Stepping into Design-Based Education

Edited by R.J. Coelen, G. Geitz, A. Donker and H. Assen

NHL STENDEN

university of
applied sciences

Stepping into Design-Based Education (DBE)

This book provides insight into an ambitious project to re-invent the educational method practiced at our institution. The predecessors used different approaches to the delivery of education. One of them used competency-based education, whilst the other practiced Problem-Based Learning. The choice to combine the advantages of both methods, as well as to develop an entirely new method that provided a better response to the fast and ever-increasing pace of changes in the workplace, was made by the Executive Boards. This approach was called Design-Based Education (DBE).

Given the significant changes required of stakeholders in the delivery of education according to the new DBE approach, it is important to take stock of what these changes mean in terms of teaching and learning and to ascertain from early steps how everybody can stay, or step, on board. The ultimate litmus test for this new method is of course how our graduates perform.

This book, a proposed first volume in a series of three, therefore provides an important view of the challenges experienced by our lecturers and other stakeholders with this new educational method. It is recommended reading for all those interested in new methods of education and those adapting their curricula to this new approach.

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Word frequency analysis of this book listing the most frequently used terms in a word cloud. Showing that this book is concerned with the **learning** process involving the **DBE** concept, and all about **students** and their **educators. Development** and **design** are frequently used terms aligning well with the phase of development and implementation of the **DBE** concept (Generated with Nvivo™ version 12).

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About the Editors

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Robert has been the editor of several books including Internationalisation and Employability (Routledge) and Valorisation of Internationalisation (Stenden UAS – Open Access). He is a reviewer for 7 international journals on education, including Journal of Studies in International Education, Higher Education, and the International Journal of Sustainability in Higher Education. He is Associate Editor for the Journal of International Students. Presently, he is co-supervising 14 PhD candidates at the University of Groningen in the field of internationalisation of education. He was a natural sciences scholar for the first two decades in his academic career.

Dr. Gerry Geitz is member of the Executive Board of Noorderpoort (vocational education), the Netherlands. She worked as a professor of Sustainable Educational Concepts of Higher Education (2016 – 2020) at NHL Stenden University of Applied Sciences, the Netherlands. She is a board member of The Netherlands Educational Research Association, division Learning and Instruction. Her research focuses on sustainable learning environments, approaches to learning, assessment, and sustainable feedback in the context of vocational education.

She has been working in education since 1987. After completing the teacher training, she started as a teacher Business Economics, first in secondary education, then in higher education. Her career in education has subsequently developed along two tracks: on the one hand managing educational courses, on the other hand doing research into education. Her motives to both steer and influence and to research at the same time are expressed in her positions as professor and director at NHL Stenden, and nowadays as a member of the executive board.

Dr. Anouk Donker is Coordinating Researcher in the Professorship Design-Based Education and Consultant at NHL Stenden University of Applied Sciences, the Netherlands. After obtaining her Masters' degree in Educational Sciences, she started working in higher education as a (junior) consultant. She was involved in (re)designing curricula, assessment practices, and quality care. After a few years she returned to the University of Groningen where she obtained her Ph.D. in Educational Sciences. Her research focused on metacognition and self-regulated learning. She has published several articles and given presentations about these topics in both national and international conferences. After finishing her Ph.D., she continued working at the University of Groningen. As a teacher, she taught and supervised students in both the Bachelor's and Master's in Educational Sciences and in the Academic Teacher Training Program. In her research, she focused on self-regulated learning and reading comprehension.

In her current job, she holds two positions. On the one hand, she is working as a consultant, focusing on the policy and practice of research in higher education. On the other hand, she is working as a researcher herself as a member of the professorship

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Dr Hanneke Assen is senior research lecturer NHL Stenden University of Applied Sciences, Leeuwarden, The Netherlands. She is employed at Stenden Hotel Management School (SHMS) since 1993 and has held various positions. Among other things, she was a member of the curriculum design team Design-Based Education (DBE), and, at this moment, she is project leader of the project, '*moving to Design-Based Education*' an accompanying research at Hotel Management School. In addition, she is member of NRO consortium 'Professional learning and development of higher education lecturers: what works, how and why does it work?'

She holds a Ph.D. in educational sciences (Tilburg University). Her Ph.D. and postgraduate research focus on educational concepts based on self-directed, contextual, constructive, and collaborative learning principles. The postgraduate research project with the title *Activators for Change: moving to DBE*, is an extension of her Ph.D. research. She has published articles on lecturers' perceptions about teaching and learning and teaching behaviour, innovative educational concepts, lecturers' collective learning processes, lecturer professional identity/development and dialogical self-theory.

About the Authors

Adalgard Willemsma is senior educational consultant at NHL Stenden University of Applied Sciences in Leeuwarden, the Netherlands. As such she advices both lecturers and managers. She also functions as a trainer, researcher and occasionally as auditor. In the field of Problem Based Learning she trained many novice tutors and observed them in practicing this job. From 2017 until 2019 she was a member of the research group and knowledge network of Sustainable Educational Concepts in Higher Education led by Dr. G. Geitz. Adalgard holds a master's degree in Educational Science at Twente University, Enschede, The Netherlands. She also studied at Aberystwyth University, Wales, UK at the Postgraduate course Librarianship and Information Technology simultaneously working at the European Mercator project on minority languages and media.

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Bart van Mulkom is policy officer recovery support at Verslavingszorg Noord Nederland, theatre maker and musician.

Deike Schulz grew up on the world's most beautiful sandbank called Juist. After graduating in Media Arts at the Minerva Art Academy in Groningen she started her own Internet agency and worked in ICT and online-publishing. In 2002 she made a career change into higher education and finished her Master in Strategy and Innovation at the University of Groningen, addressing online communities on YouTube. This master research encouraged her to carry out a PhD project, at Nijmegen School of Management, about the influence of communication within non-corporate online communities on the construction of organisational legitimacy. Currently, Dr Schulz leads the Professorship Organisations and Social Media at NHL-Stenden. Together with colleagues, students, and external stakeholders, she researches how online communication, in particular online -content, -dialogue, and -commitment, develops and becomes meaningful for organisations and their stakeholders. She has recently published in the International Journal of Communication, The International Journal of Management Education, and the Springer Encyclopedia of Sustainable Management.

Dirk Reedijk is Senior Lecturer at the Academy Social Studies, NHL Stenden University of Applied Sciences in Leeuwarden, the Netherlands. For over 20 years he is an experienced lecturer Social Work and combines this task with developing educational programmes and experiments with more holistic ways of testing and assessing. He was trained as a Social Worker and completed his master's degree in Philosophy at the University of Groningen, the Netherlands. He has always been interested in developments in society, its influence on people and profession and especially the relationship between complex society and social work. At the start of his career, he was active as a youth worker (specialised in dropouts) for more than 10 years. These youngsters were supported by means of a career-management programme. The main aim was to work toward a suitable school-and job perspective for their future. Always with the intention to empower people. At former Stenden University he worked as tutor and coach and is very knowledgeable about Problem Based Learning. At present he is chairman of the education committee of Social Work.

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Frank Scholten started working for the Innovation Lab of NHL Stenden as a student assistant during his studies to become a teacher of English and continued working for the Innovation Lab after he graduated. For the past 10 years Frank has been focussing on supporting student teachers in developing their ICT skills, and on teaching concepts such as Flipping the Classroom, distance education, e-mentoring, and Universal Design for Learning. He is also part of the development team of the MySchoolsNetwork platform as a moderator and content manager.

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Hans Otting has been working in higher education as a curriculum designer, educational expert, researcher, and manager. He was the dean of education at the Hotel Management School and the Faculty of Economics and Management. He has published various articles on problem-based learning; conceptions of research, knowledge, and learning; epistemological beliefs; lecturers' professional development.

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Jan Waalkens is currently working as a senior lecturer – researcher for NHL Stenden University of Applied Sciences and is involved in research about learning. In particular, in relation to Design-Based Education of which he was an early adopter. He participates in international conferences. His PhD is on networks and innovation capability of Architectural and Engineering Agencies. Innovation and learning are in intrinsically linked and fascinating exciting themes. They are the core business of a university.

Joana Duarte is Professor of Multilingualism and Literacy. Her research focuses on diversity and equity, language acquisition of multilingual learners, language attitudes of teachers and families, multilingualism didactics and teacher professionalisation for multilingualism in education. She studied Modern Languages (English and Portuguese) and Linguistics at the University of Lisbon and obtained her Ph.D. in Pedagogical Sciences at the University of Hamburg. Currently, she works as a university lecturer at the University of Groningen and as an Endowed Professor of World Citizenship and Bilingual Education at the University of Amsterdam.

Josh Grimme is an expert by experience employed by Verslavingszorg Noord Nederland. He is a member of the client council, actor, and storyteller.

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together with students and researchers. Within the professorship computer vision and data science he leads the integration of design-based education (DBE) and participates in several DBE developments within the academy and the university. In 2013 he received an M.Sc. by Research from the Limerick Institute of Technology in Ireland, and he received his PhD in Artificial Intelligence from the University of Groningen in 2020.

Latifa Benhadda has been working as a senior lecturer of Intercultural Management and Global Citizenship for seventeen years at NHL Stenden UAS University of Applied Sciences. She was also in close contact with the NHL Stenden UAS campus-sites since she co-created the curriculum about Intercultural Management with colleagues from the sites and has been the exclusive coach of all international branch campus students who decided to join the main campus for their third year. This experience enabled her to recognise the ins and outs of the different cultural environments of the campus-sites and the impact on education. Besides, her educational background in managing across cultures and dealing with diversity has given her a strong base to write about the interplay between education and culture.

Letty Nijhuis is a lecturer and researcher within the departments of International Business and International Tourism Management at NHL Stenden University of Applied Science. She completed her MA at the University of Groningen and her PhD at University College Cork, Ireland. With a background in historical linguistics and having lived in areas with 'smaller' languages (Ireland and Friesland), her current research interest is in the position of minoritised languages in international business.

Margreet van der Meer is Research Manager at Verslavingszorg Noord Nederland until May 2020 and does Ph.D. research on transgenerational addiction problems. She now works as Manager Development and Advice at Tactus Verslavingszorg in Zwolle.

Margreeth Themmen is Education Consultant at the Education and Research Quality Department at NHL Stenden. She is an advisor to the Communication and Creative Business academy and her expertise lies in the field of online education and digital didactics. Margreeth has worked in higher education for 22 years and has gained broad experience in various roles such as lecturer, advisor and in student success counselling. She is particularly interested in educational innovation and is therefore involved in various educational innovation projects in the university.

Marije Boonstra has a background in psychology, media, and cultural studies. She worked as a coach and musician before she started as a Research and Innovation lecturer at the bachelor Communication and Multimedia Design in 2016. She was involved in quality assurance and therefore she wrote a programme Self Evaluation Report (SER) for the accreditation in 2018. Presently, she holds a position as an Open Innovation researcher at the Open Innovation Research Group at NHL Stenden UAS.

Marijke de Jager has been working at NHL Stenden since 2007. She has worked there as team leader and Academic Dean for various higher education programmes where new curricula were developed and implemented, and she was responsible for the results of the quality of the programme. She was also a member of the Research Group Sustainable Concepts in Design Based Education. Currently, she is project leader of a new innovative teacher training programme with a broad intake for teachers for primary, secondary, and higher education.

Mariska van der Giessen finished her dissertation in 2013. She became Professor of International Business at Fontys Hogescholen in Venlo. In 2017, she switched to NHL Stenden Leeuwarden and Emmen to take up her current position as Professor of International Entrepreneurship. Her chair has eight researchers who deal with topics such as entrepreneurship in general, export/import-related topics, internationally oriented 21st-century skills, and the development of future-proof international employees to support regional economic growth. In most projects, we work in close cooperation with students, (regional, national, and international) stakeholders and lecturers, making use of DBE and DBR methods.

Merlijn Torensma studied journalism and communication, literature, and art culture and media. He worked for newspapers, magazines, and television before he started teaching at the bachelor Communication and Multimedia Design. He continues working as a freelance journalist and photographer. Merlijn does his PhD on art's effect on creativity in higher education and is connected to the research group Art and Cognition (RuG) and the knowledge group RandD Education and Research (NHL Stenden).

Migchiel van Diggelen, is Professor of Design Based Education at NHL Stenden University of Applied Sciences. He combines this role with being a teacher and researcher at the Open University of the Netherlands. He is a board member of the Netherlands Educational Research Association, division Higher Education and a member of the scientific committee of the European Centre of Evidence Based Mentoring. His research focuses on designing, guiding, and assessing student learning in design-based education and further innovation these kind of learning environments. His work focuses on the intersection of theory and practice and is inspired by his extensive experience as a teacher, teacher trainer and educational (policy) developer.

Mirjam Günther-van der Meij is Associate Professor at the Professorship Multilingualism and Literacy. Her research focuses on multilingualism, multilingual education, language development and literacy with specific attention to neighbourhood and regional language education. She studied English and Education (TESOL) at the University of Wolverhampton and Applied Linguistics at the Free University Amsterdam and obtained her Ph.D. in Applied Linguistics from the University of Groningen.

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Peter Joore is professor (Dutch: lector) in the field of Open Innovation. He studies design processes in which different stakeholders, crossing the boundaries of sectors, cooperate in solving complex societal issues in a living lab environment. He was trained as an industrial designer at Delft University of Technology, where he also obtained his doctorate. After his studies, he worked as a product designer at various companies before joining the Dutch Organisation for Applied Scientific Research TNO. In 2008, he made the switch to higher education, now working at NHL Stenden University in Leeuwarden.

Renate Bakker-Schraa is team leader and senior educational consultants of the in-house consultancy group for education and research quality at NHL Stenden, University of

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Riemke van der Meer has a fascination for the new educational concept DBE. She now works as an advisor at the Education and Research Quality department of NHL Stenden University of Applied Sciences. She has a particular passion for how one can continuously improve education and what this means for the people in an educational organisation and their students. She hopes this work can be a sustainable commitment.

Rob van Ree only recently withdrew from his position as head of Ocean Technology, or Hydrography as the in-crowd rather prefers. It ended a 26-year period of passing on my knowledge and creating opportunities for students and employers in this applied science of a special kind. While the knowledge base and its margins are defined and maintained internationally, creating a lively four-year program for the students was the ever-returning challenge.

