Preface

In a global view, the next generation is facing diverse situations of solving professional problems in a hybrid world in which there is no clear boundary between autonomous, non-human nature and human-generated process. This is due to increasing models of interdisciplinary knowledge production and emerging digital technologies that have shaped an interlinked global innovation environment. So this requires young students to prepare themselves for managing issues of complexity, uncertainty and ambiguity in their professional practice. Accordingly, on of key topics in higher education field is how to foster qualified talents who are able to face growing challenges in their future career that meets development requirements of their national societies as well as global innovation.

Such a topic is undoubtedly reflected and evidenced by Chinese universities that can be seen with a rise number of employing new pedagogical models under supports of recent policies. Chinese students are expected to be main driving forces of building a modern, harmonious, and creative society in a near future and ensuring a deeper integration of Chinese economy into a global context. Increasingly, in a changing process towards introducing advanced elements such as 'learning by doing', 'student-centered learning', 'active learning', 'peer learning', etc. to traditional curriculum system, studies on Problem-Based Learning (PBL) has shown its potential to be applied in Chinese universities. Even though most current efforts focus on medical education, there is a growing attention to design new PBL curriculum in other fields, in particular to STEM (Science, Technology, Engineering, and Mathematics) education in China. Along with curriculum reforms, discussions have also concerned with how to facilitate organizational changes in order to support the new pedagogy, how to equip teaching staff with knowledge and skills of PBL, how to motivate students to adopt the new models, and how to make institutional policies to ensure successful changes. This indicates a call for a systematic research on bringing together with diverse issues and proposals on how to foster PBL in Chinese universities in a global context.

This book responds to the above call and aims to meet current knowledge gaps by a collection of 10 chapters in one column. It is particularly interesting and meaningful that chapters bridge cultures between the East and the West: most of empirical cases of new curriculum designs are drawn from Northeastern University (NEU), which is one of top universities and has a long tradition of STEM education in China; and meanwhile, most of professional reflection is related to contributors' participatory learning experiences of PBL at Aalborg University (AAU), Denmark, which is leading engineering education in Europe and has a popular AAU-PBL model around the world. So all contributors present theories, course designs, and reflections in relation to experience of learning to develop new PBL models by looking at pedagogical innovation in Chinese universities from a global perspective. Thus, this book provides a comprehensive understanding on PBL both theoretically and practically, both locally and internationally. The following lines briefly show the different focuses of the chapters that indicate the important significances and outline the main profile of this book:

Chapter 1, "Fostering Problem-Based Learning (PBL) in Chinese Universities for a Creative Society," explores a discuss under a background of a new vision of building a creative society China. It regards Problem-Based Learning (PBL) as a promising strategy and aims at responds to the following questions: 1) How can we understand the context of building a creative society in China? 2) What is a PBL model? 3) How can we understand history of PBL in a global context? 4) What is the theoretical root of PBL? And 5) For Chinese universities, what are boundaries to be broken for facilitating changes towards PBL that benefits to build a creative society? As both challenges and opportunities of fostering PBL in Chinese universities will be revealed, and appropriate strategies of reform will be suggested, this chapter has important significances of pedagogical innovation in Chinese context. In addition, it also implies universities in other cultures for improving innovation strategies in the future.

Chapter 2, "Design of Crowd Creative Collaborative Education Model Based on PBL: Background, Reflection, and Teaching Practice at Northeast University in China," highlights that the global information technology revolution puts forward the following requirements for higher education: Education mode transforms from experience education to overall education; education mechanism transforms from traditional management to comprehensive governance; the educational goal transfers from the traditional knowledge to the ability training. In such a macro educational background, the structural contradictions in China's higher education have triggered the supply-side reform of education. The implementation of this reform to Northeastern University requires to vigorously promote the excellent education

action plan in view of the current teaching reality and local difficulties in China, to change the logic of unilateral teaching into the logic of co-creating education. Based on comprehensive learning of PBL education paradigm, the author of this chapter, based on his own teaching practice and reflection of educational philosophy, puts forward the collaborative education mode of crowd innovation, and gives the basic framework of this model. On this basis, specific cases and suggestions are given.

Chapter 3, "Fostering Practical Developers in Computer Science Classrooms: A PBL Approach," underpins that real-life software development requires practical developers. This chapter discusses the challenges put by real-life software development on Computer Science education of modern universities, and how to face these challenges by changing traditional teaching and learning to a PBL based approach. Based on a literature review on PBL theories, methods and tools, and observations made in classrooms and group rooms at Aalborg University, this chapter discusses possible aspects to consider when changing traditional Computer Science classrooms. A case is then used to demonstrate the process of changing traditional teaching and learning of a Computer Science course named Visual Programming and Applications to a PBL based approach.

Chapter 4, "PBL Implementation in Material Science and Engineering Education at Chinese Universities," addresses that it is a widespread global process of changing traditional university education with ordinary lectures to more practical and actively student-centered learning systems. Materials Science and Engineering is originally the study of actual engineering materials but now becomes more interdisciplinary, and sophisticated in the rapidly advancing industrial society. It is very necessary to cultivate the practical Materials engineers and it also becomes a big challenge for Chinese universities to make a change. PBL is one of the potential approaches for Chinese Universities. This chapter describes PBL theories, discusses PBL principles, PBL models and also some PBL experiences at Aalborg University. In addition, this chapter exposes how PBL could be applied to Materials Science and Engineering education in Chinese Universities, and a case of PBL implementation has been given to show the process of transformation from traditional education at Chinese Universities to PBL in a Materials Science and Engineering field.

