

FOREWORD

inScience Press is delighted to publish this book entitled *Education Applications & Developments VII* as part of the Advances in Education and Educational Trends books series. These series comprise the work of authors' and editors' to address global research in the Education area.

In this seventh volume, a dedicated set of authors explore the Education field, contributing to the frontlines of knowledge. Success depends on the participation of those who wish to find creative solutions and believe their potential to change the world, altogether to increase public engagement and cooperation from communities. Part of our mission is to serve society with these initiatives and promote knowledge, therefore it requires the reinforcement of research efforts, education and science and cooperation between the most diverse studies and backgrounds.

The contents of this 7th edition bring us to the most broadening issues in contemporary research on Education. This book explores four major areas within the broad spectrum of Education, corresponding to four sections: "Teachers and Students", "Teachers and Learning", "Projects and Trends" and "Organizational Issues". Each section comprises chapters that have emerged from extended and peer reviewed selected papers, originally published last year in the proceedings of the International Conference on Education and New Developments (END) conference series (<http://end-educationconference.org/>). This meeting occurs annually always with successful outcomes. Original papers have been selected and the authors were invited to extend and to submit them to a new evaluation's process. Afterwards the authors of the accepted chapters were requested to make the necessary corrections and improve the final submitted chapters. This process has resulted in the final publication of 25 high quality chapters organized into 4 sections. The following sections' and chapters' abstracts provide some information on this book's contents.

Section 1, entitled "Teachers and Students", provides studies within educational programs and pedagogy for both teachers and students.

Chapter 1: *Mathematics Education and Performance, through the Prism of PISA, in Greece and Portugal*; by Eleni Nolka, & Chryssa Sofianopoulou. Greece and Portugal are two Southern European countries, with nearly the same population as well as a centralized educational system, which were both deeply affected by the economic crisis during the last decade. Despite being severely hit by the economic crisis, Portugal has advanced to the OECD average level in its students' mathematical performance in the Programme for International Student Assessment (PISA 2018), while Greece has performed below the OECD average. PISA, as one of the most influential international educational surveys, aims to evaluate educational systems and provides a valuable platform for comparisons. In the first PISA 2000, Portuguese students outperformed their Greek counterparts by only

7 points and went on to widen the difference by 41 points in PISA 2018. What national strategies have been set up and implemented in Portugal so as to foster student's mathematical literacy competencies? The main aim of this study is, through a recording of the Greek and Portuguese students' mathematics achievements in PISA and at the same time of the mathematics education in both countries, through available policy documents and research reports, to comment on the current outcomes of the two educational systems and their students' performance in Mathematics.

Chapter 2: *Social Validity of Special Education Intervention Programs: A Step towards Self-Determination?*; by Pagona Leonidou, & Lefkothea Kartasidou. The conceptualization of social validity emerged in the 1970s with seminal articles by Kazdin (1977), Wolf (1978) and Van Houten (1979). Since then its importance was accepted widely and is now considered a mandatory aspect of intervention research in special education (Horner et al. 2005 as cited in Leko, 2014). Pre and post intervention measures using qualitative and quantitative methods can be used in social validity research with benefits and limitations (Schwartz & Baer, 1991). Horner et al. (2005) asserted that social validity is enhanced when an intervention is implemented with fidelity in authentic contexts by typical intervention agents, so it seems preferable for interventions to be implemented in natural environment, the classroom, by typical agents, the teachers themselves. Self-determination, then, as a means of accomplishing specific goals established by the person itself and eventually improving quality of life, is highly related to quality-of-life matters and it may also serve as a valuable associated indicator of the social importance of intervention outcomes and overall social validity (Carter, 2010).