Roelien Wierda graduated in English language and literature and in Educational Sciences. She taught English in higher secondary school for 15 years after which she started lecturing linguistics and educational sciences at NHL University of Applied Sciences in the Netherlands. As a specialist in Internationalization, Curriculum Design, blended and hybrid learning she is and has been involved in several national and international projects with a focus on technology-enhanced learning and Design Thinking. Roelien currently coordinates the NHL Innovation Lab – together with her colleague Ron Barendsen - which is a unit focusing on the implementation of and research into internationalization and innovative e-pedagogies such as virtual mobility, distance, and hybrid learning, flipped classroom and media literacy.

Ron Barendsen graduated in Social Sciences and in Educational Sciences. He taught Geography in several lower secondary schools and was the owner of a software company, developing educational games and simulations for public and educational institutions. For the past 20 years Ron has lectured Educational Sciences and e-pedagogy at NHL Stenden University of Applied Sciences in the Netherlands. As a specialist in Curriculum Design, e-pedagogy and Hybrid Learning Ron is and has been involved in several national and international projects with a focus on technology-enhanced learning, Game-based Learning and Design Thinking,

Ron currently coordinates the NHL Stenden Innovation Lab – together with his colleague Roelien Wierda - which is a unit focusing on the implementation of and research into internationalization and innovative e-pedagogies and applications such as virtual mobility, distance, and hybrid learning, flipped classroom and media literacy.

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Foreword

When I look back upon my educational life journey, how it shaped and prepared me, together with a gradually growing body of experiential learning, I can only conclude that the concept of life-long-learning for me is not theory but practice. Learning doesn't stop after finishing formal education, of course, as it is so important to maintain relevance in a changing and dynamic workplace and society. I grew up in a period where the nature of education, along with the world of work were reasonably stable entities, mostly predictable for longer periods of time. Young people today do not have this same stability. The latest phase of industrial development has been named the Fourth Industrial Revolution, which unlike heretofore is characterised by an exponential acceleration of innovation, knowledge of mankind, and the consequent impacts on our lives, the way we work, what we do, and how we are governed.

Education must stay ahead of the needs of our society, and it must prepare our young people to become effective global citizens and world-wise professionals, who are able to contribute to a continuous and sustainable development of our planet. It follows that if societal needs change that we must look at our education and examine whether this fulfils our requirements. Some time ago, an excellent opportunity arose due to the merger of two higher education institutes, to hold up their educational concepts against the light of societal changes. This work led to the creation of a novel educational concept, which we called Design-Based Education. It created a concept from which new curricula are to be developed for all disciplines at our institution. Such a journey deserves and indeed needs to be chronicled. Not just as an exercise to record the history of this development, but also as a guide for those embarking with us on this voyage. As this volume shows, it is a voyage of discovery, one in which travellers must engage with, and overcome, new challenges. As the concept of DBE becomes interpreted and contextualised by our staff for the plethora of disciplines we cover in our institution, we develop novel ways for our students to become prepared for this dynamic world of work and our rapidly changing society.

I trust you will find this book a useful and interesting resource as you embark on your educational journey whether it is in the context of Design-Based Education or as a source of ideas to help you further on your road to help young people make sense of, and contribute to, their future.

1 September 2021

Oscar Couwenberg

Member of the Executive Board
NHL Stenden University of Applied Sciences

Section 1.
Introduction and general considerations

Introduction

Robert Coelen, Gerry Geitz,

Anouk Donker, and Hanneke Assen

This book provides insight into an ambitious project to re-invent the educational method practiced at a new, just merged, institution. The predecessors used different approaches to the delivery of education. One predecessor used competency-based education, whilst the other practiced Problem-Based Learning for about 25 years. There were other aspects of institutional culture that were significantly different, and the merger presented at once a dilemma about the educational method of the merged institution (which one to use?) as well as an opportunity to avoid legacy issues (our method versus their method). The choice to combine the advantages of both methods, as well as to develop an entirely new method that provided a better response to the fast and ever-increasing pace of changes in the workplace, was made by the Executive Boards of both institutions. The universities decided to create a new approach based on a concept that was called Design-Based Education (DBE).

This book examines the implementation of an innovative educational concept, termed Design-Based Education in a newly merged higher education institution in the Netherlands. It focuses on the first experiences of lecturers during the journey of development and implementation of this innovative sustainable educational concept in the context of preparing their graduates for the workplace in the Fourth Industrial Revolution.

Through case studies in a variety of disciplines this book has some key messages, including:

- the concept of Design-Based Education has created implementations that address issues relevant for graduates, including:
    - metacognitive skills.
    - superior multidisciplinary collaboration.
    - enhanced self-regulation.
- Depending on the discipline involved lecturers may struggle with the implementation. The book also describes ways how these challenges have been overcome.
- How the implementation of a novel sustainable education concept like DBE, when set in different cultural contexts, can lead to some surprising insights.
- Designing education in a trialogical process with students, staff, and the work field leads to learning for all stakeholders.
- The ability to leverage diversity from a variety of sources in collaborating teams has become an essential part of the preparation of future graduates, as well as lecturers who collaborate towards a successful implementation of DBE.
- A change towards a much more learner-oriented method of education requires further professional identity development for the academics involved.
- Design-Based research is a useful component of the DBE concept.
- DBE requires not just curricular, but also systemic changes. A multilevel design approach offers a structured way to examine the impact of the required changes throughout the organisation.

The first section of the book considers some general aspects of DBE informed learning and teaching and a consideration of potentially how a DBE informed curriculum might prepare our graduates for their future workplace.

In the first chapter of this book, Geitz, Donker, and Assen set out to explain the essence of the Design-Based Education approach elaborated as a sustainable form of education. They describe the nature of the iterative approach and the importance of the acquisition of metacognitive skills by students. Their education should be such that they become self-regulated lifelong sustained learners for continued personal and professional development.

Coelen in chapter 2 contextualises the DBE approach in a global workplace in the grip of the Fourth Industrial Revolution (4IR) and considers the various aspects of the DBE approach in terms of deliverables for workplace readiness.

The second section of the book, entitled 'A new curriculum informed by DBE and DBR' is all about designing new curricula based on DBE

Assen and Otting in Chapter 3, demonstrate that the lecturers too need to practice what they have been asked to preach, i.e., to be sustainable lifelong learners. Implementing a DBE-informed curriculum is no sinecure and needs time and space to collectively reflect on concepts and create inquisitive dialogues about DBE to ensure a well-argued properly contextualised implementation fitting the discipline.

The chapter by Van der Giessen et al. describes the process of creating an elective course based on the DBE approach, whilst also applying the principles of Design-Based Research (DBR) during this early stage of curriculum development. The authors show how elements of DBR and DBE, such as early involvement of stakeholders and a multi-disciplinary approach, can help when developing a course and fostering a new cooperation between various research groups.

The fifth chapter by Van Ree is about a bachelor's programme on Ocean Technology, which is based on the Dutch island of Terschelling. Early 2018 the management team was challenged in a three-day session named KAOS (www.kaospilot.dk) to see how DBE could be applied – the core notion being that designing is a profound way to learn. As measurement is a central theme in hydrographic applications, design planning comes quite naturally. The process of brushing up the course programme applying common sense principles like those provided by DBE is in full flight.

Chapter 7 by Benhadda and Loosekoot discusses the opportunities and challenges of implementing the DBE concept at international campuses of NHL Stenden University of Applied Sciences. Using primary data gathered from a focus group of staff teaching at Stenden Hotel Management School's international campuses in Bali, Thailand, Qatar, and South Africa. It identifies four key themes to arise from the research - definitions and understandings of DBE, culture and DBE, the opportunities and challenges posed by DBE at international campuses and recommendations. The campuses span many of the cultural dimensions originally found by Hofstede in his study of international cultures at end of the last century. After discussing cultural variations in teaching and learning in diverse cultural contexts and the development of a PBL approach into a one using DBE, it presents the sometimes-surprising results of the focus group and concludes with some helpful reflections and recommendations.

The effective development and implementation of DBE not only requires changing the way lectures are conducted. It may also require changing the way that physical learning spaces are organised, changes at the level of the overarching curriculum, changes at the organisational school level or even changes at the national policy level as posed by Joore et al in their chapter. Therefore, the introduction of DBE may be regarded as a complex system transformation, where changes take place at various levels of the educational system, mutually influencing each other. To understand this type of transformation, the development of the MyschoolsNetwork Social Learning Platform was analysed using the Multilevel Design Model, following its 12-year development from a small local initiative into an international educational platform connecting thousands of students in over 200 schools in 34 countries. Based on the analysis, an adapted Multilevel Design Model for Education is presented, which is particularly suited for understanding the complex changes required to successfully implement DBE.

Section 3 focuses on the lecturer in a DBE informed curriculum. It begins with a chapter by Boonstra and Torensma. This chapter looks at how DBE challenges lecturers to mediate between the internal (university) and external (society) resources of social capital and to be able to accept unpredictable challenges of a rapidly changing society as a significant part of the curriculum. They introduce three mediating lecturer's roles when using the DBE method: the content, the personal, and the societal mediator. This is based on Illeris' model of learning dimensions and social capital theory. To understand these roles in practice, the Bachelor Communication and Multimedia Design and Honours programmes (X-Honours), both already experienced with design-based lecturer roles, were used as exemplary cases.

Van der Meer in Chapter 10 writes about the significance of the transition to Design-Based Education (DBE) for lecturers charged with development and implementation. That significance is highlighted in what eight lecturers tell passionately about it in the interviews conducted in this narrative research. These statements are of terrific value because they offer a glimpse into the undercurrent of the organisation in transition and thus form the narrative truth, including the emotions, the sensemaking that instructors give to the process of DBE. The change to a curriculum underpinned by DBE requires lecturers to move in the domains of competencies and behaviour, but also causes shifts in the spheres of feelings, culture, and identity. The interplay of stories of the lecturers who are involved, which we could call "Tamara" after Boje, are a snapshot, an illustration of the NHL Stenden organisation in this phase of educational innovation. To do justice to their complexity, Van der Meer decided not to interpret and analyse them, but to arrange them according to the structure of Joseph Campbell's Monomyth, to form a metaphor. This can be used as a starting point for professionalisation, so that the support can be consciously directed towards development and improvement, necessary for a learning organisation as a model for the vision of DBE education: continually working together on improvement and learning.

The chapter by Günther et al. illustrates the ways in which Design-Based Research stimulates recent developments within the field of multilingualism and (primary and secondary) education. The chapter illustrates how DBR fits seamlessly into Design-Based Education (DBE) by incorporating students in conducting research that is based on authentic questions from the field. It presents three research projects within the NHL Stenden University of Applied Sciences that aim at developing, implementing, and evaluating design-based interventions for holistic multilingual education The primary and secondary schools that took part in the projects each benefitted in their own unique way from the projects, which shows that, following the DBR-approach, the developments were adjusted to the specific needs of each school. Moreover, in-service teachers

received help from the cooperation with pre-service teachers, who have a different point of view, and vice versa. This emphasises the fruitful collaborative nature of the projects, which stems from the DBR-approach.

In Section 4 the book explores the meaning of the dialogue and development of a DBE informed educational approach. Reedijk et al. kick off the discussion by considering not just the lecturers and the field, but also the effects on the students. It shows the importance of close cooperation, dedicated and clustered time with lecturers and professionals in the field as designers and developers, supported by educational consultants and management. All parties were learning on the job using dialogues and prototyping. Not only the design process but also the new role of the lecturer in this curriculum and its demands as well as the effects on students are described in first classroom experiences. As a result, a solid educational basis was created for young people to develop themselves to become responsible and capable professionals in a fast-changing society, dealing with complex or even wicked problems.

Rietveld and Waalkens discussed the role of higher education in the preparation of young professionals for an uncertain future in which change is the invariable factor in Chapter 13. The concept of design-based education (DBE) aims at skilling students for this future by enhancing their research and design competencies. Reflecting on our experience gained during two years of facilitating students' learning processes using this DBE paradigm, we as educators have uncovered heretofore unrecognised issues that require further attention. An action research project in DBE shows that enhancing self-regulation and cooperation amongst students is necessary for the growth of a professional mind-set and willingness to explore and contribute to real life organisational issues. In this chapter we share these lessons we have learned over time to facilitate students' learning.

Testing to learn became the motto of the testing policy of the Creative Business programme at NHL Stenden in 2019 write De Jager and Themmen (Chapter 14). The programme wants to stimulate deep learning in its students by using self-direction and gaining more insight into their own learning. Since the introduction of DBE, the lessons and assignments at Creative Business have become more practice-oriented, challenging, and activating. How do you ensure that the testing fits in with this, and is therefore also challenging and activating, and at the same time leads to insight into the learning process of the student and helps to develop self-regulation? Ultimately this chapter reveals how students have experienced the positive influence of this new way of assessment on organising their learning behaviour, the meaningful and deep learning, understanding and application of knowledge, and their own personal growth and development.

In Dijkstra' chapter the question of what is the best project management method for a dynamic context in which applied research, technology and education come together is being considered? It is difficult to find a single method that is usable in all situations. There seem to be two main approaches: iterative and linear. The main question that is asked in this chapter is: how can several of these methods be integrated in a meaningful way for this dynamic context? Where do the methods overlap and how are they different? He proposes an integrated approach to DBE in which proven iterative concepts like Agile and Design Thinking are integrated with traditional linear concepts like the waterfall model and scientific writing. This leads to an operational form of design-based education in which, during a research project, the focus of Scrum sprints is gradually shifted from one design thinking phase to the next (while keeping the iterative nature of design thinking). Several prototypes, created by students and experienced researchers from a variety of disciplines lead to a final product. The first results are positive, and DBE seems

to work well for applied research projects in the high-tech field of computer vision and data science.

Anthonio et al. look at a qualitative research method called Photo Voice as a means of researching and reflecting on an existing situation in an organisation. In this way it fits within the methodology of DBE and DBR. Photo Voice supports learning moments of professionals and managers and contributes to research in many disciplines. It provides information about new designs or reflects on designs that have been made and may need improvement. Stakeholders, collect visual material by means of photography. A selection of photographs is made to promote dialogue with the researchers who want to improve things and work on a new design or to create points of discussion during evaluative moments. The advantage of this method is that it creates a space for open and free association, also for those who have less language skills. An example in this chapter portrays clients in addiction care who return images and words to the organisation in their own authentic way. These images stimulate reflection, improvement, and further research. These experiences and considerations have given Photo Voice a permanent place in our research group and strengthens the DBE and DBR approach.

