

Introduction

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In the 21st century knowledge society, higher education (HE) is experiencing a multidimensional transition. Shifting from the traditional, lecture-focused classroom setting to more learner-centered environments, integration of knowledge from different disciplines, interdisciplinary collaborations, use of information and communication technologies (ICTs) to enhance learning, globalization, and internationalization of HE, as well as emphasis on sustainability are some of the elements of this transition. Innovation and creativity are key drivers of change. HE is a significant tool for developing well-informed and knowledgeable citizens, well prepared to face the international job market; it also plays an important role in developing socially responsible and creative individuals, ready to address contemporary global challenges; these roles need to be strengthened and reconceived today.

With this book, we attempt to explore active learning strategies used in HE; strategies that promote leadership, innovation, and creativity. Active learning is a term used by educators to describe a more “learner-centered” approach to teaching. It involves students “doing” things and reflecting on what they are doing. Active learning practices may range from simple methods such as interactive lectures and class discussion to case study analysis, role-playing, experiential learning, peer teaching, and flipped lessons. Active learning may involve problem-based, visual-based, collaborative, project-based, or game-based learning. The editors’ long teaching experience in natural sciences and information technology has led to an initial focus on strategies used in Science,

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Technology, Engineering, and Mathematics (STEM) disciplines; the book has been enriched, however, with chapters describing learning experiences from other disciplines as well. The challenge of having to deliver large volumes of information while escaping from the traditional lecture approach and trying to promote deeper learning by stimulating student engagement, motivation, and confidence is addressed. Active learning empowers learners, as it helps them develop more responsibility, participate in the construction of knowledge, and challenge mainstream thinking and opinions. And this is an essential step in the development of informed, socially responsible, and creative individuals.

The use of ICTs in promoting an active learning environment is also explored in this book. Emerging technologies and applications for Science, Technology, Engineering, Arts, and Mathematics (STEAM) Education and other disciplines have received growing attention in recent years from various perspectives. A key strategic shift in the focus of educational strategies is evident, from content-oriented approaches to a collaborative, dynamic, media-enriched evolving paradigm. It seems that we are at a crossroad where the traditional classroom-based model of education has to be critically enriched with technology-enabled, value-added components. Active learning, enhanced and supported by the use of ICTs, is a key element leading toward the new model in HE.

The overall scope and main objective of the book is to expose the reader to the latest developments in active learning strategies used in HE, to provide good examples of such strategies, and to inspire teaching for leadership, innovation, and creativity. The book also aims to serve as a reference edition as well as a guide for teachers, professionals, and researchers; it can also be used as a teaching material at undergraduate and/or graduate level in the relevant domain.

The book is divided into three main sections. The first section is more theoretical and includes two chapters that elaborate on the epistemology of Active Learning and its unique contribution to HE. Steps in designing active learning experiences based on different learning theories are also outlined.

In the second section, the authors' teaching experiences in undergraduate and graduate courses are presented in the form of "stories." Eleven different case studies, which explore different active learning approaches used in STEAM and other disciplines, are presented. This section starts with a more general chapter on "stories" from STEM disciplines and continues with two chapters relevant to the environmental studies field, with emphasis on formative assessment and fieldwork as ways to

increase learning and promote student engagement. A chapter on how to engage non-history students in an art history course provides an example of active learning in Arts/Humanities. Seven chapters in the second section include case studies that explore the use of ICTs in promoting active learning. Two of these chapters discuss online learning; one of them also emphasizes collaborative learning. Two chapters on technology-enhanced learning for pre-service teachers, a chapter on active learning in an Information Systems course, a chapter on the use of ICTs in an Accounting course, and a chapter on the use of digital portfolios are also included. The overall aim of this section is to identify and communicate innovative teaching and learning strategies, discuss challenges faced, and provide a guide for future studies on increasing learning effectiveness in different disciplines. It also aims to provide examples of how ICTs can improve the learner's experience and to show how new, advanced learning designs and educational models can expand the frontiers in applied learning technologies toward smart learning and a knowledge society vision.

In the last section, a new vision for HE is presented. A debate paper on the pedagogical legacies of Dorothy Lee and Paulo Freire and a chapter on a new vision for HE based on lessons from Education for the Environment and Sustainability are included. This section provides insights for strategic policy making in HE, as well as a guide for teaching and learning that is fit for contemporary societies that need cultural and social transformations to effectively face significant environmental, social, and economic challenges.