Chapter 3: *Assessment of Pupils' Social Relationships and Leisure Activities in Two Romanian High Schools*; by Adriana Albu, Mihaela Vlada, Adina Iustina Nechita, & Florin Dima. It is necessary to assess the way students spend their free time in the final years of high school due to the poor results that have appeared recently in the baccalaureate exams. The study was carried out using a group of 202 students from two high schools in the Romanian county of Botoşani. The young people filled in a questionnaire with questions about leisure activities and social relationships. The results were processed using Pearson's chi-squared test. The time allocated daily for physical activity is mostly 15-30 minutes (23.76%). The time spent watching television programs is mostly 0.5-1 hours (35.64%). Most pupils (44.05%) do not spend free time on the computer. In the majority of cases (32.4%) pupils have „one” true friend. In their free time, they go out, mostly 2-3 evenings per week (28.71%), but there are also 31.68% negative answers. Parents are less concerned about school activity (“never” answers – 34.15%) and are also less concerned with the way their children spend their free time (“never” answers – 34.65%). There is a series of situations that guide us towards a modest concern for the future, both from pupils and their parents.

Chapter 4: *Forensic Sciences as Educational Support for the Promotion of Teaching and Learning of Secondary Students*; by Shirlene K. S. Carmo, Luís Souto, & Carlos Silva. The search for improvements in education systems has grown sharply, from incentives in the educational area to changes in the legislation, highlighting a more contextualized teaching, especially in the field of science. However, the dissemination of knowledge transcends the need and becomes a daily challenge in the life of educators, who need to reinvent themselves, reform themselves, and especially develop activities that make the understanding of content more relevant and meaningful. Although it is an arduous task for many students, this learning is indispensable to adequate scientific education. Thus, this research aimed to synthesize studies that have been developed on the use of forensic sciences as a pedagogical approach in the improvement of secondary education. The methodology is based on applied scientific research of a qualitative-exploratory nature. The results show experiences of the school context lived in the United States, Brazil, Singapore, and Portugal, where it is observed that students feel more motivated and involved in educational activities when integrated into the forensic context. The implementation of this theme to the school curriculum has the potential to attract attention and arouse interest in the sciences, contributing to the reduction of retention rates and school dropout and increasing the demand for scientific and technological careers.

Chapter 5: *University College Students' Perspectives and Opinions on Digital Lectures*; by Marcin Fojcik, Martyna K. Fojcik, Lars Kyte, Bjarte Pollen, & Jan Ove Rogde Mjånes. The traditional lecture, with a teacher talking and writing on a blackboard interacting with students, has in many cases been exchanged with different digital or hybrid solutions. It was evident when the whole world went into lockdown, and education at all levels needed to emergency transform learning in classrooms to learning through digital platforms. New structures had to be made, new routines, and new approaches. It was necessary to develop solutions for presenting different programs or motivating students to be active, even without a camera or microphone. In some cases, the digital lectures were synchronous, with teachers and students meeting at the same time to discuss a topic both in small and big groups. Other times, the digital courses were asynchronous to give the students more time to prepare themselves and activate their learning by giving them the responsibility to study individually. This study has investigated the student's views on what they have experienced during digital lectures. The students from different programmes were asked to answer an anonymous questionnaire of their opinion, ideas, and experiences with digital solutions. The results were categorized and analyzed to select some tools or approaches that most students found better or worse for their learning.

Chapter 6: *Enlarging the View. A Model to Promote Quality in ECEC Services by Integrating the Indicator Framework Approach to the Situational Perspective of Children's Learning*; by Paolo Sorzio, & Caterina Bembich. In this contribution it is proposed a critical framework, based on Basil Bernstein's theory, for two aims: a) criticizing some tendencies in the Indicator Frameworks for the evaluation of the quality of Early Childhood Education and Care services (ECEC), which rely mainly on measures of the structural and processual characteristics of the educational settings. However, the processual dimensions are reduced to their individual components, overlooking the complex and contingent interactions that create opportunities for learning; b) proposing a critical framework, based on Basil Bernstein's theory to analyze the different child-centered approaches to ECEC.