In the last section Van Diggelen reflects on the book and writes that "Stepping into DBE" provides rich and varied descriptions of the first experiences of an institution and relevant stakeholders with this new educational concept. His chapter offers a synopsis and formulates a red thread implicitly present in the different chapters. All chapters demonstrate the importance of constructive dialogues. Different sorts of dialogues can be found, though. First, dialogues to collectively develop a curriculum. Second, dialogues focusing on meaning-making to the role of the teacher in DBE. Third, the meaning of the dialogue for students while being engaged in DBE. In this chapter he zooms in on these different dialogues, formulate lessons learned and derive further implications for the ongoing implementation of DBE. Finally, he uses the synopsis to introduce the first outlines of a DBE pedagogy: The Atelier-model.

In the final chapter the editors present their conclusions about the early experiences with DBE by staff, students, and other stakeholders with a DBE informed curriculum.

Chapter 1

Stepping into Design-Based Education, Sustainable Teaching, and Learning

Gerry Geitz, Anouk Donker, and Hanneke Assen

The current rapidly changing world asks for higher order learners who can think independently, creatively, who easily adapt to changes, are flexible and have analytical and conceptual skills (OECD, 2014; Virtanen and Tynjälä, 2018). In addition, the current society asks for professionals who "create complex products in collaboration with others" (Windschitl, 2002, p. 135). Higher education aims to prepare students to successfully enter the dynamic labour market, in which new professions arise and other professions disappear. It is no longer realistic to expect that knowledge gained in initial education will last for a lifetime (Kirschner, 2017). Further education will necessarily occur multiple times throughout life, emphasizing the importance of acquiring metacognitive skills (reflecting on learning processes, monitoring progress toward goals, etc.). Therefore, an important goal of higher education is to support students to gain control over their own learning, help them develop skills and apply strategies to take the lead, and educate students in such a way that they become self-regulative learners, resulting in a lifelong, sustainable impact on their personal and professional development.

Stepping into DBE – scaffolding of lecturers

NHL Stenden University of Applied Sciences acknowledged this need to educate their students in a more sustainable way and elaborated this as design-based education (DBE). A model of multiple layers is built up to provide scaffolding for lecturers while designing and evaluating the learning environment of their programs. The multiple layered model is built on the 6 phases of DBE, the 3 phases of self-regulation and the model of learning (i.e., approaches to learning). The model combined with first experiences and perceptions gained during the first steps into DBE might be helpful for lecturers.

Design-Based education (DBE) is a further development (i.e., redesign) of the existing concepts of problem-based and competence-based learning. Innovative elements are added to these two concepts to design a sustainable educational concept—a learning environment in which an effective and efficient learning process is stimulated, and sustainable goals can be achieved and an ambitious learning climate that challenges students and offers room for talent development and profiling. Formal and informal learning are increasingly intertwined (Geitz and de Geus, 2019).

> *Design-Based education is a teaching and learning approach that empowers the learning process of all stakeholders in (higher) education—a trialogical process between students, the professional field, and lecturers. Actual and complex issues are faced via iterative processes to bridge the gap between a current situation and an intended situation. Characteristics of the non-linear, iterative DBE processes are empathizing, defining, ideating, applying, testing, evaluating, and improving to bridge this gap. The methodological trialogical interaction between students, the professional field, and lecturers is domain specific. The DBE teaching and learning approach adds value to the education of students, the professional field, and lecturers in terms of gaining multidisciplinary knowledge, developing metacognitive skills, and creating social value (Geitz and de Geus, 2019).*

Phases of DBE

Social constructivism is an important foundation for the DBE learning environment. To offer students the opportunity to learn in interactions with others, students spend a large part of their time in ateliers (i.e., a space—physical or online—in which students spend a substantial part of their time working on authentic assignments). In these ateliers, students work together with lecturers and the working field to solve real life issues derived from that specific professional field. They face these issues by applying iterative, methodological phases inspired by the principles of design thinking These principles are translated into **six phases of the DBE process** (that proceed in an iterative order)*:*

1. Research the question
2. Define the core problem
3. Generate ideas
4. Design prototypes
5. Test prototypes
6. Research and improve

These phases support students to construct and reflect critically on prototypes/ designs/ solutions they find for the specific question. These phases add value to the learning process of developing metacognitive skills and gaining metacognitive knowledge. Meta-cognitive skills are associated with developing higher order of learning strategies (Valcke 2014). In short, metacognitive skills can be defined as "cognition about cognition" (Flavel, 1985, p. 104) often referred to as thinking about your own thinking. Brown (1987) distinguishes two types of meta-cognition: knowledge of cognition and regulation of cognition. Knowledge of cognition involves knowledge about oneself (who), about the task (how) and about learning strategies (why and when). Regulation of cognition involves the ability to predict, plan, monitor, regulate and reflect on their own learning processes.

Self-regulation and DBE

Reflection on the phases whilst researching the effect of the solution/prototype is an essential skill in becoming a self-regulating learner. Pintrich (2000, p. 453) defines *self-regulated learning* as "An active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate and control their cognition, motivation and behaviour guided and constrained by their goals and the contextual features in the environment". Previous research showed that students' self-regulated skills are related to students' well-being and learning interests. Students who show self-regulated learning strategies expressed lower levels of stress and exhaustion and showed

more interest than students who show non-regulated learning strategies (Heikkila et al., 2012).

Zimmerman (2002) proposed a model in which **three phases of self-regulation processes** are included: *the forethought phase, the performance phase, and the self-reflection phase*. These phases occur before, during, and after learning. Before learning (i.e., forethought phase), task analysis and self-motivation beliefs play an important role in enhancing self-regulative behaviour in students. Goal setting, strategic planning, and self-efficacy beliefs influence self-regulating behaviour positively. During learning (i.e., performance phase), self-control and self-observation methods support students in becoming more self-regulative learners, and finally after learning (i.e., self-reflection phase), self-judgment and self-reaction contribute to this self-regulative cycle. Self-regulated learning is a complex phenomenon that has been researched extensively, resulting in several models representing the phases and characteristics of self-regulation (Andrade and Cizek, 2010). In acknowledgment of the many different models representing self-regulation, Zimmerman's model provides a sound basis for considering the intended learning process in a DBE learning environment from a self-regulatory perspective.

This cyclic reasoning in terms of self-regulation can be applied to the cyclic and iterative reasoning of design-based education as well (see Figure 1) (Geitz & de Geus, 2019). *Before* starting a research/learning process to approach a problem, goal setting, planning, and managing one's motivational beliefs are necessary processes influencing the effectiveness of the execution of this research/learning process. Furthermore, *during* the research/learning process, the application of strategies to effectively approach and execute the research (i.e., learning) supports the intended outcome of the process. Finally, *after* the initial research steps resulting in a solution/prototype, self-reflection is needed to determine whether the intended outcome/performance is recognized and valued by knowledgeable others (i.e., working field and lecturers). Self-reflection leads back to the forethought phase that precedes the next learning efforts (Andrade & Cizek, 2010).

Approaches to learning and DBE

The sustainable approach to teaching and learning in design-based education is thus embedded in the concomitant processes of DBE and the phases of self-regulated learning. Whilst designing a DBE learning environment, the learning activities, and strategies should be aligned to these phases as well.
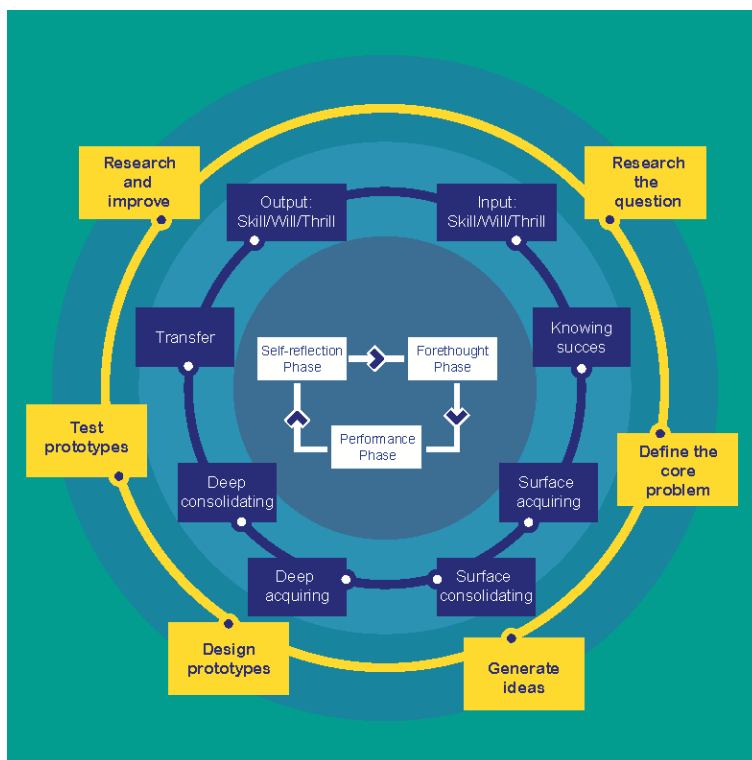
Figure 1. Multiple layers of a sustainable learning environment (adapted from Geitz and De Geus, 2019)

The conceptual framework of learning intentions and learning activities is known as approaches to learning (Marton and Säljö, 1979). They defined the different approaches as deep learning and surface-level learning. Students who apply the deep approach pay attention to the fundamental idea of the materials to be learned, whereas students who apply the surface approach concentrate on surface features of the materials and try to remember them word for word (Heikkilä and Lonka, 2006). Previous research has shown that students' approaches to learning are related to several characteristics, such as their well-being, study success, and employability (Heikkilä, Lonka, Nieminen, and Niemivirta, 2012; Tuononen, Parpala, and Lindblom, 2017). In addition, previous research demonstrated that a deep level of learning (higher-order learning) is positively related to students' characteristics such as well-being, study success and employability (Heikkilä, Lonka, Nieminen and Niemivirta, 2012; Tuononen, Parpala and Lindblom, 2017).

For teaching to be sustainable, it is necessary to provide scaffolding for students in the learning environment to support their learning processes (Geitz and de Geus, 2019). Hattie and Donoghue (2016) proposed that various learning strategies are powerful at certain stages in the learning cycle (see Figure 2). They designed a model based on a synthesis of 228 meta-analyses. The results of these analyses indicate that there is a subset of strategies that are effective, but the effectiveness depends on the phase of
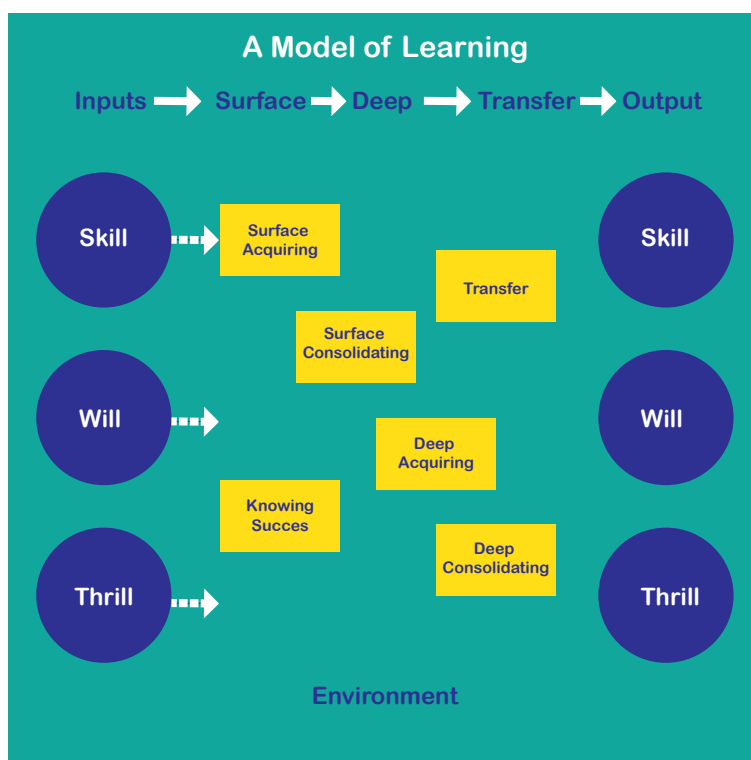
Figure 2. A model of learning, from:" Learning strategies: A synthesis and conceptual model," by J.A. Hattie and G.M. Donoghue, 2016, NPJ Science of Learning, 1, 16013.

learning in which they are implemented.

The inputs and outputs of Hattie and Donoghue's (2016) model are the same: skill (i.e., knowledge and ability), will (i.e., the student's dispositions that affect learning), and thrill (i.e., motivations, emotions, and enjoyment of learning). The aim is to help students develop all three. The pre-learning phase is related to whether the students are aware of the criteria of success of the learning task and what it means to be successful at the task/assignment at hand. Students who can articulate the success criteria are more likely to be strategic in their choice of learning strategies. Furthermore, the model highlights the importance of surface and deep learning and does not privilege one over the other. In addition, the model distinguishes between acquiring and consolidating knowledge. During the acquisition phase, information is stored in the short-term memory; during the

consolidation phase, a learner needs to actively process the material to increase the likelihood of moving that knowledge to the longer-term memory.

During the phase of surface acquisition, there are many effective strategies, such as organizing and summarizing. At the surface consolidation phase, the investment of effort and deliberate practice is critical. Investment in terms of practice and overlearning is more effective if it is done gradually over time. The strategies related to consolidating learning are heavily dependent on the student's proficiency to invest time on tasks wisely. Deep acquisition is related to the activation of prior knowledge before making relations and extensions beyond what students have learned at the surface phase. During the deep consolidation phase, the power of working with others is most apparent. This involves skills in seeking help from others and listening to others in discussion. Another important strategy is when students become lecturers of others and learn from peers, which involves high levels of regulation and monitoring (e.g., sustainable feedback is an important instrument/tool to facilitate deep consolidation). The model implies an order of the learning phases, but in practice, this is not the case. As Hattie and Donoghue (2018) stated, there can be much overlap in various phases: "to learn subject matter (surface) deeply (i.e., to encode in memory) is helped by exploring and understanding its meaning; success criteria can have a mix of surface and deep, and even demonstrate the transfer to other (real world) situations; and often deep learning necessitates returning to acquire specific surface level vocabulary and understanding. In some cases, there can be multiple overlapping processes: learning is iterative and non-linear." All the distinguished phases are related to effective learning strategies.

