterns in general versus academic education.

Thomas Köhler[1], Norbert Pengel[2], Jana Riedel[1], Werner Wollersheim[2]
[1]Media Center, Dresden University of Technology, Germany
[2]Leipzig University, Faculty of Education, Germany

1 Introduction

Learning while studying is an individual process of actively acquiring knowledge through the co-construction of knowledge resources under supervision by teaching mentors. Mentoring activity typically consists of the interaction of two areas, namely the personal relationship between mentor and mentee, as well as individualized guidance on performance at the factual level, i.e. the partial result-based evaluation of the previous and advice on the future learning process. This in-process feedback is considered to be a key impact factor in learning success in international educational research, provided that it is as direct and as accurate as possible (Hattie & Yates, 2014).

Learning environments have always been intentionally designed in a way that directs the learner's adaptive capacity in particular directions and thus makes normatively desirable restructuring and reconstruction more likely (Pirnay-Dummer et al., 2012). This results in a wide range of didactic considerations on how, with all the diversity of learners, individual performance potentials should be promoted as equally as possible and independent of the individual's personal identity to the specific mediation strategy of a single teacher (Reich, 2014). Such mentoring is very effective – it may increase the effectiveness of learning processes, has a positive impact on learning-relevant personal characteristics (motivation, self-efficacy, engagement, etc.), increases the binding power between the university, teachers and students – but it is also very complex and not scalable, which is why it usually only is reserved for selected settings and the highest performance class (Rüegg, 2004).

At present, students are still faced with the challenge of adapting their learning behavior to the traditional one-size-fits-all structures (Berthold & Leichsenring, 2012). Individual support measures for all parts of a heterogeneous student body with different learning prerequisites and needs and with regard to the qualification requirements of the working world and the participation in a pluralistic and digitized society are not universally established (Schaper, 2012). Such has been criticized already 20 years ago, for example by Lievrouw et al. (2000) and continuously discussed in the light of the quickly expanding ICT based educational scenarios (Köhler & Ihbe, 2006; Mabed & Köhler, 2012).

Indeed, digital education technologies allow to map and scale the part of mentoring processes aimed at pertinent performance development: Learning Analytics (LA) methods already capture data traces of learners and are used, among other things. used to record learning progress, motivation, metacognitive states of learners, and ultimately to improve student outcomes (Baker, 2014). Even the potential of so-called Social Academic Analytics in Higher Education has been addressed with convincing findings (Stuetzer et al., 2013). Current research goes beyond user interactions in digital learning environments and uses data collected in physical environments through wearables and the Internet of Things to identify cognitive learning styles and affective states (Kummerfeld & Kay, 2017). Further approaches to learning support focus on the automatic evaluation of processed tasks (Pirnay-Dummer & Ifenthaler, 2011). Adaptive Learning Environments (ALE) are systems that adapt flexibly to individual users and are based on the following components: a domain model, a learner model and an educational model. The concretization of the domain model into learning material annotated and structured with metadata is called knowledge model. The learner model usually contains an assessment of the level of knowledge and thus of the degree of learning achievement of the learners, which serves as the basis of personalization. In order to adaptively respond to learners' individual needs and goals, these systems continue to have an educational model in which didactic knowledge is formalized in a computer-usable manner. Through these three components, AI-based systems, customized to the user and current context, can provide tailored support, e.g. by suggesting learning paths and content or even the dynamic creation of curricula (Ullrich, 2008). The didactic knowledge these systems possess is usually declaratively specified as a reflection of expert knowledge. Admittedly, this allows the formalization and application of very complex didactic knowledge, and thus further adaptivity. However, the formalization is very complex. Altogether it can be expected that the learning theoretical discourse has only begun to consider those new dimensions in the light of the co-constructionst or connectivist approach (Marquet & Köhler 2017).

2 Delphi-based method for research and its implementation

Basis for the research is a Delphi-based method for research and its implementation in a workshop. In order to allow understanding this step first the procedure of the presented analysis (i.e. the research methodology) will be briefly described. Following the approach of case studies, it has been decided to identify and examine most recent R&D projects originated or conducted by the authors themselves. Subsequently authors define four scenarios for future TEL and TET in the sense of an educational setting. While the number the settings is determined arbitrarily, the modeling takes place against the background of the development dynamics of recent years, as documented by the literature and also observed in the authors' research practice.

Selected are those education technological features that appear to be particularly distinctive. As part of a group discussion with senior employees of the Media Center of the Technische Universität Dresden, a central research and development with over 15 years of background in TEL / TET development, these were presented, agreed and subsequently further specified according to the research situation and experience with its education practical implementation. For each scenario, authors than assigned one to three currently active or just completed research and development projects, with the aim of being able to use the latest developments as a case-based illustration of possible variants of the scenario. Those projects had always been supported by competitively acquired funds form prestigious programmes provided by the European Union (Programme Horizon 2020), the German National Ministry of Science and Research (BMBF) and the German research Association (DFG) Programmes for research funding, insofar as state-of-the-art R&D approaches are not only used in German-speaking countries.

