Preface

This edited volume consists of selected papers from distinguished experts and professors in the field of smart learning environments. This book addresses the main issues concerned with the future learning, learning and academic analytics, virtual world and smart user interface, and mobile learning. The learning environment has been affected by advances in technology development and changes in the field of education. What we should do is to make the learning systems, no matter what platforms (i.e., personal computers, smartphones, and tablets) they are running at, be aware of the preferences and needs that their users (i.e., the learners and teachers) have and are capable of providing their users the most appropriate services and help to enhance the users' learning experiences and to make the learning efficient. This book aims to gather the newest research results of smart learning environments from the aspects of learning, pedagogies, and technologies in learning.

This book arranges research based on three themes: learning analytics, ambient design, and smart pedagogy. Each chapter covers three to four latest research results related to the development of smart learning environment for the future learning. The aim is to provide readers with evidence and experiments that account for users' experiences and perceptions related to knowledge and concepts acquisition through these smart learning approaches in various disciplines and domains.

First, this book starts with Dr. El-Bishouty and his colleagues' three research results that automatically analyze both learners' characteristics and courses in learning systems based on learners' cognitive abilities, learning styles, and course context. The first research result is a system, which can automatically identify students' working memory capacity based on their behavior, is developed. By knowing students' working memory capacity, teachers can provide students personalized support and recommendations so the students can learn better. The second research result is a tool that can analyze course contents and check whether or not the current course contents are suitable for the students who enroll in this course. Teachers may adjust course contents by adding, moving, or removing learning activities to make the course contents more appreciated by the students.

The third research result is an application that can build a comprehensive context profile through detecting available features of a device and tracking the usage of these features. The context profile can help researchers to design advanced adaptive and intelligent capabilities for their learning systems and environment.

The second chapter talks of an approach that can measure students' coding competency proposed by Dr. Kumar and his colleagues. They first talk of the types of learning traces that they collect from the Java tutor sensor (i.e., MILA) which students install in their Eclipse development environment before they start doing programming assignments. Dr. Kumar and colleagues then explain the data analysis methodology including the creation of key performance indicators for the three dimensions: overall course measurement, student-based traces, and content-specific traces. The technologies they currently include are simple statistics, rule-based approaches, pattern recognition, mixed-initiative conversational agents, and causal models. Their research can discover causal connections between study pathways and competencies.

Dr. Gao and Dr. Wen in the third chapter propose an enhanced semantic similarity topic modeling method for document analysis. They not only use co-occurrence information but also the semantic similarity based on WordNet as auxiliary information while analyzing the similarity among documents. They evaluate the proposed method by comparing it with existing topic modeling methods and find the accuracy that the proposed method reach is around 1.26–1.31 times higher than the existing methods. As the learning repositories grow rapidly due to the easy of publishing and accessing information, the proposed method can help students to understand the knowledge in documents and organize documents quickly.

The last chapter in the learning analytics theme is Dr. Li and her colleagues' effective approach in identifying and recommending experts with high expertise and influence in online learning communities. Their method not only considers the topic similarity degree that the documents posted by users have, but also measures the quality of the documents based on user feedback, review sentiment, and topic-specific influence degree of the users who give feedback. Dr. Li and colleagues use the gold standard method to evaluate the proposed approach's accuracy and find the correlation coefficient value to be sufficiently high. Their research can be applied to large size of learning community such as MOOCs. In the large learning community, many produced artifacts, postings, and learners are loosely tied and the proposed approach can be used to identify and recommend experts with high expertise and influence to make an online learning community interconnected and cohesive.

The ambient design theme starts with Dr. Jong's Chap. 5. In Chap. 5, Dr. Jong explains a GPS-supported integrated educational system, EagleEye, which can help both teachers and students to do context-aware outdoor exploratory Geography learning activities. He finds that EagleEye not only better promotes collaboration among students in terms of doing learning activity in the fieldtrip, but also earns teachers' positive perceptions toward its educational innovation—student-centeredness, motivation, scaffolding, and user-friendliness.

Dr. Chen and his colleagues in Chap. 6 introduce their investigation and findings on the note-taking that pupils have on the textbook. First, they summarize a note's three features (i.e., forms, locations, and the contents) and the note-taking influence factors (i.e., student's initiative, teacher's lecturing speed, and the content's difficulty). They also find that the contents of a note are quite different from the textbook's discipline and the student's age. Their findings are important for researchers in the e-text area. Researchers have to consider the features and functions (i.e., a mediator for family-school communication) while developing e-text readers and content.

Chapter 7, the last chapter in the ambient design theme, is written by Dr. Hu and Dr. Huang. They talk of the effectiveness that Clickers—a small device that allows students to quickly answer questions presented in the class—have if compared with peer discussion, for secondary school students learn biology. They find that both Clickers and peer discussion strategies are good for students to gain knowledge of biology and there is no significant difference in terms of students' learning achievements. Although Clickers may get students motivated in learning than peer discussion strategy, there is no significant difference in terms of students' learning attitudes among the two strategies.

The third theme—the smart pedagogy theme—starts with Dr. Libbrecht and his colleagues' Chap. 8. In their chapter, they argue that a learning tool can be smart if it has semi-automatic feedback paradigm designed. For semi-automatic feedback, their definition is—teacher is able to complement the feedback generated by the learning tool by a relevant feedback. In this chapter, they also introduce two smart learner support through semi-automatic feedback-based learning tools and correspondent use cases. The tasks that teachers are supposed to do are also summarized at the end of this chapter.

Mr. Fang and his colleagues in Chap. 9 introduce a motion-based Evergreen Fitness System that enables older adults' balance training. In order to design such game, they consulted two domain experts to design proper exercises for improving balance performance. They also invite senior participants to evaluate the suitability of the movements and the enjoyment of using the system, as well as provide feedback to improve the prototype. Several important conclusions of developing such system are: (1) such system should include enough in-game navigation, so learning how to use the system is not required; (2) the content should be more relevant to the users' daily life; and (3) such system should be capable of adjusting the motion recognition according to individual differences.

Chapter 10 talks about the use of story-based virtual laboratory for Physics developed by Mr. Fan and his colleagues. The virtual lab can help students to sharpen their science process skills that are usually not given attention in traditional science learning. Their experiment result shows that students, especially female students, believe that the system is useful for them in terms of learning. They also find that students' past physics grades and TIPS (i.e., Test of Integrated Science Process Skills) scores do not influence students' intention of using the system; which means students with low academic achievement can also benefit from the use of the virtual laboratory and improve and practice their science process skills.

The last chapter of the smart pedagogy theme and this book is written by Dr. Santos and his colleagues. They use augmented reality to develop an X-ray application which allows students to see inside of objects with mobile devices like a tablet. Surprisingly, their research results show that augmented reality X-ray does not have a significant impact on students' perceptions toward depth and realism. Via interviews with teachers, they find the augmented reality X-ray is perceived to be useful but a high-quality teaching plan is missing. Moreover, both teachers and students need to be trained to use the augmented reality X-ray tool in the classroom.

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