Synthesis of elements of sustainable teaching and learning - DBE

A sustainable approach to teaching and learning can be visualised by bringing the theoretical insights together: self-regulation, approaches to learning (i.e., intentions and activities), and the six DBE phases (i.e., how to approach "wicked" real-life problems). In Figure 3, these concepts are brought together, representing the multiple layers of a sustainable learning environment. These layers must be considered whilst designing a learning environment, as they offer a permanent frame of reference that must be confronted to develop a fully balanced, design-based education program. It is important to consider the phases of learning, the associated effective learning strategies, and the intended goals (e.g., self-regulation, metacognition, etc.) (Geitz and de Geus, 2019). Research has shown that alignment in learning environments should be addressed to ultimately reach the intended goals of students (Biggs, 1996).

As stated previously, an important goal of higher education is to support students to exercise control over their own learning and to help them develop skills and learn strategies to take the lead. It should aim to educate students in such a way that they become self-regulative learners, resulting in a lifelong, sustainable impact on their personal and professional development.

Stepping into DBE

The multiple layers of a sustainable learning environment help lecturers to develop a DBE learning environment, it provides scaffolding whilst (re)designing learning environments (Geitz and de Geus, 2019). Previous research demonstrated that students respond differently on specific features of a learning environment (e.g., a learner-oriented approach to teaching and learning). Some students easy adopt the desired deep learning approach, while others struggle with this approach (Vanthournout, Donche, Gijbels, and Petegem, 2009). This might cause uncertainty, reluctance, demotivation and disappointed study success. Therefore, it is pivotal to help students to develop a deep approach to learning and to help them to develop meta-cognitive skills. The role of

lecturer in DBE as designer of the learning environment and as facilitator of learning processes is therefore crucial. In the end what matters most is that students become their own lecturers of learning and that lecturers become learners of their own teaching (Biggs and Thang, 2011).

Overall, it can be concluded that "Stepping into DBE" is a complex process that should be based on evidence informed insights and, as important as well, should be based on shared experiences and an inquisitive dialogue about perceptions of lecturers, educational advisors, and students!

Chapter 2

Preparing students for an exponentially changing world of work

Robert Coelen

Abstract

The world of work is under the influence of the Fourth Industrial Revolution (4IR). It is necessary for education to respond to this to prepare students for this exponentially changing workplace. The decreased half-life of content knowledge forces us to consider metacognitive skills as an important arsenal in the repertoire of graduates. Design-Based Education, if implemented in a multidisciplinary mode, can align with the latest insights into the essential elements of employment-readiness. This chapter contends that we have made a good start but need to embrace the use of disciplinary diversity as a regular approach to learning to ensure our graduates are ready to cope with workplaces under the influence of 4IR.

Keywords: 4IR, Fourth Industrial Revolution, multidisciplinary collaborating learning groups, diversity

The higher education response to 4IR

The Fourth Industrial Revolution (4IR) is not a prolongation of the Third, which used electronics and information technology to automate production (Schwab, 2016). This is because of three factors that define 4IR, namely velocity, scope, and impact. Changes occur with unprecedented speed, across almost all forms of human endeavour in production and governance. There is no doubt that education needs to change, to reinvent itself, to remain relevant and to produce graduates that can take part in a world of work that at best only somewhat predictable. Gleason (2018) posits that traditional undergraduate education through information transfer is no longer a viable form of education to ensure employment and a career. Indeed, Kirschner (2017) made the point that knowledge gained in the initial phase of tertiary education will most likely not be relevant throughout a person's career.

Higher Education Institutes variously aim to holistically educate graduates for work and living. A balancing act in which curricula are designed to address the development of young persons in a holistic way as well as preparing them for a lifetime of work. The skills required for graduate employment has been lacking according to industry for a long time (Capelli, 2015; Dacre Pool and Sewell, 2007; Dearing, 1997; Freeman (1976); Robbins, 1963). Opengart and Short (2002) referred to a change in labour market policy orientation from job security to a position of employability security. This of course leads to a work environment where participants must continuously adapt to changes. Such changes are presently moving from linear to exponential speed of development.

Just as Kirschner (2017) contended that knowledge gained in early phases of higher education would not be sufficient throughout a person's career, the notion that current employability skills would be sufficient is also being questioned (Bridgstock, 2009). Whilst in an increasing number of jurisdictions universities are being asked to release

employment statistics, such data fly in the face of the observation that gradually the traditional linear progression of graduates in one organisation is becoming less common (Arnold et al., 2005). Landing a job shortly after graduation is no longer a good measure of the suitability of the education enjoyed for a life-time career. Indeed, McMahon, Patton, and Tatham (2003) argued that employment is no longer characterised by a finite and fixed set of tasks and therefore knowledge, competencies, and skills applied to one job may not suffice for an extended period. The graduate will therefore need abilities to continuously identify and utilise opportunities for further development and learning.

Such further education requirements throughout life signal the necessity for graduates to acquire or further develop metacognitive skills, including being able to guide and control one's own thinking, actions and learning processes, task orientation, goals setting and systematically monitoring progress towards such goals, as well as evaluating and reflecting on the outcomes. A process that is typical of today's graduate workplace.

A better alignment with the workplace

As a response to aligning graduate skills and knowledge with the workplace, there have been disciplines in higher education that have for a long time practiced the integration of the professional world into the formal curriculum. The health professions constitute one such example, in particular medicine has been at the forefront of this development. The term 'intern' was first applied to medical students in the 1920's. Teacher education has also had a long history of placing pre-service teachers in real classroom environments to enhance their skills. Much the same for nursing programmes throughout the world, often periods of practice under supervision are required to achieve a status of being a registered nurse and qualifies the holder for more senior positions. In the US in the 1980's only about 3% of university students participated in internships. This grew to more than 80% by the turn of the century (Huhman, n.d.). Today, a period of professional practice in the form of an internship, especially in programmes that aim to deliver graduates for a large variety of professions are a mandatory part of the curriculum. In the Netherlands, universities of applied sciences have an almost universal requirement of an internship prior to graduation. Increasingly, this is also the case for professionally focussed programmes at the research-intensive universities.

Whilst many benefits are recognised of internships or placements, much further research is required to optimise this now frequently practiced aspect of higher education (Inceoglu, et al., 2019). The benefits include increased chance to receive job offers, thereby signalling employer appreciation of internships (Callanan and Benzing, 2004; NACE, 2015; Highfliers Research, 2015; Rathbun-Grubb, 2016). Indeed, employers in the UK repeated their warnings that graduates without work experience were unlikely to be successful during the selection process (Highfliers Research, 2015). More recently, the UK's leading graduate employers confirmed that they were offering a record number of places for work experience (Highfliers Research, 2021). Other benefits became apparent from a meta-study by Inceoglu and associates (2019). They showed that specific work or study-related self-efficacy, competencies and skills did increase (in contrast to generalised self-efficacy and self-esteem). The theoretical model they developed also suggested learning could lead to identity transition during placement. The work-related enhancement of self-efficacy signalled possibly a mastery of the domain together with the new identity formation.

A reality of addressing challenges in the workplace as well as society at large is that they increasingly are being solved with teams. Thus, whereas once upon a time the challenge of reducing obesity in the population, for example, was considered the domain of nutritional sciences, today we know it has many causes pertaining to several disciplines.

Whilst nutritional sciences remain an important domain, other disciplines including economics, physiology, sociology, media studies, advertising, transportation, infrastructure, and genetics are also involved in solving the population health problem (Page, 2017). No single individual would be able to find a cure for obesity. Clearly, it requires a team to address the numerous aspects to be able to have a significant effect. Furthermore, the various national contexts of this problem would create additional hurdles that would most likely require not one team but many, each aware of their local context.

The ability to put together a team of specialists to look at a particular problem is, in the world of work, a matter of resourcing the right specialists – in education it presents a pedagogical problem, since the potential professional diversity in a cohort of students is more limited than can be resourced in the workplace. In fact, it is limited by the cohort itself. The introduction of Problem-Based Learning (PBL) was a response to the need for medical students to be able to apply their acquired knowledge in professional practice. Since its introduction in the study of medicine it has been applied to many other fields (Barrows, 1996; Hallinger and Lu, 2011; Smith et al., 2005). Important features of PBL are that it is learner-centred and uses defined, but often ill-structured (interdisciplinary) problems. Despite the potential interdisciplinarity of problems used in PBL, the practice of PBL in most instances involves students from one specific programme (or discipline).

The need for enhanced metacognitive learning, as expressed above, and to create a more sustainable method of education has prompted Geitz (2016) to coin education as a trialogical process in contrast to Biesta's (2015) statement that education is a dialogic procedure. Trialogical, because the actors in this process involve students and teachers, but now also relevant professional practice that informs education and contributes, in the DBE approach, challenges or problems from their world of practice. This in effect is one key difference with the most common nature of problems dealt with in PBL-based education. Just like in the world of work, specialists are selected to work on problems, based on an initial investigation as to which experts are required, DBE aims to use the same multidisciplinary approach.

How does the DBE approach fit?
Whilst the DBE approach is strongly based on teamwork, the current application of this method is yet largely mono-disciplinary. There is a 'laboratory' at our institution, where a multidisciplinary approach is the norm, our so-called X-Honours programme where students come together from any discipline and work together on challenges brought in by industry. If the theoretical model of Inceoglu et al. (2019) can be underpinned with further empirical data, than it might follow that an earlier professional identity formation might be engendered by students from different disciplines working together according to the DBE approach. Part of the DBE informed teaching and learning method, in which student evaluate the outcome of their work in concert with their tutors and professionals from the field, would assist the development of enhanced metacognition.

The challenges of transition from the earlier educational methods practiced at the predecessor institutes to DBE has thus far stood in the way of developed the multi-disciplinary approach that more accurately mimics the world of work and possibly enhances the development of work- and study-related self-efficacy and identity formation at an earlier point in time in the development of our students to better equip them for working in the context of the Fourth Industrial Revolution.

Diversity as an important resource for success

McKinsey and company have for quite some time now developed the concept that companies that embrace diversity generally are more likely to perform better, (based on earnings before interest and taxes – EBIT) than those that did not (Hunt et al., 2014). The nature of the source of diversity that is most influential depended on the national context and the type of industry. Thus, in the US ethnic/racial diversity was more impactful on financial performance, whilst in the UK gender diversity on the executive team resulted in the highest performance uplift. According to Page (2017) regardless of the source, the importance of diversity is that it enhances the total cognitive repertoire of a team. Provided the diverse team members can contribute their perspectives to the team task. It is important, particularly in the context of education that uses collaborative learning, that the challenge potentially addresses the cognitive diversity that is present in the group. Thus, the available cognitive diversity must be filtered through the lens of the task into relevant cognitive diversity.

This concept is most easily illustrated if one considers the exercise, given to students of an international business programme at a European university, to create a business plan for doing business with China. The students are to assemble themselves into collaborative learning groups and as a group task create this business plan. Assume for a moment that there are Chinese national students in this cohort. It does not require much imagination that every group would attempt to enlist Chinese nationals in their team, although it would not be likely that Chinese-only teams would form, since the business plan would also require knowledge about the local business (and more general) culture. In this case the lens through which this plan would have to be created would include filters of both the European and Chinese cultural contexts. Teams with mixed nationality would likely perform better than those with only one nationality.

Using the same logic, if the business plan was focused on a particular product where engineering knowledge would be useful, in a setting where students from different disciplines would be able to participate, the same time might not only look for Chinese nationals but might also seek to enlist engineering students. I pose that the process of working in multi-disciplinary and multi-national teams where the various students (with different educational or national backgrounds) were able to manifest themselves accounting for the specialised cognitive repertoires would enhance their professional identity formation. This would be further enhanced if, at the end of a DBE cycle, the nature and value of the various contributions, based on the diverse cognitive repertoires would be evaluated and made explicit. Indeed, I suggest it would stimulate students to look for appropriate cognitive diversities when, after having analysed a challenge or problem, they can determine what specialists they need to develop a solution.

A brief investigation into the perceptions of students of the X-Honours about working in multidisciplinary teams confirmed that students themselves learned from the experience that they could trust others from different disciplines to contribute their expertise, they recognised the diversity present in the collaborating groups and saw one another as complementary participants with various strengths and weaknesses, the final products or solutions were thought of by students (and the organisations that contributed the challenges) to be of a superior quality. Indeed, students remarked that the diversity of disciplines present resulted in timesaving (not having to learn about other disciplines form scratch like would be necessary in a monodisciplinary setting) and immediate presence of multiple synergistic perspectives for a challenge that would be less likely to be present in monodisciplinary collaborating groups.

To further enhance the metacognitive development of our students, it would behove us, who are charged with the further development of the DBE approach, to build in ways to develop increasingly sophisticated discovery of relevant cognitive repertoires that are not just based on cognition associated with particular disciplines or national backgrounds, but more subtle aspects such as the way diverse people think, how they analyse problems, what their motives are and other aspects that just like an iceberg are initially not visible, until you look underwater and see the enormity of this behemoth. Already at the age of 6, or maybe earlier, we are capable of learning that people have skills or knowledge that initially we may not be aware of.

Take the example of playing a competitive sports game in primary education. The teacher will quite often ask two pupils to select their team, choosing their classmates, one about. Initially, the choices of the two are directed by aspects such as who are the popular kids in class, or who are their friends. After a few games however, having discovered the diversity of psychomotor abilities amongst the children in the class, the choosers will increasingly focus on who is a good goalkeeper, who is a good goal scorer, or who is good at dividing the play in a game. They do this since the objective (or fun) of the task is to win the game, notwithstanding maybe the teacher's intention of educating their pupils just to be healthy and practice sports.

Unfortunately, at this stage I am not aware of any teacher who uses this to teach children that it is possible to discover qualities of another person that can help you in a team task. If they did, we might in higher education be more likely to receive students who are far more adept at selecting team members with diverse cognitive repertoires or more adept at discovering this to enhance their collaborative learning outcomes. Indeed, it is a sad indictment of secondary education that final exams, or indeed entrance exams at the tertiary level promote individual 'excellence' instead of further developing the metacognitive repertoires so that apart from specialist knowledge that individuals may (and should) acquire and apply they are better prepared for an exponentially changing world of work.