The editors of this book aim to promote a humanistic vision in universities and colleges, linking education to sustainable development,¹ prosperity, and socially cohesive and caring communities. They suggest that HE – and all education – today should be appropriately designed for individual change, empowerment, integration, and social transformation. As authors and editors of this book, we believe it is a unique value proposition for HE.

¹In this book, we use sustainable development to underline the need for a balanced and harmonious relationship between human societies and the environment, an integrated approach to environment – society – economy and culture. Sustainable development and sustainability imply an integrated and deeply ethical approach, looking forward to the future, as was discussed in the document “Our Common Future” prepared by the United Nations World Commission on Environment and Development, 1987.

As stated above, the target audience of this book are educators and researchers, undergraduate and graduate students in the area of teaching and learning in HE. The book can also serve as a guide for educators and researchers; it can provide insights into pedagogies of engagement and give lessons and ideas for teaching and learning in specific fields. It may become a start for exchanging ideas and promoting research on the scholarship of teaching in HE.

A more detailed summary of the content of the chapters based on the chapter abstracts is presented below.

Chapter 1 concerns itself primarily with questions of how students in HE studies can best acquire, apply, create, and share knowledge. It examines the epistemological claims of the supporters and detractors of active learning while simultaneously exploring the nascence and development of some of the major understandings that presently underpin an epistemology of active learning. While the focus of earlier works may have been on changes that HE instructors should make to improve student understanding of key STEM concepts, this chapter addresses changes in the roles of both students and instructors as the co-creators of active learning environments and learning communities. A particular focus is given to the significance of metacognition as a critical skill that enables students to assess their own learning and also critically assess sources of information. The chapter includes a framework that indicates trends toward high-impact active learning skills for students in STEM HE and the research which theorizes and supports these new instructional imperatives.

Chapter 2 outlines the potential steps to take in designing active learning experiences based on several theories underlying the learning process. The chapter examines theories of learning and instruction including information processing, schema acquisition, and cognitive load theory. An explanation of how these theories support problem-centered learning as well as a rationale for the need to help learners develop domain-general, flexible problem-solving skills that will transfer to future needs and contexts is presented. The second half of the chapter focuses on designing active learning experiences based on: the selection of real-world problems as the foundation for learning, activating prior knowledge, demonstration of the process or concept, multiple opportunities for practice with relevant scaffolding, and the chance to integrate that knowledge into the learners' own context. Examples of assessments, strategies, and activities to foster active, problem-centered learning drawn from the literature are also provided.

Chapter 3 discusses the active learning strategies used in STEM disciplines and analyzes the potential of active learning to redefine the value proposition in academic institutions. After providing the theoretical underpinnings of active learning as an evolving practice, an attempt is made to connect it with different learning theories and present an integrative model in which institutional strategies, learning strategy, and ICTs work synergistically toward the development of knowledge and skills. In this chapter, the authors present the results of a survey examining “stories” of active learning from the STEM disciplines, identifying good teaching practices and discussing challenges and lessons learnt. The key idea is that active engagement and participation of students is based on faculty commitments and inspiration and mentoring by faculty. The authors finally present a stage model for the implementation of active learning practices in HE. Emphasis is placed on a new vision for HE, based on systematic planning, implementation and evaluation of active learning methods used, collaboration, engagement with society and industry, innovation and sustainability, for a better world for all.

Chapter 4 is a case study from the environmental science field. It focuses on a specific first-year course (module) offered at the University of Southampton, UK. “Environmental Science: Concepts and Communication” aids students in their journey into Environmental Science by preparing them to face the challenges of university study and beyond. It thus engages students in independent learning and provides them with opportunities to develop and enhance the skills necessary to do so. Formative and student-led activities and tasks are considered important tools to achieve this aim. This chapter provides an overview of selected formative and student-led activities with focus on methods and approaches, values and benefits, and the practicalities of delivery. Three assessments are reviewed: a practice essay, a communication exercise, and a practice presentation. The intended benefits and value of these assessments are (1) engagement with environmental issues and topics, and (2) development and enhancement of study skills. The value of such work is only realized, however, with student engagement. Delivering this module has demonstrated that formative elements are most effective when orientated to tutor group activities. Motivation for engagement appears most effective when the visibility – or absence – of students’ work is brought to the foreground though working in small groups. There is added value in that the collation and sharing of feedback within a small group permits students to learn not only from their own work but also from the work of others.

