

Personalized Learning

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Synonyms

Customized learning; Individualized learning

Definition

Personalized learning means tailoring education to learners' current situation, characteristics, and needs in order to help learners to achieve the best possible learning progress and outcomes. Personalized learning can appear on different levels of education, including personalizing curriculums, courses, learning material, learning activities, and other learning support. Through personalized learning, each learner is provided with education that is tailored to his/her individual characteristics and needs and learns in a way that is most suitable for him/her, resulting in different learning experiences for each learner.

Theoretical Background

Each learner has individual characteristics and needs such as different prior knowledge, cognitive abilities, learning styles, and so on. These individual differences affect the learning process and are the reason why some learners find it easy to learn in a particular course, whereas others find the same course difficult (Jonassen and Grabowski 1993). Personalized learning addresses the individual differences of learners by treating each learner as an individual person and considering his/her current situation as well as his/her characteristics and needs in the learning process. This implies that the learning experience is different for learners with different characteristics and needs due to the tailoring of the curriculum, courses, learning material, and/or support.

In the educational domain, the terms "personalized learning" and "adaptive learning" are often used in a similar context. While both terms refer to the tailoring of education to learners' current situation, characteristics, and needs, adaptive learning stresses more on the aspect of achieving this tailoring automatically

(typically by a learning system) while personalized learning stresses more on the consideration of the learner as an individual person. Furthermore, adaptive learning can also be applied to groups of learners, tailoring education to those groups. On the other hand, personalized learning always focuses on the individuals, regardless of the fact whether they work alone or in groups.

Personalized learning can involve different levels in the educational process, including personalization of the curriculum, the courses, as well as the support provided within the courses. Furthermore, personalized learning can be based on different characteristics and needs of learners and can take place in traditional (face-to-face) learning settings as well as in technology-enhanced learning settings.

In traditional classes, personalized learning requires a small number of learners per teacher. The small number of learners makes it possible for teachers to become aware of the individual characteristics and needs of learners and enables teachers to tailor their lessons, activities, and support, respectively. In traditional classes, personalized learning is also related to more choices for learners in the curriculum programs, parental involvement in education (if learners are children), student-driven learning, as well as allowing learners to make decisions in the personalization process.

The use of technology in education opened up new possibilities for providing personalized learning to learners and significantly enhanced the potential of personalized learning. Through the development and usage of learning systems, large numbers of learners in a class can use and benefit from personalized learning (Graf 2007). Personalized learning through technology can range from welcoming a learner by his/her name in the online course and allowing a learner to personalize his/her learning environment, for example, through changing the language and the color schema, to more complex features such as enabling the learner to create his/her own personal learning space by adding/removing particular tools and features to/from his/her space. Furthermore, personalized learning can take place by considering learners' characteristics and needs and recommending learners personalized courses, learning material, and learning activities. Such personalization can be based on different characteristics and needs of learners such as their prior knowledge, learning styles,

cognitive abilities, learning interests, learning goals, motivation, and so on (Graf et al. 2009). A learning system can detect such characteristics and needs of learners, either through asking learners explicitly or by monitoring their behavior and actions in the system, and use this information then for providing personalized learning (Brusilovsky 1996). Another aspect where technology can facilitate personalized learning is the personalization of curriculums where systems can consider various factors of learners in order to calculate the most suitable curricula as well as the best sequence of courses for each learner.

Important Scientific Research and Open Questions

Most of the current research on personalized learning is strongly related to technology-enhanced learning, enabling learning systems to provide personalized learning. When looking at learning systems that are commonly used in technology-enhanced learning, such as learning management systems, it can be seen that these systems typically provide only simple features for supporting personalized learning, allowing learners, for example, to change the language or color schema of their interfaces.

However, a lot of research has been performed and is performed on integrating more complex aspects of personalized learning into learning systems. One research direction in this context deals with making learning environments/systems more personal and providing personalized learning experiences by allowing learners to change and adjust the environment to their personal needs and preferences. A promising area in this context is the use of mash-ups for building personal learning environments (Wild et al. 2008). Such mash-up personal learning environments are based on the idea of social software and Web 2.0 technology and enable learners to create their own learning spaces with the tools and features they need and want to use through adding them to and removing them from their learning spaces.