Chapter 7: *Social Identity Formation of Black Learners in South African Historically White Schools*; by Anthony Mpisi, & Gregory Alexander. The chapter engages with the issues influencing the social identity formation of black learners attending historically white schools (HWSs) in the Northern Cape province of South Africa. Black South Africans were treated as intellectually and racially inferior during the apartheid years. The situation was further exacerbated when black learners were admitted to HWSs. Consequently, the school that should normally contribute to developing a positive social identity formation of learners, seemingly has the opposite effect on black learners. An empirical investigation, by way of quantitative research, was employed to ascertain the issues influencing the social identity formation of black learners in HWSs. The authors, however, report on the data segment of 10 selected items pertaining to social identity formation, which was one of the components of an extensive doctoral study questionnaire, which was completed by 832 black learners enrolled at 27 HWSs in the Northern Cape province. Some of the findings indicate the manifestation of negative influences, low educator expectations, the disjuncture between home and school education as having an effect on the social identity formation of black learners. This chapter proposes certain suggestions to be considered by HWSs in South Africa to possibly mitigate the identified challenges.

Section 2, entitled "Teaching and Learning", offers research about foundations in the education process itself, in various contexts, both for tutors and students.

Chapter 8: *Learning Non-Euclidean Geometries: Impact Evaluation on Italian High-School Students Regarding the Geometric Thinking According to the Van Hiele Theory*; by Alessandra Cardinali, & Riccardo Piergallini. This paper aims to explore the impact of a non-Euclidean geometry course on Italian high-school students regarding the assessment of geometric thinking. To accomplish this, we analyse the results of the van Hiele levels test. We slightly modified and translated to Italian the van Hiele test, originally designed by Usiskin, and we used it to detect possible changes of the students' levels of geometric thinking after we taught a non-Euclidean geometries course of our design. The students involved in the test (N=56) span ages 15-18 and all attend the "Liceo Scientifico" high school type. The results show that

there is a statistically significant (p -value < 0.05) improvement in the median level of understanding in geometry if we consider the so-called modified van Hiele theory. Since we observe this improvement only for classes with an entering van Hiele level of at least 3, we suggest our non-Euclidean geometry course only for these classes of students, regardless of the grade.

Chapter 9: *Factors Influencing the Physical Sciences Pre-Service Teacher's Pedagogical Orientations in one of the Universities in South Africa*; by Aviwe Sondlo, & Umesh Ramnarain. To effectively teach sciences, science teachers require content knowledge of the science subject and know how to teach such content better. The purpose of this paper was to determine factors influencing the Physical Science pre-service teachers' pedagogical orientations. Orientations refer to teachers' knowledge and beliefs about teaching science at a particular grade level. Pedagogical orientations are classified into two approaches: direct approaches and inquiry approaches. A mixed-method approach was adopted, where a quantitative method was used to determine Physical Science pre-service teachers' pedagogical orientations and a qualitative method was used to establish factors influencing their pedagogical orientations. A questionnaire of ten items was administered to forty-five final year Physical Sciences pre-service teachers, and they were requested to select the most appropriate pedagogical orientation and then justify their choices. The questionnaire justifications and interviews were used to generate themes. This study's findings indicate that Physical Sciences pre-service teachers' preferred pedagogical orientations were between Direct Active and Guided Inquiry, and factors influencing their pedagogical orientations were: school resources, class size and teaching time.

Chapter 10: *4th IR – The Impact the Use of Mobile Teaching Devices will have on Higher Education*; by Johannes Andreas Gerhardus Beukes. Students and lecturers use mobile devices more and more and within a few years they will become indispensable tools in the classroom. Recent research clearly indicates that mobile devices such as smartphones, laptops and tablets are the tools of choice for students, scholars, teachers, and lecturers. It is playing a major role in teaching and learning, especially in higher education. It is therefore indisputable that the development of artificial intelligence and new ways of communication take their place in the classroom during the 4th IR. The integration of these new technologies into the teaching and learning experience in the classroom will be dependent on effective pedagogical implementation and planning to be successful. Taking this into account, this paper explores the effect that mobile devices have in the classroom on the teaching and learning experience of the student as viewed from the student's perspective. The advantages of the implementation of mobile devices must be weighed against the negative influence they may have. All the participants in the study reported that they have access to and use mobile devices to use the internet to source information.