Chapter 5, "Rethinking Environmental Education: Reflections on AAU UNESCO Center Certificate Course of Problem-Based Learning," has important significances of integrating PBL into environmental education based on a professional learning reflection at Aalborg University in Denmark. Based on the inherent wholeness of the human-nature ecosystem, interdisciplinary, sustainability-oriented teaching philosophies in environmental education, endeavor has been made for the appeal of more concern the value of life, aiming at promoting greater sensitivity to critical

thinking, individual happiness, and social responsibility. Problem-Based Learning may be an effective way to realize the action competence of students by solving real problems and adjusting their behavior and finally to compass transformative learning and lifelong learning. Following this sense, this chapter will provide a theoretical reflection on how to improve environmental education by PBL in the future.

Chapter 6, "The Change Towards PBL: Designing and Applying PBL at a Program Level," proposes the design of course groups on PBL for students from the BSc. programmes of Robot Engineering (RE) at NEU, China. The overall courses are divided into four groups throughout grade 1 to 4. By a discussion step by step, this chapter firstly provides background information about student cultivation and discipline construction in RE, then introduces the correlation of characteristics between PBL and RE programme that lays the reasons for applying PBL in RE. Finally, this chapter introduces the detailed design of course groups by PBL.

Chapter 7, "An Elective Course-Based Model for the Change of Traditional Engineering Curriculum Towards PBL," presents two PBL models for the change of traditional engineering curriculum based on traditional courses across colleges at the Northeastern University in China. A particular focus of the PBL model design is about the interdisciplinarity. In this regard, the E2-iPBL model is developed based on general and major elective courses offered across many disciplines, whereas the JD-iPBL model is considered to develop PBL courses by further introducing compulsory major courses for a joint-degree training program. For practical implementations within the traditional engineering curriculum background, the change of teacher's role for student-centered constructive learning is briefly summarized. Possible realizations and simple cases are illustrated. Finally, a comparative study of the E2-iPBL and JD-iPBL models is outlined.

Chapter 8, "Experience and Reflection on PBL and Implementation of Interdisciplinary-Level PBL Plan," introduces the author's teaching practices, teaching philosophy and teaching challenges by traditional ways in Northeastern University of China at first. Then it presents the author's experience and learning of PBL in UNESCO center of Aalborg University. And the impact and guidance of the course on author's teaching philosophy, challenges and skills are also given in this chapter. To apply PBL teaching methods, the author proposes future teaching plans with PBL. Moreover, design and implementation of interdisciplinary level PBL plan is presented. And the implementation plan is expounded by six aspects, students, teaching staff, learning goals, contents, teaching and learning methods and assessment. Finally, a case is put forward by the implementation plan.

Chapter 9, "Facilitating Cross-Cultural Communication: A Global Dimension to Fostering International Talents and Innovation in University Foreign Affairs

Management," emphasizes that the global integration of universities is profoundly affecting the direction of higher education's development, accepting the idea of international education, promoting the internationalization of higher education, and cultivating high-quality innovative international talents. The purpose of this chapter is twofold: 1) to make a brief interpretation of global dimension mainly focusing on the criterion for "international talents" and the requirements for the internationalization of higher education; and 2) to address foreign affairs management in universities plays a vital role in promoting the internationalization of teaching, research and administrative management, which can be regarded as a key diver to develop global dimension of innovation in higher education. Accordingly, this chapter proposes potential strategies for innovation of the foreign affairs management in universities, which has important significances in studies on internationalization of higher education, cross-cultural communication, and foreign affairs management.

Chapter 10, "Developing Engineering Creativity in STEM Programs in Chinese Universities," aims to formulate a proposal of developing engineering creativity by problem and project-based pedagogies in STEM programmes in university education in China. It will introduce the increasing needs of engineering creativity in China, deepen understanding the concept of creativity and engineering creativity, and provide a review of diverse models of problem and project-based pedagogies in STEM programmes. This further brings a discussion on how to develop engineering creativity in STEM programmes in Chinese universities in order to overcome the barriers caused by traditional education system and culture. A series of strategies will be proposed including supporting student group work, designing interdisciplinary project, facilitating staff development, and developing creative communities, etc. Briefly, this chapter has significances of developing engineering creativity in China and also implies how to develop problem and project-based pedagogies in STEM programmes in other cultures around the world.

As we can see today PBL is widespread across cultures around the world; however, at present in China, it is still in its infancy. Accordingly, contributors involved in this book behave as pioneers of keeping an open mind, exploring innovative strategies, and leading university education changes towards leaner-centered models in China. This book lays a stepping-stone in paving the way of moving on higher education reforms by taking PBL as a reference. It guides audience to unpack a 'black box of PBL' from perspectives interplayed between the Chinese context and the global context. Thus, this book contributes to provide an international forum to encourage more educators, researchers, decision-makers, and practitioners, who are interested in PBL and who are seeking for strategies of contributing university education innovation, to share with knowledge, experience, and insights between each other.

This further benefits to draw significant inspirations and implications of rethinking 'why', 'what', and 'how' to develop PBL for institutions in higher education around the world and improving traditional universities for gaining more core competence and opportunities of sustainable development in the future.

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