Chapter 5 focuses on field-based education for environmental studies which has been a foundational principle for the Environmental Studies program at Stockton University, and began in 1971. Located within the 445,000-hectare Pinelands National Reserve, on an 800-hectare campus near Atlantic City, New Jersey, USA, two professors in the program discuss their rationale and experiences teaching students about the environment within the environment. Expounding on the interdisciplinary literature of field-based learning, the authors present four unique case studies including local and regional experiences, as well as student learning abroad. The first case proposes that learning outdoors might be beneficial for students with learning disabilities. This is exemplified during a one-week field study to the 2.4-million-hectare Adirondack Park & Preserve. The second instance reveals the benefits of working with local towns and environments; acting as consultants in a multidisciplinary capstone experience. Next, the authors show how on campus data collection and hypothesis formulation help students to learn about environmental design and statistical analysis. Finally, an international trip to the Caribbean opens the minds of students through a service learning project. While on campus, in town, across the United States or at an international destination, learning in the field gives students the opportunity to expand their knowledge through field-based active learning strategies.

Chapter 6 explores issues of quality teaching, learning, and assessment in HE courses from the perspective of teaching fully online (poly-synchronous) courses in undergraduate and graduate programs in education at a technology university in Ontario, Canada. Online courses offer unique opportunities to capitalize on students' and professors' digital capabilities gained in out-of-school learning and apply them to an in-school, technology-enabled learning environment. The critical and reflective arguments in this chapter are informed by theories of online learning and research on active learning pedagogies. Digital technologies have opened new spaces for HE which should be dedicated to creating high-quality learning environments and high-quality assessment. Moving a course online does not guarantee that students will be able to meet the course outcomes more readily, or that they will necessarily understand key concepts more easily than previously in the physically co-present course environments. All students in HE need opportunities to seek, critique, and construct knowledge together and then transfer newly-acquired skills from their coursework to the worlds of work, service, and life. The emergence of new online learning spaces helps us to re-examine present higher education pedagogies in very deliberate ways

to continue, to maintain, or to improve the quality of student learning in HE. In this chapter, active learning in fully online learning spaces is the broad theme through which teaching, learning, and assessment strategies are re-considered. The key elements of the authors' theoretical framework for active learning include (1) deliberate pedagogies to establish the online classroom environment; (2) student ownership of learning activities; and (3) high-quality assessment strategies.

Chapter 7 describes and analyzes the result of an active, co-operative learning design adopted in "Change Management," an elective course in the University of Catalunya, Spain, which is a fully online university. The chapter describes the context and the foundation that supports the learning design, outlines the learning activities and their evolution, and presents the results of a student survey to assess the effectiveness of the design in reaching its main goals. The results of the survey suggest that students perceived this design as enhancing their teamwork competence, while being interesting and motivating, and useful to learn the course's content. Therefore, the desired goals were attained and the design was kept, with minor changes, in subsequent editions of the course. In addition, students without prior teamwork experience valued collaborative activities more than students who had previously worked in teams in other subjects of their degrees. In contrast, no differences were found for individual learning activities. This suggests that the design can be useful in introductory courses where students are asked for the first time to learn in virtual teams.

Chapter 8 is a case study from Humanities and Arts. It presents how an instructor in a Roman Art class at a US University managed to engage five football players; it provides an account of how she tried to engage the class as a whole. The author discusses the commitment she made to making each class period one in which an active learning technique was used, often paired with some lecture, sometimes not, to engage students and help them learn about Roman Art and Architecture. She discusses the type of assignments she thought would work, based on research and her own observation, as well as the results of a focus group held with the football players a year later. Football players tend to be kinetic learners and thus were chosen as the follow-up to see how the active learning techniques in this class met objectives. Specifically, this chapter discusses the inclusion of a *Reacting to the Past* game, a research project on "Daily Life in Ancient Rome," case studies where students had to create an artifact (a list, a floor plan, a propaganda program, etc.) in response to a prompt, and presentations

on different methodologies of interpreting an image from a Pompeian tavern.

Chapter 9 presents innovative approaches to active learning that were introduced into the teaching of pre-service teachers at the Faculty of Education of University of West Bohemia, Pilsen, in the Czech Republic. Over the last three years, the Technology Enhanced Learning course has seen substantial innovations in both the content and use of teaching strategies designed to prepare the students for their professional lives. The whole update of the course was implemented using the results of action research – all individual changes were rigorously tracked and analyzed. Besides practical activities with tablets and smartphones, during which students familiarize themselves with various types of applications and reflect on their use in teaching, the course was extended by the use of practical aids for the efficient inclusion of mobile technologies for teaching – the Czech version of Allan Carrington's Pedagogy Wheel. During the teaching, students work with internet applications and cloud services. Teaching is complemented with communication on the Facebook social network. A close link to professional life is achieved through workshops, which in-service teachers from elementary and high schools provide to pre-service teachers. A significant part of the teaching consists of co-operative projects between pre-service teachers and pupils of elementary schools. The innovative approach to active teaching in the Technology Enhanced Learning course is apparent even during the exam. In the course of the exam, students process, present, and defend a lesson plan for the implementation of an activity using digital technologies.