Chapter 11: *A View of Secondary Technical School Students on the Support and Barriers to their Professional Growth*; by Dana Vicherková, & Josef Malach. The aim of the paper is to find out how Czech secondary technical schools students evaluate their professional growth in the course of their secondary school studies, what are the barriers to this growth and what are their views on the possibilities of schools to support their interest in the chosen field of study. Qualitatively oriented research focuses on the quality of secondary school studies as regarded by secondary technical schools students in the Moravian-Silesian Region of the Czech Republic. The research outputs provide suggestions for students to improve their professional growth throughout their secondary school studies and suggestions for procedures that may help remove barriers in their educational paths to a technically oriented profession. Respondents - secondary technical schools students - most frequently state the possibilities of their professional growth, comprising the "I-student" and "Teacher and teaching" factors. More than half of the barriers mentioned by students belong to the category of dispositional (personality) barriers. In second place are institutional barriers, and a negligible number of barriers have been included among situational barriers. The most significant number of students' opinions on how the school should deepen their interest in the field was concentrated in the group of factors "I - student". It is followed by opportunities to support interest in the "School" factor group.

Chapter 12: *Analysing Lesson-Based Interviews with Pre-Service Generalist Teachers who Lead Class Singing*; by Annamaria Savona. In pre-school and primary schools, teaching songs and leading class singing are often entrusted to generalist teachers. During their training, they are expected to attain and/or consolidate subject-specific skills. Research has yet to explore how generalist teachers make sense of their song-leading lessons and become familiar with subject-specific knowledge and skills. Using interviews based on video-recorded lessons from 10 pre-service generalist teachers, this study examines how each teacher experienced and managed leading class singing in their three-year training. The analysis includes the use of the visual tool Lesson Activities Map (LAMap), which is a graphical system for the organisation of lesson activities and is valuable for ensuring consistency in the interpretation of lesson-based interview analysis. This chapter presents a case study and offers implications both for the dissemination of new visual analytical methodologies in education and for understanding the teaching experiences of generalists involved in the professional development of teaching songs and leading class singing.

Chapter 13: *The Development, Piloting and Administration of an Instrument to Measure Nature of Science Understanding*; by Tarisai Chanetsa, & Umesh Ramnarain. The study describes the development of an instrument to measure the Nature of Science (NOS) understandings in high school Science teachers. The instrument was initially piloted on two high school teachers in South Africa, one teaching Life Sciences and the other Physical Sciences. It was subsequently used to measure NOS understanding in 10 high school Science teachers in South Africa over 6 months in 2021. The objective of the study was to construct a questionnaire that could measure NOS understanding based on the Family Resemblance Approach (FRA) and the Consensus View (CV). The NOS is a construct that has been defined by various scholars and there exist multiple perspectives. For this study, two perspectives that define NOS, the CV of Abd-El-Khalick and the Reconceptualised Family Resemblance (RFN) approach to NOS of Erduran and Dagher were considered. To collect data on NOS understanding, the researcher compared the Views of Nature of Science (VNOS) instrument used to capture NOS understanding under the CV, and the RFN questionnaire used to capture NOS understanding under FRA and compiled an Integrated Family Views of Nature of Science (IFVNOS) questionnaire. The findings revealed that the IFVNOS questionnaire developed can be used as a reliable tool to measure NOS understanding.

Chapter 14: *Performance of Brazilian Middle and High School Students in Reading Processes: Comparative Study between Public and Private Education*; by Adriana Marques de Oliveira, Jair Lício Ferreira Santos, & Simone Aparecida Capellini. This chapter discuss the following question: Is there a difference in the assessment for reading processes between students in public or private middle and high school? To answer these questions, this chapter aims to compare the performance of middle and high school students of public and private schools schools using tests from the Brazilian Adaptation of Reading Processes Assessment Battery - PROLEC-SE-R. The Reading Processes Assessment Battery - PROLEC-SE-R, individual version, was applied to 436 students: 221 from public school and 215 from private school, in the following order: 1) Reading Words, 2) Reading Pseudowords, 3) Grammatical Structures II, 4) Punctuation Marks, 5) Reading Comprehension I, 6) Reading Comprehension II, e 7) Oral Comprehension. A cross-sectional study was performed using descriptive and bivariate analysis. Based on these results, the answer to the initial question is affirmative. Private school students do indeed achieve a higher mean score when compared to public school students in word reading, showing that spelling helps in the reading processes. When knowledge of the use of the word in a sentence, extraction of meaning and its understanding is required, the difficulty of accessing the mental lexicon of the population studied becomes evident.