DBE informed curriculum as preparation for the workplace in the context of 4IR

As an organisation we contend that curricula informed by the DBE approach are a better way to prepare students for work and life after graduation. We aim to deliver graduates with superior skills to be effective in the workplace and to be responsible global citizens. It should be noted that given the most likely places of work of our graduates that we do this within a Western context. In this chapter, I shall further only consider the preparation for the world of work and hold the DBE approach up against the latest thinking about employability.

Employability has been variously defined depending on the disciplinary background of authors resulting in a concept that lacks clarity and specificity of meaning (Römgens et al., 2020). The need for a more unified approach and integration of the various conceptual frameworks was highlighted by several authors for quite some time (Knight and Yorke 2004; Small, Shacklock, and Marchant, 2018; Peeters et al., 2019). Römgens and associates (2020) took up this challenge and combined the conceptual frameworks from two streams of research on employability, namely research related to workplace integrated learning (WIL) and higher education research. The outcome of their work resulted in an alignment of dimensions from these two streams, with 4 showing overlap and 3 being unique, but complementary. The seven dimensions (Römgens et al, 2020) were (in italics from higher education research):

1. Human capital - *(Applying) disciplinary knowledge*
2. Social capital – *Transversal skills*
3. *Emotional regulation*
4. Lifelong learning and (active and passive) flexibility – *Career development skills*
5. Reflection on self and organisation – *Self-management*
6. *Self-efficacy*
7. A healthy work-life balance

Higher professional education has for a long time focussed on content knowledge transmission, but in more recent times shifted from teaching content to competence (Koenen et al., 2015). This resulted in curricula in which students worked on tasks to which they applied their knowledge (Geitz and De Geus, 2019). The emphasis on applying knowledge, rather than just learning disciplinary knowledge was a central tenet in the shift towards more competence-based education. Given the notion that disciplinary knowledge has an ever-decreasing shelf-life and that lifelong learning to remain up to date becomes a more essential aspect of professional life, the motivational aspect of learning has gained considerable importance. The advent of problem-based learning was in part due to the need to promote life-long learning (Boud and Feletti, 1997). Geitz and De Geus (2019) pointed out that contextual learning legitimised the evolution of Problem-Based Learning (PBL) from its use in a single discipline to context-bound forms in many disciplines. Equally, competence-based learning required disciplinary context. In both educational methods the disciplinary boundaries, given generally the discipline-bound background of the lecturers or tutors involved, may have limited the range of perspectives from which a problem or assignment was considered. This is less like the workplace where expertise is generally brought in based on an assessment of the challenge. Thus, while previous methods have made a move from pure content transmission to applying knowledge, they may not yet have addressed the way the workplace solves complex or wicked problems.

Do methods based on the DBE approach offer any advance on this? Provided the concept of a multidisciplinary approach, which is one of the stated aims of DBE, is fully realised and students meet in multidisciplinary teams to solve real world problems, the dimensions of a challenge will more likely be examined a multitude of disciplines. This has two potential effects. First, disciplinary knowledge will be applied from the various student experts involved and the way in which this can be organised is through teamwork in which not only disciplinary knowledge is applied, but also transversal skills (including communication, critical thinking, negotiation, etc.) are called for to ensure optimal solutions. Furthermore, and this has already been observed in our X-Honours classes where students join collaborative problem-solving efforts from different disciplines, students will develop stronger professional identities. The observations that have been made are that students will divide aspects of a task according to the various disciplines that are represented. This would promote the formation of a professional identity, which is an important aspect of self-management and self-efficacy." What am I (professionally)?" and "How do I manifest this?" are important questions to consider in a world of work where long-term jobs are increasingly unlikely and career management will involve being able to articulate the answers to these questions clearly to be able to obtain new employment that matches the stage of professional development.

Another benefit, recorded by one of the X-Honours students was the ability to learn from experts (defined as students from other disciplines) to learn something more about an aspect from another discipline that was important in solving a problem ("looking over their shoulders").

Does a full implementation of all aspects of DBE also promote emotional regulation? Mayer et al (2004) defined emotional intelligence as "the capacity to reason about emotions, and of emotions to enhance thinking. It includes the abilities to accurately perceive emotions, to access and generate emotions to assist thought, to understand emotions and emotional knowledge, and to reflectively regulate emotions to promote emotional and intellectual growth." Dacre Pool and Sewell (2007) contended that academic and life success was linked to people with high levels of emotional intelligence, thus it would be a necessary component of graduate employability.

One example from the brief X-Honours study shows this to be present in multi-disciplinary groups, where a student voiced this as:

> *"I thought my discipline to be the most important and should function as a first consideration in all the work I do." Having worked in multidisciplinary teams I have learned that this may not always be the case, indeed it may work against me, and now know to temper this perception."*

Thus, this insight would have been less likely to occur in monodisciplinary learning environments. This example also points towards better self-management during collaborative work. Indeed, being able to represent one's discipline in a multi-disciplinary group could also be viewed as stimulating participation. Groups were quick to distribute tasks according to various specialisations present and this constituted an early look at the value of organising a group to optimal effectiveness. At the same time the multidisciplinary approach provided participants with opportunities to deal with conflicting demands and interests.

It is not difficult to conclude that a full multidisciplinary implementation of the DBE approach will present students with many more opportunities to hone their metacognitive skills and to provide a learning space that is more closely aligned to the workplaces they will occupy in the future.

Section 2.
A new curriculum informed by DBE and DBR

Chapter 3.

Lecturers' perceptions of collective learning: A collective move to Design-Based Education

Hanneke Assen and Hans Otting

Abstract

Collective learning stimulates lecturers to have an inquisitive dialogue, to develop a shared vision, to take collective actions, and to evaluate and reflect on their actions. Collective learning supports lecturers to develop and move to educational innovations, like Design-Based Education (DBE). Therefore, lecturers' perceptions of collective learning can be seen as a predictor for successful development and implementation of DBE. A narrative approach is used to explore to what extent lecturers perceive collective learning within their programme during the DBE development and implementation. Findings show that most lecturers are willing to develop and implement DBE, however, in general, lecturers experience hardly collective learning processes within their programmes. During team meetings they perceive a monologue instead of a dialogue about DBE principles, a focus on operational instead of conceptual issues, individual versus collective actions, and a lack of reflection on actions. This study shows that collective learning and the development of DBE, cannot be seen as separated processes and that collective learning, included the inquisitive dialogue, does not occur automatically. Therefore, lecturers should be supported to integrate collective learning within their daily practice

Introduction

Design-Based Education (DBE) is a sustainable and learner-oriented approach to teaching and learning. DBE involves a trialogical learning process among students, lecturers and industry professionals and is based on self-directed, contextual, constructive, and collaborative learning principles (Geitz and de Geus, 2019). By means of a social and iterative process these three groups generate ideas, design prototypes, and create solutions for real-life and wicked issues presented by the professional industry (Geitz and Sinia, 2018). The development of DBE is an intensive innovative educational development process requiring a meaningful change in teaching and learning strategies. Lecturers play a key role in the DBE development process as designer of a proper curriculum as well as activator and facilitator of the students' learning processes. Therefore, lecturers' contributions are pivotal for the implementation of new educational developments (Sharma, 2001). Earlier research showed that most lecturers struggle with developing a learner-oriented curriculum and applying learner-oriented interventions (Assen, Koops, Meijers, Otting and Poell, 2016; Donche, 2005; Meirink, Meijer, Verloop and Bergen, 2009; Windschitl, 2002).

The move to a learner-oriented approach, like DBE, is not an effortless process and involves more than changing the teaching style. It requires a change in the lecturers' professional teacher identity. There can be no innovative educational development without teacher identity development (Postareff, 2007). Teacher identity development is crucial for changing teaching behaviour. Therefore, a move to DBE seems not to be possible without supporting lecturers to develop their teacher identity. Earlier studies

showed that collective learning motivates lecturers to develop their professional identity and supports them to move to a learner-oriented approach to teaching (Ashfort, Harrison and Corley, 2008; Assen et al., 2016; Lengelle, 2016). Collective learning can be defined as "work-related processes that arise when lecturers of the collective collaborate and consciously strive for common learning and/or working" (Lodders, 2013, p. 15). Lecturers' collective work-related experiences are the starting point for collective learning.

Collective learning differs from collaborative learning. In collaborative learning, lecturers learn together with the goal to achieve individual learning outcomes. Collective learning stimulates lecturers to have a dialogue, evaluate and reflect on their beliefs about teaching and teaching behaviour with the goal to achieve collective learning outcomes (Assen, 2018; Hoekstra Brekelmans, Beijaard and Korthagen, 2009). In addition, collective learning reduces the isolated position of lecturers and allows them to extend their teaching strategies and research capacities (Patton and Parker, 2017)

Lodders (2013) distinguished four factors of collective learning: inquisitive dialogue, shared vision, collective action and evaluation and reflection. These four factors should be integrated in the development and implementation process.

- Inquisitive dialogue:

DBE is based on a learner-oriented approach to teaching. Lecturers' beliefs about teaching and learning might differ among lecturers and even might differ from this approach. Therefore, an inquisitive dialogue is needed. In an inquisitive dialogue, team members embrace the diversity of assumptions and ideas in a team and are open and respectful to the various perspectives and point of views, even when those strongly differ from their own. Lecturers express their ideas openly, despite their status, and discuss arguments and thoughts to achieve a shared vision. The 'why' question is important and is asked often to stimulate the dialogue about DBE. The goal of the dialogue is not to convince others but to achieve shared ideas about a problem. This will lead to coherent collective learning outcomes (Simons and De Laat, 2002). Lodders (2013) demonstrated that the inquisitive dialogue is the crucial factor which impacts the other three factors.

- Shared vision:

A shared vision creates a sense of coherence and purpose to diverse educational activities. A shared vision on DBE gives a clear understanding of what lecturers would like to achieve. Consequently, all lecturers have a common commitment, and they work collaboratively on goals they strive for. Without a shared vision, activities are pointless and meaningless (Lodders, 2013).

- Collective action:

Collective ideas and actions are a result of the inquisitive dialogue and are based on the shared vision. The vision is translated in actions. These actions are organised and coordinated by the lecturers of a team. Lecturers ensure that activities are carried out, give each other advice, and support each other in their DBE actions (Lodders, 2013).

- Evaluation and reflection

To close the collective learning cycle evaluation and reflection of both process and results takes place. Lecturers evaluate to what extent they achieved the formulated goals

(joint ambition), which aspects were important, and what stimulated or hindered them to achieve goals. In addition, they share insights and formulate how they could be more effective and efficient in future projects and share insights they have gained from other team members. The evaluation and reflection factors might be a starting point for a new cycle of collective learning. Critical evaluation and reflection might lead to other beliefs and behaviour (Kember, Leung, Jones, Loke, McKay, Sinclair et al., 2000). Therefore, willingness to evaluate and reflect is pivotal for teacher identity development (Nevgi and Löfström, 2015).

In summary, to develop and implement DBE requires collective learning. Using an inquisitive dialogue, it is necessary that lecturers share their ideas and conceptions about teaching and learning with the goal to develop a shared understanding and vision on what they would like to achieve together with DBE. A shared vision leads to collective DBE actions and reflection on these collective actions gives insights into learning outcomes of the team.

Collective learning does not develop automatically. Verbiest (2003) describes two conditions to promote collective learning: lecturers' characteristics and lecturers' situational conditions (Verbiest, 2003). Lecturers' characteristics like beliefs about teaching and learning, prior knowledge and learning motivation and skills, influence the way lecturers learn collectively and the way they integrate educational innovations in their daily practice. Furthermore, lecturers' perceptions of their situational conditions have impact on the way they learn collectively. Learner-oriented learning environments seem to be more sensitive for these situational conditions than conventional learning settings (Lindblom-Ylanne, Trigwell, Nevgi and Ashwin, 2006). Verbiest (2003) describes three aspects of situational conditions:

- Integration of collective learning in the work and educational context
- Organisational conditions such as work pressure, availability of resources and facilities, the presence of interested colleagues and team characteristics and culture, and
- Leadership style plays an important role in lecturers' collective learning processes. Transformational leadership, for example, encourages a high level of collective learning and improves the innovative capabilities of lecturers (Lodders, 2013; Thoonen, Sleegers, Peetsma and Geijsel, 2011). Transformative leaders encourage transformational learning, which is "not something to be remembered and recalled, but something that has become a part of the person (Illeris, 2009, p.142).

Research showed that most university lecturers hardly ever learn collectively (Meirink et al., 2009; Vangrieken, Dochy, Raes and Kindt, 2015; Windschitl, 2002). Most lecturers tend to individual instead of collective learning (Toytan, Tynjala, Piirainen, and Ilves, 2017), seem more engaged in exchanging information, and do not spend enough time for evaluation and reflection. Moreover, lecturers are not often engaged in an inquisitive dialogue (Lodders, 2013). Collective learning supports lecturers to strive for an inquisitive dialogue about their shared vision and collective actions and supports them to develop their professional teacher identity. Therefore, the aim of the current study is to explore to what extent lecturers perceive collective learning during the development and implementation process of DBE.

Method
Context
The present study included 4 programmes of NHL Stenden University of Applied Sciences. These programmes started in September 2018. In each programme, two lecturers were involved as programme coordinators. Programme coordinators are lecturers who are responsible for the development and the implementation of (a part of the) programme, in most cases of one module period of 10 weeks.

Research design
A narrative design was used to gain insight into the lecturers' perceptions of collective learning within their programmes. A narrative design approach focuses on retelling the lecturers' perceptions (Creswell, 2014). One story line per programme was developed based on the four factors of collective learning, inquisitive dialogue, shared vision, collective action and evaluation and reflection (Lodders, 2013).

Participants and data collection
The participants were 31 lecturers from four programmes. To explain lecturers' feelings, values, reactions, experiences, and perceptions about collective learning in their programme, two data collection methods were used: 12 lecturers participated in interviews and 19 lecturers participated in focus groups. The data collection took place from January until April 2019 in the second semester of the academic year. As DBE was implemented in the first semester all participating lecturers had experience with DBE as facilitator of students' learning processes and 10 lecturers were accomplished curriculum designers.

Twelve lecturers of two programmes were interviewed individually. The duration of the interviews was about one hour. All interviews were audio-recorded and transcribed. Examples of questions were:

- What is according to you collective learning and how do you perceive collective learning in your programme?
- Do you experience a shared vision on DBE in your programme team? Can you describe the vision on DBE?
- What are according to you the agreements about the goals that the programme strives for?
- Are you and team members enabled to ask 'why' questions to deepen and broaden important DBE themes (explain)?
- What are according to you are the agreements about DBE actions and the faced problems within these actions?
- How do you reflect on these actions?