3 Concluding demands toward the future teaching profile

Already scenarios concluded are always in tension between academically organized and individual-informal learning, as described by Caplan (2018). With the aim of further validation, these four scenarios were also compared with the E-Learning strategy of a large and above all excellent, i.e. leading German technical university, here the Technische Universität Dresden, and matched with appropriate fields of action and specified target areas in which these scenarios with the visions the E-Learning strategy (for example for Technische Universität Dresden via https://tu-dresden.de/mz/resources/files/services/ e_learning/elearningstrategy.pdf). In this respect, it is a matter of a rather theoretical exegesis with case-based-qualitative empirical connection and normative positioning Forecasting EduTech for the next decade. In order to develop a more precise understanding the workshop will focus on the often not similar development in general versus academic Education.

Already in 2005 authors (cf. Köhler & Kahnwald) did ask whether a class does need a teacher when discussing new connectivist teaching and learning paradigms for virtual learning communities in the context online communities and social computing. However, what are the requirements of these educational developments for teachers? As a result of the developments introduced have far-reaching consequences for the competence and qualifications of teachers. Accordingly, development projects have a partial focus on competence development. This applies equally to the staff in the different education sectors of school, university and company or vocational training, but experiences a different form of sector-specific. With regard to the university, it is particularly important that:

- teachers as authors of learning objects can effectively use media tools and are no longer at the bottom of their adoption;
- teaching activities are accessed by accessing learner data, both in real time and in a time aggregated form;
- the massive use of HCI scenarios that will permanently support teachers in their decisions through digital help systems.

Subsequently it can be concluded that a renewed teaching profile must be expected for the near future, based upon rather mentoring like practices permanently supported by human computer interactions.

Acknowledgement
This work was supported by BMBF (German Federal Ministry of Education and Research) as it is linked to the project tech4comp.

References

Baker, R. S., & Inventado, P. S. (2014). Educational Data Mining and Learning Analytics. In Larusson, J. A. & White, B. (Eds.), Learning Analytics (pp. 61–75). New York: Springer.

Berthold, B., & Leichsenring, H. (Hg.) (2012). CHE Diversity Report: Der Gesamtbericht.

Hattie, J., & Yates, G. C. R. (2014). Visible learning and the science of how we learn. Routledge.

Köhler, T. & Ihbe, W. (2006). Möglichkeiten und Stand der Nutzung neuer Medientechnologien für die akademische Lehre. Überlegungen zur aktuellen Situation an der Technische Universität Dresden; Wissenschaftliche Zeitschrift der Technischen Universität Dresden, 1–2.

Köhler, T. & Kahnwald, N. (2005). Does a class need a teacher? New teaching and learning paradigms for virtual learning communities; In: Online Communities and Social Computing. Proceedings of the HCI 2005. New York, Lawrence Erlbaum Associates.

Köhler, T. Igel, C. & Wollersheim, H.-W. (2018). Szenarien des Technology Enhanced Learning (TEL) und Technology Enhanced Teaching (TET) in der akademischen Bildung 2028; In: Getto, B. & Kerres, M.: Digitalisierung: Motor der Hochschulentwicklung?, Münster, Waxmann. http://www.waxmann.com/buch3868

Köhler, T., Wollersheim, H.-W. & Igel, C. (2019). Scenarios of Technology Enhanced Learning (TEL) and Technology Enhanced Teaching (TET) in Academic Education A forecast for the next decade and its consequences for teaching staff. Proceedings of the 8th International Conference on Learning Technologies and Learning Environments (LTLE2019), Toyama 07.–12.07.

Kummerfeld, B. & Kay, J. (2017). User Modeling for the Internet of Things. In: 25th ACM International Conference on User Modeling, Adaptation, and Personalization (UMAP 2017), New York: Association for Computing Machinery (ACM), 367–368.

Mabed, M. & Köhler, T. (2012). An empirical investigation of students' acceptance of OLAT as open web-based learning system in an Egyptian vocational education school; In: International Journal of Web-based Learning and Teaching Technologies (IJWLTT)

Marquet, P. & Köhler, T. (2017). The empowerment of users: rethinking educational practice online; In: Dobrick, F. M., Fischer, J. & Hagen, L. M.: Research Ethics in the Digital Age. Ethics for the Social Sciences and Humanities in Times of Mediatization and Digitization; Berlin, Springer.

Pirnay-Dummer, P., & Ifenthaler, D. (2011). Text- guided automated self-assessment. A graph-based approach to help learners with ongoing writing. In D. Ifenthaler, D. & Kinshuk & Isaias, P. & Sampson, D. G. & Spector, J. M. (Eds.): Multiple perspectives on problem solving and learning in the digital age (217–225). New York: Springer.

Reich, K. (2014). Inklusive Didaktik. Bausteine für eine inklusive Schule. Weinheim: Beltz.

Rüegg, W. (2004). Geschichte der Universität in Europa, Bd. 3. München: Beck, 24, 176.

Stützer, C. M., Breiger, R. L., and Köhler, T. (2013). Social Academic Analytics in Higher Education. In Proceedings: Social Media 2013 – 18th International Education Technology Conference, Hong Kong: Publ. by Springer (in press). [Merit Award].

Schaper, N. (2012). Fachgutachten zur Kompetenzorientierung in Studium und Lehre. Bonn: HRK.

Ullrich, C. (2008). Pedagogically founded courseware generation for web-based learning: An HTN-planning-based approach implemented in PAIGOS. Lecture notes in artificial intelligence: Vol. 5260. Berlin, Heidelberg: Springer.