Section 3, entitled “Projects and Trends”, presents chapters concerning, as the title indicates, education viewed as the center for innovation, technology and projects, concerning new learning and teaching models.

Chapter 15: *Global Intercultural Project Experience (GIPE): A distributed interdisciplinary project-based learning framework*; by Manfred Meyer, Attlee M. Gamundani, Katja Becker, Daniel Malpartida, Agung Nugroho, José Ochoa-Luna, Colin Stanley, & Heike Winschiers-Theophilus. This chapter describes a new concept and experiences of a distributed interdisciplinary learning program for students across continents. The aim is to provide students with a truly Global Intercultural Project Experience (GIPE) by working together with peers from around the world and solving real-life client’s problems. We have received seed-funding for four annual projects to engage students from Germany (Europe), Namibia (Africa), Indonesia (Asia), and Peru (South America). In 2020 and 2021, 28 and 44 students from four continents engaged in a one-semester distributed interdisciplinary project for a Namibian and Indonesian client, respectively. Despite Covid-19 they successfully completed the project expressing deep appreciation for the learning opportunities overcoming challenges of working across widespread time zones, cultures, changing requirements, and various technical difficulties. Considering the vast learning benefits, we suggest incorporating such projects in all tertiary education curricula across the globe, while streamlining organizational efforts based on lessons learned.

Chapter 16: *Exploring the Experiences of TVET College Educators Regarding Virtual Learning During COVID-19 in South Africa*; by Adebunmi Yetunde Aina, & Ayodele Ogegbo. This study explored the experiences of private TVET college educators regarding virtual learning during the Covi-19 school lockdown. The Kanter theory of change is adopted as the theoretical base in this study. Data collection was done through face-to-face semi structured interviews and non-participant observation with six educators from three TVET colleges in Gauteng Province, South Africa. Collected data was analyzed using content analysis. Findings reveal that though participants have positive attitude toward the process of change required in transitioning from traditional environment to virtual environment, majority of them did not receive substantive training on how to use technology to support virtual teaching. However, educators indicated that the change process comes with several challenges such as technical problems, ineffective communication from management, workload, inadequate training, lack of access to ICT tools and lack of other structural support within the college which impacts their effective implementation of virtual teaching. Thus, teachers should be adequately prepared, supported and empowered to cope with the changes and transition processes involved to continue teaching in a virtual environment. More so, TVET college managers and policy makers should priorities change management programmes designed to prepare teachers for the inevitability of technological change in education.

Chapter 17: *Understanding the Concept of Energy in High School: The Use of a Robotic System and Video Analysis as Teaching Resources*; by Galeno José de Sena, Leonardo Mesquita, Marco Aurélio Alvarenga Monteiro, Janio Itiro Akamatsu, & Maria Teresa Jacob. This article presents a work carried out to improve students' understanding of the concept of energy using a robotic platform and video analysis software. The electronic system made it possible to monitor a movement with characteristics similar to those of a simple harmonic motion, through a looping device, allowing the demonstration of the law of conservation of energy. The monitoring of the experimental configuration was carried out using the Arduino® platform. Demonstrations involving the use of the apparatus as well as the video analysis software were made for Physics students from a high school. The results showed that the automation of a simple experiment can become an interesting tool for both the teaching and learning process, triggering social interactions among students useful to assist in the fixation of physical concepts, even the most abstract ones such as Energy. In addition, the use of video analysis software provides students with experiences of collecting data, analyzing graphs and tables, which supplements the understanding of the nature of science and scientific practice.