Nineteen lecturers of the other two programmes participated in two focus groups. These focus groups consisted of a small group of informed lecturers. The aim of a focus group is to stimulate a dialogue about a specific topic (Puchta and Potter, 2004). Questions were posed initially by the researchers to stimulate and focus the conversations. Students of the minor Human@work were involved in the organisation and execution of the focus groups. The conversations were audio-recorded and transcribed. Initial questions included:

- What are your experiences with collective learning with your team?
- What is your desired situation for collective learning?
- What do you need to achieve the desired situation?

Students asked lecturers to answer questions using two distinct colours of Post-its™. One colour referred to positive and the other to negative experiences.

Data analysis
Transcriptions of the interviews and focus groups were used to "retell the perceptions and experiences of lecturers in their own words" (Creswell, 2014). Lecturers who participated in this study were invited to confirm the validity and credibility of the retold stories. They were asked whether they recognised themselves as a team in the retold story. Three programmes received a written retold story by email, and in one programme the retold story was presented verbally. During this presentation the most important themes of their story were included. Lecturers were invited to make suggestions to improve the story. These resulted in some minor adjustments, particularly in the wording (e.g., most lecturers instead of all lecturers).

To determine the most important themes about collective learning, retold stories were analysed in three steps. Two researchers analysed the data independent of one another. In the first step, the four factors of collective learning were used to categorise relevant fragments (open coding). In the second step connections between the categories were made (axial coding) and in the third step the most important themes were identified (Straus and Corbin, 2007). These important themes were the basis for core narratives. A core narrative is a structured approach to a collective story of an organisation. Researchers discussed the most important themes and one core narrative for all four programmes was developed around these themes.

Ethical considerations
Lecturers were informed about the purpose of the study. They cooperated voluntarily and lecturers and management of each programme granted permission for the study. Data were anonymised to protect the privacy of participants. In addition, to prevent statements are verifiable no narratives per programme or per lecturer were described.

Findings
The collective narrative of the four programmes was developed around six core themes that emerged from the analysis.

Primary versus secondary adopters
Lecturers deal with the DBE development and implementation process in diverse ways. The way they moved to DBE seems to be related to the way they adopted the DBE concept. As one of the interviewees said: "all lecturers are committed to DBE" and "are willing to develop and implement DBE", but not all lecturers adopt DBE at the same pace. One-third of the lecturers could be characterised as primary adopters. Most of these primary adopters are very enthusiastic about DBE. Most of these lecturers were involved in the development of the DBE vision and the implementation of the DBE learning environment. They followed courses on the development of a learner-oriented curriculum and therefore gained more knowledge about the DBE principles compared others, who did not participate in such courses. Primary adopters seemed far ahead in the DBE development process. They showed pro-active behaviour in the design of the curriculum and started with experiments. During the implementation of DBE, most primary adopters took the role of coordinator of (a part of) the programme.

The remaining two-thirds of the lecturers could be viewed as secondary adopters. They preferred to receive more information about DBE in general. They need more time to develop and integrate DBE in their daily practice. Secondary adopters mentioned three reasons for their hesitation: Firstly, these lecturers mentioned that they would like "to

have a deepening dialogue about the vision on DBE" with the team. Secondly, they would like to elaborate the DBE principles before they would design a DBE curriculum. Thirdly, the statement "decisions were already taken without having an inquisitive dialogue about DBE principles with all team members" illustrates that lecturers have the feeling they were excluded from decision processes about DBE. Secondary adopters were incidentally involved as curriculum designers.

Lecturers of all four programmes recognised a certain level of friction between the primary and secondary adopters. This friction occurred when secondary adopters had the feeling that they were lagging regarding knowledge and experience with DBE. Although, primary adopters mentioned that they tried to involve all lecturers in the design process, all secondary adopters felt the opposite. A primary adopter said: "Some lecturers did not 'jump' in the DBE development process". This lecturer asked his/herself: "Did we offer not enough opportunities to join or were these lecturers not able to create their own opportunities to join development activities?"

Monologue versus dialogue

"We discussed DBE in our team meetings, however this discussion was very superficial" and "There was a one-way communication about DBE" are statements, which represent the way lecturers perceive a lack of in-depth dialogue and a lack of critical thinking about DBE during team meetings. Lecturers, primary and secondary adopters, tried to convince other lecturers about their ideas and opinions on the DBE, but they did not question other lecturers' visions, ideas, and opinions during formal meetings. They did not ask 'why' questions and hardly related their ideas and viewpoints to others. Therefore, lecturers' opinions and conceptions about DBE differ: "Whether you are in the curriculum development group or not, all lecturers have different opinions about DBE" and they experienced that, without a shared vision, "we face the same challenges again and again".

Although all lecturers perceived the working environment to be safe to voice their opinions and ideas, they 'struggled' with asking critical 'why' questions to broaden and deepen DBE concepts and to provide constructive feedback on DBE. Lecturers gave several reasons for their 'struggle': 1) top-down decision; decision to implement DBE was 'set in stone'; 2) time pressure; because of the implementation of DBE in September 2018. It was expressed that: "certain organisational issues need to be discussed". Therefore, there was no time for in-depth discussions, 3) respectfulness: the following statement illustrates that lecturers did not want to ask critical questions because of respect for DBE developers: "the lecturers who developed the curriculum are hard-working lecturers, they have enough work to do" and 4) positive culture; As one of the lecturers commented: "I do not want to be seen as negative, so I do not ask my critical questions". In addition, another lecturer mentioned, "opinions and ideas are perceived as a judgment of the developers". It seems that the positive attitude of the developers (mostly primary adopters) hindered lecturers to ask critical questions or to provide them with constructive feedback.

Conceptual versus operational knowledge

Although, the participating programmes in the current study started with DBE in September 2018, lecturers reported the absence of a shared vision on DBE. One of lecturers mentioned: "Even though we started with DBE, I ask myself what DBE is exactly" and another lecturer said: "We have all different opinions about DBE". Moreover, in most formal meetings operational and organisational issues take precedence over more conceptual issues. Lecturers understand that operational issues, specifically in a newly developed curriculum, are essential. To meet the expectations of students, it is important

that the curriculum is well organised. However, all lecturers expressed that they would like to have dialogue about the conceptual issues to develop a shared vision on DBE.

Individual versus collective actions

The statement of one of the lecturers: "We move next to each other, we do not take actions together" illustrates that instead of collective work-related challenges, lecturers focus on individual goals: "We lecturers prefer individual goals above collective goals. We hardly discuss collective actions". Lecturers pay little attention to findings and experiences of other lecturers during formal team meetings; however, they learned a lot from other lecturers in informal settings. They discussed their experiences with other lecturers informally and so adjusted their facilitation strategies during DBE sessions. Actions are predominantly based on individual findings and experiences and decisions are rarely based on collectively gathered evidence-informed information. In addition, as one of the lecturers said: "Knowledge and skills learned during workshops and trainings do hardly get a follow up, there is a lack of integration of these learning activities in our daily practice". It seems that lecturers focus on individual development and hardly share the learning outcomes of these trainings with other lecturers.

Reflection versus continuation

All lecturers reported that they discussed their teaching experiences, however there was not enough time for in-depth discussions and reflection in team meetings. As one of the lecturers expressed: "We would like to learn from each other, however we feel too much work pressure to reflect on our actions". Lecturers reported that during team meetings descriptions of, and opinions about DBE activities were discussed. Nevertheless, they did not ask other lecturers what they thought about these activities. Lecturers did not recognise a systematic way of evaluation and reflection about actions taken during DBE activities. The comment of one lecturer: "Consequences of actions and decisions taken are hardly discussed' illustrates that lecturers would like to have more time for reflection. Lecturers are aware that because of the on-going DBE activities, the focus on students learning takes precedence.

Directive versus supportive

A recurrent theme during the interviews was the way lecturers perceive their role as DBE facilitator. Almost all lecturers (29 out of 31) felt insecure about the DBE facilitator role. Specifically, they had doubts about the structured and unstructured educational activities and the balance between the directive and supportive teaching style. The following questions of lecturers were related to this theme: "What are my tasks? When do I intervene, when do I direct the learning process, when do I let student go and let them make their own mistakes? Who is responsible for the students' learning process? ". The balance between a directive and supportive (leadership) style could also be related to the programme coordinators (in most cases also DBE curriculum designers. Most lecturers mentioned that they perceived a predominantly directive style of programme coordinators regarding DBE implementation.

Conclusion and discussion

The current study was designed to explore to what extent lecturers perceive collective learning during the development and implementation process of DBE. DBE is an innovative approach to teaching and learning. Collective learning supports lecturers to move to this approach. Findings of this study suggest that lecturers perceived a lack of collective learning. Collective learning is not automatically integrated in the work and educational context. Specifically, the absence of the inquisitive dialogue, which is pivotal for collective learning (Assen, 2018; Lodders, 2013) is a major cause for the lack of integration. Although, lecturers shared opinions and ideas about DBE during formal and

informal meetings, they did not take time and/or did not feel free to ask 'why questions' to one another to deepen and broaden their knowledge about the DBE concept. Thus, there seemed to be a lack of shared vision on DBE. Moreover, lecturers found it difficult to agree on what they would like to achieve with DBE. In other words, lecturers gave the impression that they would like to have a better understanding of the educational direction the team would like to go with DBE. Without a clear direction it is difficult to coordinate and apply collective actions. Consequently, it is difficult to evaluate and reflect when there are no agreements on collective actions. Of course, it would be possible to discuss what activities went well, what could be done better, however, without agreement on collective actions, analysis of learning outcomes is not possible.

Conditions collective learning
There are various reasons for the lack of collective learning. Certain conditions to promote collective learning seemed not be present.

Firstly, lecturer characteristics impact collective learning. For instance, the discrepancy between the primary and secondary adopters can be seen as a threshold for the design and implementation of DBE. Primary adopters are innovators and are perceived as opinion leaders and role models. Primary adopters are often involved as developers and programme coordinators of a part of the DBE programme and therefore, they tend to share innovative ideas only with other primary adopters. They seem to forge ahead, accept the uncertainties about DBE and tend to learn from failures (Rogers, 2004). Although the enthusiastic and pro-active behaviour of primary adopters is essential to develop DBE, it might contrast sharply with the secondary adopters, who are more cautious. The secondary adopters would have preferred an inquisitive dialogue to better understand DBE and its underlying principles (self-directed, contextual, constructive, and collaborative learning principles), before contributing to the DBE development and implementation process. They would have liked to have more time to elaborate DBE principles and would like to have been informed by DBE research and best practices. It is likely that their need for a deep approach to DBE may put secondary adopters a long way behind. This is a pity because both primary and secondary adopters might have innovative ideas (Rogers, 2003). Although, the difference between the paces of adoption of DBE might be a cause of friction among primary and secondary adopters, the current study showed that secondary adopters are willing to adopt DBE, even without the fundamental dialogue about DBE principles. In other words, secondary adopters could be seen as team players. Although they were not yet convinced about the conceptual principles of DBE, they were willing to adopt DBE collectively because they realised it is for a greater good.

All participating lecturers gave the impression that they were willing to develop and implement DBE. Although lecturers struggled with the facilitator role in DBE, they did not refuse to change their didactical-pedagogical interventions. This finding is in line with studies of Coklar and Ozbek (2017), and De Vocht and Laherto (2017) who demonstrated that hardly any laggards are found in educational institutes. Lecturers nowadays must cope with rapid and fundamental changes in education and therefore lecturers are used to adopt innovations constantly (Van der Heijden, Gelden, Beijaard and Popeijus, 2015).

Secondly, various situational conditions have impact on collective learning. For instance, time pressure is perceived as a factor that hinders collective learning. Primary adopters emphasised that the time available for lecturer's meetings was taken up with discussions about operational and organisational issues. There was hardly time to discuss conceptual issues. Consequently, secondary adopters lacked an inquisitive dialogue. Another situational condition is the facilitation of innovation. All lecturers perceived directive

leadership during the development and implementation of DBE. Primary adopters seemed to have fewer problems with directive leadership than secondary adopters. Secondary adopters seemed to prefer transformational leadership. Transformational rather than directive leadership is important to stimulate collective learning. Transformational leaders support a dialogue about the direction a team would like to achieve (Thoonen et al., 2011) and therefore, they are crucial for educational innovations (Lodders, 2013), such as DBE.

Thirdly, all lecturers mentioned that they shared predominantly operational problems during team meetings. They also mentioned a lack of opportunity to express their feelings and to ask their conceptual questions about DBE, which made it also difficult for them to receive support from other lecturers. Consequently, rather than solving a problem collectively, lecturers tended to prepare their educational activities individually and solve their own educational problems. This contradictory behaviour may be due to the friction between autonomy and collaboration (Vangrieken, Grosemand, Dochy, and Kyndt, 2017). Frictions between autonomy and collaboration might influence the way lecturers learn collectively. In higher education, lecturers value their professional autonomy highly (Strong and Yoshida, 2014), however at the same time educational innovations require collective learning (Ronfeldt, Owens Farmer, McQueen, and Grissom, 2015). Moreover, lecturers need a safe working environment, confidence, and trust to ask questions. They want to have an open dialogue, to reflect on their beliefs about teaching and learning and to be enabled to experiment with various facilitation strategies without judgment. Educational innovations require an open learning culture (Thoonen et al., 2011).

In conclusion, DBE appears not to be fully integrated in the professional identity of lecturers. Situational conditions, lecturers' characteristics, and team culture hindered collective learning. This in turn might also influence the development of these lecturers' professional identity as appropriate for DBE. Collective learning is needed to support lecturers to develop their professional identity and is needed for a high quality of lecturers' DBE educational activities (Rots, Aelterman, Devos, and Vlerinck, 2010). Therefore, it is recommended to integrate collective learning in the further development of DBE.

Collective learning and the development and implementation of DBE cannot be seen as separate processes. Lecturers' perception of collective learning is an important predictor for a successful development and implementation of DBE. The current study shows that DBE development and collective learning within the programmes are not fully integrated. Due to a lack of lecturers' collective learning, there is no optimal alignment in the students' learning environment, specifically, regarding DBE principles self-directed, contextual, constructive, and collaborative learning. In other words, a holistic DBE curriculum and a sustainable approach to teaching and learning seem to be a challenge. Moreover, lecturers in their role of curriculum designer and facilitator of learning processes are the linking pin between the professional industry and students' learning processes. They act as role models and stimulate dialogue, evaluation, and reflection with the goal to achieve collective learning outcomes. Therefore, improvement of the teachers' collective learning processes might also have positive effects on the trialogical processes among students, lecturers, and industry professionals.