Chapter 10 examines how to apply effective teaching and learning strategies as an essential component in understanding the complexity of human groups, especially in educational contexts. To look for the relationship between the contributions that people make, it is critical to understand the singularities of cultures when developing innovations and to foster leadership in education. This chapter presents an experience developed in HE in Chile, focused on the ability of pre-service teachers to enhance the development of individual talents as an active teaching and learning strategy that aims to create a society made up of integrally developed people in educational contexts. In addition, the authors make reference to the use of virtual learning environments as a vehicle to connect students between physical and virtual boundaries. This strategy is based on the Talent Management Model which was implemented in intercultural primary schools by professors and pre-service teachers from the south of Chile. The virtuality dimension

promoted the detection of individual traits of students and contributed to the development of a cultural identity. Additionally, it offered theoretical and practical knowledge that implied an innovation in the training of future teachers.

Chapter 11 examines how the use of active learning techniques can significantly improve the teaching–learning process in Information Systems courses, since the content is explored in a more interactive, participative, and relaxed way. Although expositive classes are still broadly used in Brazil, in this chapter the authors present some active learning techniques as well as experiences of their application in Information Systems K-12, undergraduate and graduate courses in Brazil. As a result, the authors have noticed learning has been more effective and students have been motivated by the use of these active learning techniques. Although used in the context of Information System courses, the techniques could be adapted to other scenarios.

Chapter 12 presents a case study from the field of Accounting. Even though students increasingly demand the integration of the varied technologies and mobile devices in the learning environment, educational systems of the public universities continue to be traditional. In this chapter, a teaching innovation for first-year university students using the Socrative app is presented. The authors of this chapter investigate how the university can combine ICT with traditional methodologies of learning, in order to increase student interest in the subject and awakening students' passion and vocation for the accounting area.

Chapter 13 makes reference to a constant growth in digital portfolio use in tertiary education in the recent years. Portfolios are used by educational institutions for assessment, as a showcase of both student and institution work, and with an increasing trend also as a tool for higher employability of graduates and support of lifelong learning. This chapter introduces concepts of portfolio, digital portfolio, language portfolio, autonomy, and self-assessment. It approaches both positivist and constructivist paradigms of digital portfolio and presents examples of ePortfolio implementation at the University of Pardubice, Czech Republic. Selected examples of good practice with respect to autonomous learning, experiential learning, and international cooperation are also given.

Chapter 14 can be described as a debate paper in which the author reintroduces the anthropological and pedagogical insights of Dorothy Lee and Paulo Freire in the ongoing debate on active learning and HE. These insights refer in the case of Dorothy Lee, on “valuing the self” of the student, and additionally on learning (values) from “remote

cultures,” and last but not least on the meaning of freedom and autonomy in the teaching/learning process. The author points a few selected lessons and contributions from Freire: (1) the socio-cultural anchor of freedom and autonomy, (2) the view of education as a tool for raising-awareness, critical thinking, inspiration, hope, empowerment, cultural action, and social transformation, and (3) the view on citizenship education. The author discusses in this regard, the significant role assigned by Dorothy Lee and Paulo Freire to the neglected notions of dialogue, freedom, culture, self, autonomy, and structure. Lastly, the author argues in favor of reincorporating the pedagogical insights of Dorothy Lee and Paulo Freire in the curricula and structure of HE, and also reminds those concerned with upholding democracy that these formative values and concepts were acknowledged in the early conception and development of active learning.

Chapter 15 presents a new vision for HE based on lessons from Education for the Environment and Sustainability. Environmental Education (EE) and its descendant Education for Sustainability (EFS) or Education for Sustainable Development, by definition, propose and adopt active learning and experiential methods, as they seek to prepare people that will work for a healthy environment and better societies. And this is where the difference lies between EE/EFS and the generic active learning approaches. EE or EFS are committed active learning approaches; they have an explicit goal to work for social – environmental change. The transition from learners to active learners is addressed by active learning, which however assumes that active learners will also become responsible and active citizens. EE and EFS have however demonstrated that this is not an obvious development. After a discussion of the main characteristics of EE/EFS, this chapter explores what facilitates the transition from active learners to active citizens, based on lessons from EE and EFS. Finally, it reflects on the implications of these lessons for HE and a new vision for HE in contemporary societies and a brief guide for educators and Higher Educational managers are proposed. The authors propose the following typology of educational purposes – i.e. individual change, empowerment, integration, or social transformation – and corresponding instructional methods and tools. Higher education institutions and instructors (or academics) should be clear about the purpose of the educational praxis and instructors should choose the pedagogical methods and tools that match the selected purpose(s) in order to facilitate the transition from active learners to active and responsible citizens.