Chapter 18: *Working with Digital Escape Rooms: Adding Value to the Teaching of Literature*; by Madalina Armie, José Francisco Fernández, & Verónica Membrive. The escape room, also known as an escape game, is a gamification tool that aims to enhance motivation and teamwork (Wood & Reiners, 2012). In the educational field, in particular, the escape room can be defined as an action game in real time in which the players, in teams, solve a series of puzzles or problems and carry out tasks related to the curricular contents studied throughout the course, in one or more rooms, with a specific objective and at a specific time (Nicholson, 2015). The use of escape rooms for teaching-learning the English language at different educational levels has been studied qualitatively and quantitatively (Dorado Escribano, 2019; López Secanell & Ortega Torres, 2020). However, there is no study on the applicability of the escape room in the English literature classroom at the level of tertiary education. This paper aims to demonstrate how the inclusion of this innovative pedagogical tool can be useful for working on theoretical-practical contents of literary studies of the undergraduate degree in English Studies. The study will focus on exercises to implement as part of the educational digital escape room using a sample of students and evaluating their motivation.

Chapter 19: *A Qualitative Case Study on the Self-Reliance Education Process of the Divorced Migrant Women in South Korea*; by Sooan Choi, & Youngsoon Kim. The purpose of this study is to explore the point where divorced migrant women who have been given the goal of self-reliance for their new lives are reconstituted as 'Adventurers' and identify the limitations. For this objective, a case study was conducted using the life histories of 5 divorced migrant women residing in the self-reliance support facility (named Didimteo), selected among the life history interviews of 80 migrant women. We performed open coding for data analysis, repeatedly reading the participants' interview data. As a result, qualitative classification revealed three distinct meanings for the self-reliance education process: Recovery of affirmative, Rediscovery of 'becoming,' Empowerment for the

future. If the self-reliance education experience is defined in terms of the results of this study, it may be described as a ‘process of becoming an adventurer for economic self-reliance’. However, the psycho-emotional comfort and support that migrant women experience through self-reliance education at Didimteo confirmed the possibility that Didimteo could move forward as a self-reliance education community and social network for divorced migrant women.

Chapter 20: *Training Programs based on Reflective Strategies in the Context of MDVI*; by Andrea Hathazi, & Ioana-Letitia Serban. MDVI children acquire and develop communication skills based on their specific features and usually they need a large amount of time to learn how to employ different systems of communication to express a need and have an impact on other people or on the environment. In this context, a Consortium of 3 universities, 4 special schools, one NGO and one IT company have addressed the need of a professional training in communication abilities of the specialists working with MDVI children in an Erasmus+ European project called PrECIVIM. A training program has been created, based on common experiences, reflective strategies, and different components. The results of the training program are presented in terms of the data regarding the number of responses registered in the reflective logs (RL), the analysis of the professionals ‘reflections on their interventions, the number of professionals who at the end of the training program began to use the RL to record data about MDVI children’s communication skills and to acknowledge teamwork with specific feedback from the intervention sessions. The training program has emphasized the need of trainers and partners who offer constructive feedback and who implement reflective strategies in the intervention process regarding communication with MDVI children.

Chapter 21: *Impact of Identity-Oriented Literature Education on Adolescents’ Learning Practices and Learning Outcome*; by Peter Grandits. A mixed-methods quasi-experimental study evaluated the effects of a pedagogical intervention in literature education on Austrian upper secondary high school students’ insight into the self and the other. The intervention is based on the newly developed NDR-model, the letters in the abbreviation representing the basic practices of narration, dialogue and response underlying the model. Two cycles of NDR interventions on the identity issues of “happiness” and “relations” were implemented. An IPA study was conducted to explore how the implementation of the NDR-model of literature education affected participants’ learning practices (narration, dialogue, response) and learning outcomes (self-understanding and understanding of the other). Qualitative analysis of interview and artefact data suggested that NDR students’ learning practices were promoted. Additionally, they experienced insight into the self and the other because they were stimulated to engage with literary texts in the context of their personal identities.

Section 4, entitled “Organizational Issues”, gives a glance on tools for implementing organizational learning and change in the education context.