A key priority should be the development of a shared vision of DBE using an inquisitive dialogue. This dialogue does not occur automatically, therefore lecturers should be supported to experiment with asking open and deep approach questions. Sufficient time and facilitation should be given to support an such a dialogue and to promote the university as a place "where learning is promoted and valued" (Kosnik, Niyata,

Cleovoulou, Fletcher, and Menna, 2015). This will influence the way lecturers perceive collective learning within their daily practice and will have a positive impact on the learning outcomes of students.

Chapter 4

Situationally developed design processes

Herman Blom and Martin Struik

Abstract

NHL Stenden is committed to providing Design-Based Education (DBE) and Design-Based Research (DBR). In this chapter, we examine the part that knowledge (obtained through research) plays in the design-oriented research conducted by the professorships. Is it wise to start with the significance of knowledge in a design process? Do we see different approaches of gaining insight, the deductive and inductive? In which phase of the design process is knowledge gained, what knowledge is gained, what is the role of the experts, how much interactivity is there with the stakeholders, what role does interactivity play in the subsequent process and most decisive: how does the creative leap come about?

Introduction

In the professorships of universities of applied sciences professionals and researchers work together on practice improvement. This integration of design and research is a new form of practice-based research. It is explicitly recognised that it is always research activities that underlie the design processes. But how? The way in which this research contributes to the creation of the design varies by design strategy. Thus, we put the design strategy at the centre. The design strategy is the way design processes are shaped. It is then always not only about designing, but also about research. Research processes serve the purpose of gaining insight into the most appropriate solution to design problems. They can of course also serve a broader purpose. After all, the design process is not only about improving practice, but also about developing knowledge.

In Design-Based Research it is important to be able to design elements of the solution in different ways. Design processes are related to the type of the problem and the experiences of the researcher in the specific field and the relation with the stakeholders. So, in which way the problem is complex. In all these solution approaches there is a role of knowledge.

We assume that all professorships, in some way or extent, give shape to design-oriented research. The intensity and manner vary greatly. The way they give shape to their research depends strongly on the professorships' design strategy. Much is bound up with the generally implicit choice of a design strategy, in particular the place and role of research, but also the choice of process model (cyclic, linear, nonlinear?).

The key question is: "Which implicit design strategy do the different professorships customarily apply?"

To map the design strategy per professorship, we took project proposals and reports as a basis. In doing so, we made a random selection from the projects, generally determined by the documents made available by the professor. We did not have the ambition or the pretension to be able to determine a definitive interpretation of the design strategy per professorship or domain.

Losse (2018) made a distinction between professional products as various elaborations of applied research: analysis, advice, design, manufacture, and handling. We will refer to this classification as to make an estimation of the products of the professorships because of the link with the design strategies. It will make the choice of the strategies more understandable.

This study has an exploratory character. The goal is to provide a first impression of the palette of design strategies in the professorships of NHL Stenden. Researchers will thus have the possibility of a common set of concepts that facilitates mutual discussion and the conversation about the choices made. So, our aim is to contribute to the vocabulary that can be used in a discourse about design-based research in NHL Stenden University of applied Sciences.

The creative leap
How does the designer make his choices, in what way do the design requirements come about, who or what gives the decisive influence? To answer this question, we use the term 'creative leap'.

The information available to a designer when devising solutions to design problems is, in fact, incomplete. This empty space must be bridged to realise a solution. The designer constructs a not yet existing reality based on imagination, which is by definition subjective (Rutten and Schijvens, 2014). There are no fixed ingredients, heuristics, or standards for the way in which the designer does this. There is also talk of the creative leap or the design leap in this context. Van Aken (2011, p. 50) emphasises that a design cannot be logically derived from the input of a design process. The designer always makes a creative leap to something that does not yet exist: 'designing is always an exploration of the possible' (p. 49). The creative leap is usually situation specific. That is, in different situations with similar design problems you may not always arrive at the same solution.

The creative leap, according to Plomp et al. (1992), is as the art of creating; the aha-erlebnis that occurs to arrive at a solution. Sternberg and Lubart (1999) conceive of creativity as the activities that ensure that something new and appropriate is delivered (both novel and appropriate). Here we would like to note that we conceive of "something new" as an idea, use or object that is experienced as new by stakeholders in the design context. It is therefore about the experience of newness.

Table 1. Tool 'The strategy matrix'

	Analytical strategy	Communicative strategy	Functional strategy	Expert strategy	Evolutionary strategy
Creative leap is expressed in ...	the connections the designer manages to make between the empirical data and theory and the way he stacks insights.	Knowing how to make visible and bring together the different conceptions.	empathy with the user and being inventive in finding ways to construct, put into practice and evaluate a prototype.	the associative thinking process in which the designer creates unique (thinking) combinations based on his own expertise.	monitoring the situation and stakeholders and creating optimal conditions for stakeholders to act.

Design strategies

In Strategisch ontwerpen (Strategic design), Blom and Van Lanen (2021) present a classification of design strategies. Depending on questions, objectives, research traditions and in particular the relationship with the environment, each domain seem to follow strategies with design processes that are appropriate for that domain.

The following strategies can be distinguished:

1. Analytical strategy. The logically consistent and linear approach to the design process is pivotal. The design is based on theoretical data and empirically obtained data.
2. Communicative strategy. The perceptions and visions of all stakeholders in the design process are pivotal. The design is based on broad consensus.
3. Functional strategy. The pursuit of practicality for users in the context of use is pivotal. The design is based on evaluations of tests that demonstrate that the design works in practice.
4. Expert strategy. The creativity, vision and expertise of the designer are pivotal. The design is basis on the designer's convictions.
5. Evolutionary strategy. Humankind's natural ability to shape the world to its will is pivotal. The designer creates conditions to activate stakeholders. The constantly evolving design is based on the learning process and the dynamic growth process that is rooted in practice and the resulting insights from stakeholders.

So, there are several ways to organise a design process. A designer can have several reasons (with underlying motives) for choosing a particular strategy. The designer determines the strategy based on the characteristics of the design situation. In this context, Blom and Van Lanen (2021) mention situational design with determinants for the choice of strategy. There is often one leading strategy, the so-called primary strategy, to which elements of other strategies can be added. These additional (secondary) strategies can improve the design process so that it can be geared more effectively to the specific characteristics of the design situation. The five strategies help professorships to strategically organise design processes and enable others to interpret the work of the professorships.

Design strategies of the professorships of NHL Stenden University of Applied Sciences

Which design strategies do the professorships of NHL Stenden University of Applied Sciences use? We want to give an indication that does not make any statement about the entire work of the lectureship or domain in question.

The analytical strategy is often reflected in the presentation of the professorships. In the domain of economy, it appears to be the dominant primary strategy by the professorships of NHL Stenden University of Applied Sciences. In the economy domain you can find many linear process models of the analytical kind. E.g., labour market issues require a lot of desk research. Insights are 'stacked'. We generally see a strong urge to acquire knowledge that results in advice, which is then discussed and elaborated with stakeholders for coordination and improvement purposes. The fact that there are many stakeholders in rather complex societal contexts makes it difficult to test prototypes cyclically and continue the intervention strategy beyond the point of testing and implementation. This complexity urges long time planning, that until yet has not resulted in interventions that have been brought in one or more implementation loops. Perhaps for these reasons, as a rule, analysis plus possibly an opinion are the professional products in the domain of economy.

Professorships in other domains use the analytical strategy as well. Though they use this strategy in a fairly unadulterated form, in general professorships are driven by a desire to first obtain the first required knowledge, and then they come up with a design that can be tested.

It is a misconception that the analytical approach would not work well in dynamic professional practice. We have noticed that these professorships make cyclical use of the analytical strategy, working through the design phases several times. The repetition enables one to view a problem at different levels or to tackle separate problems one by one.

The communicative strategy calls for all stakeholders to reach consensus on the design problem, the requirements, and the prototype. Stakeholders can influence not only the design process, but other parties as well with their input. However, they do not need to be involved at the start of the design process. What role do experiences or opinions of users, stakeholders play in the research of the professorships of NHL Stenden UAS? Who makes the design decisions: the users (experts) or the end users (users) or is it a consensus-based approach with stakeholders? This is about the role of co-creativity. Co-creativity here means that sharing knowledge leads to higher quality advice and interventions. The communicative strategy in the sense of a consensus or interactive strategy is not applied as a principal strategy throughout the entire design process. Tuning processes always play a role. Co-creation is often mentioned. Nevertheless, we never see the pursuit of consensus as the basis for the design proposal. For example, in the social and in the health domain, the end user is not often taken as the measure of things. So, the stakeholders' pursuit of coordination and consultation does not even seem to be dominant as a secondary strategy. In the technical domain, the knowledge basis acquired by the professorships is far too pivotal for using the communicative strategy as primary or secondary strategy.

The functional strategy – as classic form of design strategy - is spread across the domains. The Digital Innovation in Healthcare and Welfare, Serious Gaming, Data Science and Computer Vision, and other Smart Sustainable Manufacturing professorships represent the digital innovation implementation areas that seem to be ideal for research through design. These users work iteratively and involve end users in their test process. There are also professorships in other, non technic domains that test and further develop smaller intervention, namely Green Logistics, Multilingualism and Literacy and Sustainability in Hospitality and Tourism. The stakeholder as end user is used to enable iterative cycles around trials and prototypes. This short cyclical approach is also referred to as 'Design Sprints' or 'Sprints'. The end user has a crucial advisory role during design testing. The user's recommendation has consequences for the continuation of the design process. In these domains the prototype or fabricate are the most used types of professional products.

As we said, many professorships of the Smart and Sustainable Industries make cyclical use of the analytical strategy, working through the design phases several times. This repetition has a strong functional aspect, that is sometimes done by 'Sprints', e.g., the professorship Sustainable Plastics and Circular Plastics.

The expert strategy is apparent in the emphasis on top-down interventions, which seems to be the case in the educational domain. The search for knowledge in the social (and economic) domain is dominated by the creation of social technology. Stakeholders rarely seem to assist in designing tools but do provide input on the practical value of those tools. They are often a source of information (respondent) for the designer who strives

to map out the design problem and the value of the solution by means of a survey, (panel) discussion or observation. It is not the informant, but the designer who draws conclusions based on this information. Given the complexity of the challenges addressed, interventions are still rarely subjected to a testing process. Their intervention issues are often so extensive that test processes in the form of several iterations or even cycles are difficult to realise. However, some are now in preparation. More cyclical use is made of educational tools in the dynamic field of professional education. The designer seems to start with a solution which is only related to needs and any problems experienced at a later stage. These non-linear design processes are often difficult to plan and sometimes design decisions are in direct response to specific situations in which the designer carries out their task. This creates a paradoxical practice of 'support creation', 'vitalisation' or 'agency'. The designer gauges the observer's response to certain insights or ideas, and then decides whether to act on that response. In the educational domain we see a lot of prototypes as types of professional product.

Lastly, in the evolutionary strategy, problem ownership occurs only after delegation. In the evolutionary strategy, the designer strives to maximise the design flexibility for the stakeholders. Joint problem ownership applies. The designer facilitates the design process. This strategy is apparently used in the Small N-design professorship where the prototype is embedded in the draft design as a kind of action research. The Talma professorship and the Scenario Planning professorships would also like the stakeholders to take over the design process in a delegated process, with the idea that they would then assume the role of problem owner.

Conclusions

Thinking in terms of professional products (Losse, 2018), we can distinguish various elaborations of applied research. This is regarding the following professional products: analysis, advice, design/prototype, manufacture, and handling. We see almost all types of professional products for the professorships (except from handling). In almost all research projects of professorships prototypes are created in varying degrees and then entered in an iteration process. So, it's not surprising that we see the functional strategy a lot. Analysis is a dominant professional product as well. This makes obvious that the analytical strategy is widely applied, not only as diagnose as such, but as a diagnostic/preparation for the determination of the prototype as well. That prototype can be visible as a design, but also as a fabrication. At the end, in line with DBE, we see a great variation in strategies. Nevertheless, there are opportunities to increase the variation in DBR strategies. There are several reasons to address this variation.

Do we see a difference in strategy between that of the professorships and what we expect of students? This possible discrepancy could have consequences for what we expect of students and how professorships do work. A more substantive question is the following. What does co-creation mean? After all, the term occupies a prominent place in the discourse on DBR. Various forms of stakeholder participation can be distinguished in the design process. The amount of influence on the development of the design and thus the role of the participants can differ. The question is how the design flexibility is distributed between the designer and stakeholders in the design-oriented research conducted by professorships: participation, sharing of experiences, consultation. We see a whole range of positions of the designer in igniting the spark for the creative leap. All positions on the scale between the decisive position of the designer (expert strategy) until the decisive position of the stakeholders (evolutionary strategy) are linked to a toolbox of research methods and creativity instruments. Reflection on the use of this toolbox could facilitate the composition and structure of the curriculum. The functional strategy is linked to the origin of DBE: prototyping. We see the functional strategy clearly

in the domain where it has gathered a following, namely those of social media and technology. It must be investigated under what conditions the functional strategy can be done justice in other domains. Professorships can learn from each other in this respect as well. Then there is the expert strategy. Too often it is the experts who decide among themselves what the design requirements should look like. Is that what we want? Is that typical and good for the many areas in which we see the primacy of the expert (education, health care)? If so, it is good to account for it and bring forward the associated techniques of data collection, creativity, and analysis. There are also opportunities here for curriculum development.

A last remark: It seems that the implicit choice of professorships for a design strategy has to do with choices that go back to epistemological principles do you go inductive or deductive? Do you take existing knowledge and theorizing as a basis - the deductive approach - or do you try to add knowledge by gathering facts - the inductive approach? We see particularly in the field of economics the deductive approach, while in technology and ict the inductive approach seems to dominate. Starting with prototypes to arrive at a successful fabrication in a process of trial and error can lead to visible results faster within a DBE environment. The question is under what conditions a more deductive approach can produce visible design results.