This book presents best practices for effective active learning and teaching in HE. It includes case studies of active learning approaches adopted at universities in different countries and continents and in different disciplines. It presents best cases of technology-driven learning innovation, as well as insights on HE for sustainable societies. It is a book that highlights the importance of collaborative knowledge sharing, exploration, and creation, involving active engagement of both students and instructor – and even the local community – all as actors of the same play. It emphasizes an integrated pedagogical approach that uses engaging and collaborative learning methods, problem solving, technology-driven learning innovation, collaboration with the community, and other teaching strategies, within the explicit context of a new civic ethic (e.g., personal issues are social problems).

The insights gained in this book could be further enriched with more studies on the effectiveness of different active learning methods. It would be interesting to explore what active learning methods effectively stimulate not only creative thinking but also lead to change in values and behaviors. A systematic study of student performance in classes where active learning is used, as well as a more thorough analysis of teachers' conceptions of effective teaching and an exploration of students' attitudes on the effectiveness of learning methods – also in terms of behavioral change – could provide further insights into how transformative learning can be achieved.

This edition is the first part of a sequence of books already planned. The main goal of this series is to explore active learning pedagogy and methods within the present social context and challenges, as well as the “keys” that can make active learning empowering and transformative, leading to more humane, caring, and sustainable societies.

The objective of this first book, *Active Learning Strategies in Higher Education: Teaching for Leadership, Innovation and Creativity*, which you currently hold in your hands, was to explore active learning practices internationally and introduce our Active Learning Philosophy. We do believe that the variety of chapters and the adopted teaching and learning strategies that have been communicated in the three sections of the book summarize the main aspects of this philosophy: innovation and integration; creativity and collaboration; and leadership and social action. The understanding of the philosophical underpinnings of active learning theory and the challenges of our times, and their integration in HE practices can cultivate an exploratory, collaborative, empowering, and transformative active learning philosophy that can lead to

sustainable societies. The role of technologies is also introduced without entering into details.

The next book will concentrate on transformative learning. An indicative title is *From Active Learning to Transformative Learning: Moving Beyond Boundaries and Disciplines*. In this edition, the focus of our discussion will be on a detailed sophisticated methodological framework for the design of transformative active learning programs, with a focus on HE. The greatest challenge is related to the fragmented nature of knowledge and organization in HE institutions. Contemporary social and environmental challenges require integrated approaches and the liquidation of boundaries – between humans and the environment, me and the “other,” disciplines, the university and the community. Our unique value proposition is that Transformative Active Learning will be one of the most significant enablers of this innovative, out-of-the-box, technology-enabled education and thinking. For this reason, in the chapters of this edited book, we will present best practices of Transformative Learning; interdisciplinary – multidisciplinary practices in STEAM.

We do hope that our readers will value the individual contributions in each chapter and will also be able to be carriers of our active learning vision. In simple words, our effort will be successful if we find more advocates for active and transformative learning and its adoption in universities and colleges, so that HE:

- Promotes individual contributions and seeks for social humanistic visions for the learning process.
- Acknowledges the value of each individual knowledge artifact but recognizes and supports its integration with knowledge elements from different disciplines.
- Promotes the development of personal values, skills, and competencies but also connects it with a socially beneficial context for their exploitations.
- Compensates group efforts in learning content interaction and explorations and builds connections between universities and communities, different cultures, civilizations, and religions.
- Promotes creativity, imagination, and emotional depth of students along with knowledge acquisition and development – all as equally important and complementary.
- Constructs a dialectic, not authoritarian, communication channel between faculty and students.

- Informs HE administration about the non-countable benefits of active learning at institutional level.
- Promotes employability with advanced ethos and enhances personalities of individuals.
- Cultivates a participatory culture in academia at all levels.
- Makes learning an intellectual process contributing to a vision for a better world for all, designed for active citizens with increased responsibility.
- Makes HE more relevant for a socially inclusive sustainable development.
- Builds bridges between individuals, groups, institutions, and nations.
- Envisions a socially beneficial and effective use of resources in Academia, Industry, and Society.