Chapter 22: *PJI Principles: Taking Steps to have Conversations on Equity in our Classrooms and Daily Lives*; by Jennifer Sanguiliano Lonski, Laurinda Louise Lott, & Hank Van Putten. Today’s educators, from kindergarten through higher education, are uniquely positioned to provide their students with real life opportunities that demonstrate and promote equity, change, and social justice ideals amongst their peers, throughout the schoolhouse and into their communities. These opportunities for students, supported by the norms and culture of the classroom, often come in the form of daily interactions with curricula, which affords teachers the window to teach how to disrupt inequity among students and in their lives. For teachers and school leaders to open this window, each must also have the courage to investigate and learn from the mirrors of the experiences of others reflected to them. The work of the Peace and Justice Institute at Valencia College provides educators with the courage to investigate those personal mirrors for the benefit of their students. Their courage is found in the sharing of stories about themselves and by turning off their automatic responses to the stories of others. The following chapter considers how The Principles, the philosophical foundation of PJI, translate into an equitable classroom practice. This qualitative case study of 24 teachers explores the impact of the PJI Teachers Academy in the k-12 classrooms of these teachers.

Chapter 23: *Education and Leadership as Drivers for Economic Growth - The case of Portugal*; by Natália Teixeira, Ana Lúcia Luís, & Paula Lopes. The competitiveness of nations requires several factors that must occur for it to attain sustained levels of economic development. Some of the most important vectors that constitute differentiators of nations competing globally are the qualification of its population, as well as the degree of sophistication, capacity for decision-making and strategic vision of its leaders and elites. A greater competitive ability of a nation translates into a higher capacity for wealth creation and a better performance on key items of social and human development. Often, small niches of excellence and strong leadership in key sectors are crucial, notably for the example that these examples of excellence signify to others, thus producing a dragging effect whereby other sectors and individuals are pulled in by inspiring role models and their examples. This chapter examines the performance of Portugal from different indexes, providing different perspectives, all related to levels of education and retention of qualified individuals, aiming to assess and evaluate the deep constraints that the country faces at a critical moment. Recommendations are centered around the key idea of a strong emphasis on the acquisition of knowledge as a catalyst for economic development.

Chapter 24: *The Perception of Employees in the Construction of University Brand: Spanish Context Case Study*; by Javier Casanoves-Boix, Ana Cruz-García, & Inés Küster-Boluda. This research was carried out to examine the role of brand capital in higher education. For this purpose, the main contributions of the literature to the study of brand capital and its application to the education sector were analyzed. Then, the variables determining brand capital in the higher education sector were identified and a comparison between the main employees was made. Once the

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educational brand capital construct was established, an empirical study was carried out using a valid sample of 1,106 responses (690 from lecturers and 416 from service staff, belonging to eight public and private universities in Valencia (Spain). SPSS v.19 for Windows and EQS 6.2 were used as statistical work tools. The present investigation fills a gap in the marketing discipline because it is considered that there are no current investigations that analyze the perception of the brand capital through the opinions of the main employees involved in Spanish universities. The results obtained show the effects of each variable of brand capital in relation to the determining variables and, especially, to brand awareness, thus, helping the university managers to decipher the key aspects for their employees and thereby generate strategies to maintain them or improve them.

Chapter 25: *Women in Engineering: Actions for Improving their Integration in the Faculty of Engineering in Bilbao*; by Francisco Javier Maseda Rego, Itziar Martija López, Patxi Alkorta Egiguren, Izaskun Garrido Hernández, & Aitor J. Garrido Hernández. The situation of women in the engineering world has different aspects that should be carefully analysed. Last century, the woman who first broke this taboo in Spain was the mayor of Bilbao, the first female industrial engineer graduated in Spain in 1929, Pilar Careaga. By means of her public presence, her message could reach general society, but only as something exceptional. At the Faculty of Engineering in Bilbao, the first female Industrial Engineer was Pilar Ipiña, who graduated in 1965. Thirty six years later. After nearly a century, women in engineering remain a clear minority. Proposing solutions requires knowing the causes, in order to be able to carry out actions that lead to harnessing women's talent and enable them to realise their full potential. This paper presents a multi-staged process for the integration of women in engineering degrees. The first stage analyses different issues about the faculty structure and regulations. The second stage relates educational objectives and the gender perspective. The third stage marks the importance of educational materials. The fourth stage summarizes educational methodologies and activities. The fifth stage proposes a change of assessment model. Finally, the sixth stage comments on the importance of control and visualization of results.

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