Another approach for providing personalized learning is to develop systems that are able to identify learners' characteristics, needs, and current situation and consider them in order to provide learners with a personalized learning experience. Many systems have been developed and evaluated over the last years that implement certain learning strategies for personalized

learning. Examples of such systems are given in the survey by Knutov et al. (2009), where some of the most well-known adaptive and personalized learning systems are compared with respect to their concepts, architectures, and techniques for providing adaptivity and personalization. Such learning systems are able to consider particular characteristics such as the prior knowledge or the learning styles of learners and provide personalized learning based on these characteristics. As mentioned before, many characteristics exist which are worth to be considered in such learning systems in order to tailor education best possible to learners. One of the future research topics in personalized learning, for technology-enhanced settings but also for face-to-face settings, deals with the combination of different characteristics of learners that should be considered when delivering personalized learning. In technology-enhanced learning, open issues related to the combination of characteristics include, for example, whether and how characteristics influence/compensate each other and how such effects influence the provision of personalized learning. Another open question in this context deals with the selection of characteristics that should be considered in personalized learning and whether these characteristics should be the same for all learners or might vary for each learner.

Another area of future research is the interweaving of personalized learning with other pedagogical models such as mobile learning, ubiquitous learning, game-based learning, collaborative learning, and others. For all these models, the consideration of personalization has high potential to enhance the respective model by improving the learning progress and outcome of learners through tailoring the respective activities and concepts to the learners' current situation, characteristics, and needs.

Cross-References

- ▶ [Adaptability and Learning](#)
- ▶ [Adaptation and Learning](#)
- ▶ [Adaptive Blended Learning Environments](#)
- ▶ [Adaptive Learning Systems](#)
- ▶ [Adaptive Learning Through Variation and Selection](#)
- ▶ [Individual Differences in Learning](#)
- ▶ [Individual Learning](#)
- ▶ [Personalized Learning Systems](#)

References

- Brusilovsky, P. (1996). Methods and techniques of adaptive hypermedia. *User Modeling and User-Adapted Interaction*, 6, 87–129.
- Graf, S. (2007). Adaptivity in learning management systems focussing on learning styles (Ph.D. thesis). Vienna University of Technology, Austria.
- Graf, S., Yang, G., Liu, T.-C., & Kinshuk. (2009). Automatic, global and dynamic student modeling in a ubiquitous learning environment. *International Journal on Knowledge Management and E-Learning*, 1(1), 18–35.
- Jonassen, D. H., & Grabowski, B. L. (1993). *Handbook of individual differences, learning, and instruction*. Hillsdale: Lawrence Erlbaum.
- Knutov, E., de Bra, P., & Pechenizkiy, M. (2009). AH 12 years later: A comprehensive survey of adaptive hypermedia methods and techniques. *New Review of Hypermedia and Multimedia*, 15(1), 5–38.
- Wild, F., Mödritscher, F., Sigurdarson, S. E. (2008). Designing for change: Mash-up personal learning environments. *eLearning Papers*, 9. Retrieved from <http://www.elearningeuropa.info/files/media/media15972.pdf>

Personalized Learning Systems

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Synonyms

Personalized educational systems; Personalized e-learning systems

Definition

Most of the learning systems typically used in educational institutions, such as learning management systems, provide the same courses, identical in structure, composition, and content, for all learners (Graf 2007). In contrast, personalized learning systems are learning systems that consider the individual differences of learners and tailor the learning experience of learners to their current situation, characteristics, and needs. By adapting courses, learning material, and/or learning activities to learners' individual situation, characteristics, and needs, personalized learning systems aim at increasing learners' progress and outcome, enabling

learners to learn with less effort, for example, in terms of time required for learning, and offering higher learner satisfaction.

Theoretical Background

Each learner has individual characteristics and needs such as different prior knowledge, cognitive abilities, learning styles, and so on. These individual differences affect the learning process and are the reason why some learners find it easy to learn in a particular course, whereas others find the same course difficult (Jonassen and Grabowski 1993). Personalized learning systems address this issue by adapting courses, learning material, and/or learning activities to the learners' current situation, characteristics, and needs.

Besides the term “personalized learning systems,” there exist other terms which are often used in a similar context. The term “adaptive learning system” stresses the ability of a learning system to automatically provide different courses, learning material, and/or learning activities for different learners and the term “intelligent learning (or tutoring) system” refers to systems that focus on the use of techniques from the field of artificial intelligence to provide broader and better support for learners. On the other hand, the term “personalized learning system” emphasizes the aim of the system to consider a learner's individual differences and treat each learner as an individual person. However, many of the learning systems developed based on the idea of tailoring education to learners' characteristics and needs can be considered as personalized, adaptive, and intelligent.

Personalized learning systems usually focus on personalization on the course level, meaning that such systems provide courses that fit learners' individual needs and characteristics. The personalization typically works in two steps. First, the respective characteristics and/or needs of learners have to be identified. This process is called student modeling and aims at building and updating a student model that includes information about the students' characteristics and/or needs. Brusilovsky (1996) distinguished between two different ways of student modeling: collaborative and automatic. In the collaborative approach, the learners provide explicit feedback which can be used to build and update a student model, such as filling out a questionnaire. In the automatic approach, the process of building and updating the student model is done