Table 2. Design strategies of the professorships of NHL Stenden University of Applied Sciences.

	analytical strategy / *Evidence based design*	Communicative strategy / *Consensus based design*	Functional strategy / *Practice based design*	expert strategy / *Authority based design*	evolutionary strategy / *Action based design*
Related terms	linear, instrumental, or rational strategy, waterfall method	deliberative, communicative or interactive strategy, relational approach	rapid prototyping, pragmatic strategy, user experience design (UXD or UED)	expert strategy, connoisseur approach, artistic approach	(complete) co-production or (complete) co-creation, open innovation, learning organisation
Role of the designer	analyst theorist researcher scientist	connector mediator creator	experimenter pragmatist go-getter	authority expert connoisseur specialist	organiser facilitator stimulator supervisor/coach booster
Role of the stakeholders	informant	collaboration partner	expert by experience /consultant	observer	problem owner
Participation moments	At the start of or after the design process to get feedback.	During much of the design process, in the event of large interest groups, participants who represent their colleagues can switch during the process.	In some sub-processes of the design process, particularly testing and implementation.	Few, possibly at the start or the end of the process or during delivery moments of intermediary products	Throughout the entire design process
Manner of participation	The informant provides information at the initiative of others.	The cooperation partner contributes to and has a say in joint planning, for example in a project group, but is also dependent on the influence of others.	The expert by experience gives their opinion on the design problem and (interim) solutions.	The observer plays no active role and is mainly a recipient of information. At times, the expert by experience acts as a mirror.	The problem owner initiates the design process and, in any case, has a direct and active influence on the origin, progress and execution of the design assignment.

The designer uses prototypes or draftdesigns as ...	a means of communicating the progress of the project upon completion of project phases.	a tool to visualise perspectivesand to reach consensus	a preliminary version of the solution that can be testedwith users with a view to improvement.	an aid during internal andexternal discussions.	a semi-finished product thatshould galvanise and encourage stakeholders to develop the product.
Creates support by...	using a consistent and traceable working method and providing evidential value.	including the interests of stakeholders in the design.	demonstrating that the designworks in practice.	adding a persuasive narrative to the design and/or ensuringexclusivity.	making stakeholders themselves responsible forthe design.
Process flow	Linear occasionally cyclical as well	non-linear linear	cyclical	non-linear occasionally linear or cyclical as well	cyclical occasionally linear or cyclical as well

Chapter 5

Being Aware: Responsible Consumers Asking for Purposeful Products and Services. Designing an Interdisciplinary Research Minor at NHL Stenden

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Abstract
This paper describes the process of creating a Design-Based Minor, while also applying the principles of Design-Based Research during this early stage of educational development. The authors show how elements of Design-Based Research and Education, such as early involvement of stakeholders and a multi-disciplinary approach, can help when developing a course and fostering a new cooperation between research groups.

Keywords: Design-Based Education, Design-Based Research, Purposeful Entrepreneurship, International Entrepreneurship, interdisciplinary cooperation, Education Development

Introduction
The introduction of Design-Based Education and Research (DBE and DBR) at NHL Stenden UAS in 2018/19 set the framework to develop a concrete idea for collaboration between departments, which could involve researchers, students, and lecturers as well as the work field (enterprises, public authorities, public and private organisation etc.). We, Professors and Researchers of the research groups for Purposeful Entrepreneurship, International Entrepreneurship and Organisations and Social Media, were looking for a way to integrate our research and educational goals. Through meetings, we soon realised that all three Professors were interested in questions related to sustainable consumer dilemmas and awareness products, in combination with 'purposeful entrepreneurship' and 'meaningful communication'. These are all issues that also fit the current Zeitgeist. In addition, we all spoke with several Small and Medium-Sized enterprises (SMEs) that also struggle with these dilemmas. These dilemmas form a 'wicked problem', waiting to be 'solved' by young fresh minds.

We agreed that this could present an interesting opportunity to collaborate on this specific issue: all three research groups have a pertinent body of knowledge, with only differences in perspectives due to different academic backgrounds. Furthermore, collaboration between our research groups would also benefit the three academies involved (the Academy for Commerce and International Business, the Academy International Business Administration and the Academy Communication and Creative Business).

Within the three research groups and within the linked study programmes, but also within SMEs, the concept of ethically responsible entrepreneurship is gaining popularity and traction. Research as well as teaching carried out within our research groups often

aligns on this subject and would stand to benefit from interdisciplinary collaboration. Having considered that, we decided to set up an interdisciplinary Research Minor on the topic described. The goal of setting up such an interdisciplinary cooperation in the form of a Research Minor should be that students will learn by trial and error, focussing on issues that come straight from the work field. Consequently, this is a great opportunity to not only develop and teach a design-based Minor, but also use the DBR/DBE principles, which encourage multidisciplinary cooperation, to shape this Minor.

In summary, the main reasons for the collaboration to develop a new research-based minor are:

- Interdisciplinary collaboration in a very practical sense between staff, students, and professionals, which will make sure questions and dilemmas from the field will be answered from a variety of perspectives
- Stimulating student participation in research on a topical and urgent issue
- Establishing and expanding a heterogeneous network for students, professionals, and staff
- Creating a platform to work within DBR/DBE, which will also use DBR/DBE to improve over the years
- Contributing to the research projects of three research groups
- To experience the DBR/DBE method for ourselves, by taking a design-based approach to developing this Minor.

Background Idea
Against a background of discussions and increasing awareness about the urge of climate change, environmental issues and increasing inequality, it is hardly surprising that one area of focus in contemporary Business Studies is concerned with the question how to create more purposeful products and services for consumers who are increasingly aware of their spending.

Most people would agree that purposeful products and services are desirable. However, creating this kind of business is not just an ethical issue, but also an economic one. In current literature on related topics, we can see that moral issues in economics play an increasingly important role. Humans are no longer considered to be a homo economicus: making completely rational decisions, aiming for profit maximisation as Raworth (2017:127) states:

> *"We wasted two hundred years staring at the wrong portrait of ourselves: Homo economicus, that solitary figure poised with money in his hand, calculator in his head, nature at his feet, and an insatiable appetite in his heart."*

In contrast to this image, consumers tend to be increasingly aware of and concerned about the consequences of their acts on the society they live in and on the environment. In short, a trend can be seen that economic perspectives have changed, moving from the theoretical completely selfish perspective towards acting more responsibly and collaborative. The awareness that a perceived change in human behaviour can make a real change in the world of business is a trend which has just started a few years ago (cf. Klomp, Wobben and Kleijer (2016); Raworth (2017)).

This trend has led to increased attention within Business Studies to themes such as sustainable business and circular economy. Some of these themes focus on the business processes, some on innovations in production techniques, or some even on the policy

side – however, for the collaboration project, we would like to get a broader view of both the consumers' and the producers' side by looking at the phenomenon of 'awareness products and services'.

Awareness products (services) can be described as products that benefit the individual human, (parts of) society or – AND in the best case – the environment. Awareness products are often an alternative for common products that are normally cheaper or more readily available. Therefore, the consumer often must search to find an 'aware alternative'. Sometimes the consumer must pay more for an 'aware product' than for a common one. Sometimes they will have to go out of their way to find a shop or an online seller who will stock the product. Awareness products can sometimes be products that belong to the category of 'luxury articles' and might therefore not be affordable for everyone. This is especially the case when 'awareness products' belong in a market niche (e.g., only available from specialised eco-friendly shops, rather than more popular stores). They tend to only get more affordable when these products make the shift from niche towards mainstream markets.

The consumers' choice to buy an awareness product and the producers' choice to produce an awareness product is based on several decision-making factors. There are two mechanisms that can be seen: While the producers (entrepreneurs) keep an eye on the profit and profit margins of their companies and therefore depend on the economic interaction of markets, consumers do have leverage by making aware choices in their spending. When consumers behave more 'aware', producers must adapt their production and can also make a shift towards awareness products. Otherwise, entrepreneurs can decide to become more aware, 'purposeful', in their business plan, finding a niche market for their product or service, which is produced in such a way that it has a less harmful impact on the world, within affordable profit margins and financial
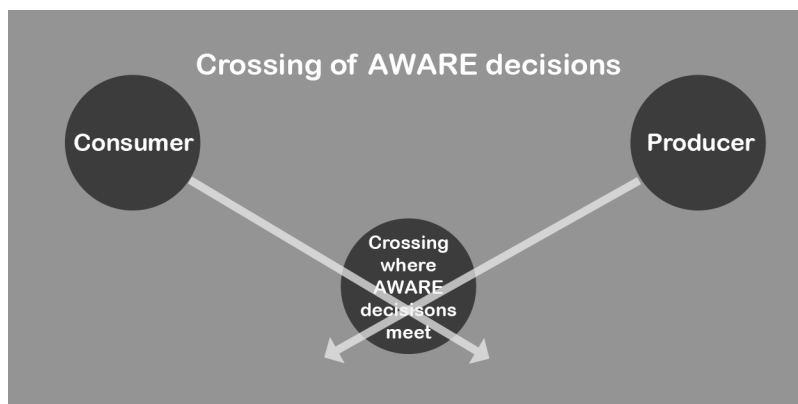
Figure 3. AWARE decisions.

security.

Figure 3 illustrates the crossing of aware decisions of consumers and producers. With this intersection comes the sustainability awareness dilemma that will be the core of this Research Minor:

At the crossover point, two main questions will play a major role:

1. How can consumer behaviour or demand influence the variety and rise of alternative awareness products on a market?

2. How can producers influence consumer behaviour by offering aware alternatives?

This sustainability awareness dilemma can be translated into many smaller research questions. For the consumers we can ask, for example:

- 'How do consumers budget for the luxury of a so-called awareness products?',
- 'Are consumers willing to pay more for 'awareness products' – and with that buying less of common products? What is the tipping point for changing a decision?',
- 'Under which circumstances or conditions are consumers buying awareness products?'.

On the other hand, we do also handle the perspective of the producers/entrepreneurs by asking questions such as:

- 'How can we develop aware alternatives for common products?',
- 'How can awareness products "cross the chasm" from niche products in niche markets towards mainstream?" (cf. Moore (2014),
- 'How is it possible that awareness products/services are successful on some markets but not on others?',
- 'How to generate a more aware value-chain'?
- 'How to communicate the awareness of the product meaningfully online and offline? (Schulz, van der Woud, and Westhof, 2020)
- 'How to develop/design/produce/sell the alternative 'awareness' products?',
- 'How to conquer new (international) markets with awareness products that are doing well on the home market?'
- 'How to generate innovative new business models for awareness products/services, overcoming barriers' (cf. Chesbrough, 2010)'
- How can digital data support the development of new business models for awareness product/ services' (Schulz and Faber, 2019)?

Students can use their respective specialisations to add to the group work, but also gain insight from other students' strengths due to the interdisciplinary nature of the Minor. For example, Creative Business or Communication students may be more familiar with the use and analysis of social media (data) in business and communication and Business Administration students with financial aspects, while students of the study programme of International Business are experts in setting up (international) business- and marketing plans. During the development of the content of the research-based Minor, the learning outcomes will be formulated as well. In the next section, we will show how all principles mentioned above were implemented in the design process.

Design process: From an idea towards setting up concrete structures

Since the Minor will be design-based, it was decided to also use a design-based, iterative approach to educational planning (following Chance, 2010). The step-by-step procedure
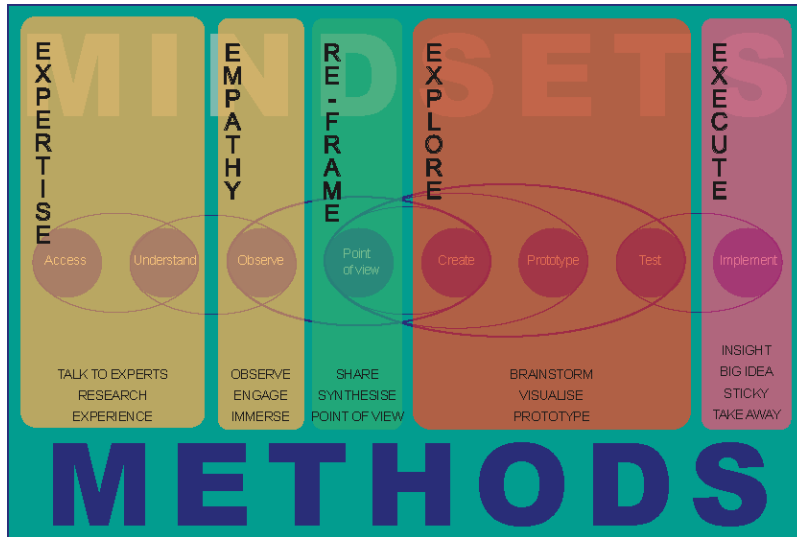
Figure 4. The Stanford model
(https://hci.stanford.edu/dschool/resources/design-process/gallery.html)

as described by the Institute of Design at Stanford (USA), illustrated in Figure 4, is the method we followed in our design for this Minor. This model provides guidance for faculty who are considering incorporating Design Thinking projects in their business classes. For such projects the complex, iterative processes of design are structured into a few phases: Expertise (problem finding); Empathy (observation); Re-framing (sense-making), Explore (prototyping and testing) and Execute (design the innovation) (following Glen, Suciu, Baughn and Anson, 2015). As such, design thinking can guide creativity. "Creativity is a process that everybody can implement [...] design thinking is a framework and method that fuels creative confidence which is fundamental for innovation"(Plattner, Meidel and Leiffer, 2015, p.5) and from creativity, innovation can be generated, as Fraefel (2014; p.9) claims: "[it] is an ongoing process of innovation – implementation will be accompanied by the research team – stakeholders in the field are not only data providers, but also actively customise the design, effects are continuously analysed allowing for prompt adjustments to the implementation."

For the iteration process in designing this minor, we followed the steps from the Stanford model (see Figure 4). Our own specific iterative process is schematised in Figure 5. Each circle is an iterative step, in which the red arrow signals the self-reflective process of the design (following Adams and Atman, 1999) and each step can be identified within the Stanford model as well.

The first round of iteration started in the period after the involved Professors committed to the Minor plans. This round consisted, next to defining the topic in more detail, of finding support in the three aforementioned academies. Since interdisciplinary, faculty-transcending Minors did not appear to exist at the university yet, information about organisational possibilities needed to be acquired (compare Shavelson et al., 2003).

Furthermore, since there is a large selection of Minor programmes already available at NHL Stenden, checks for overlap and repetition needed to be carried out. This was done by reading the descriptions of several Minor programmes and trying to get in-depth
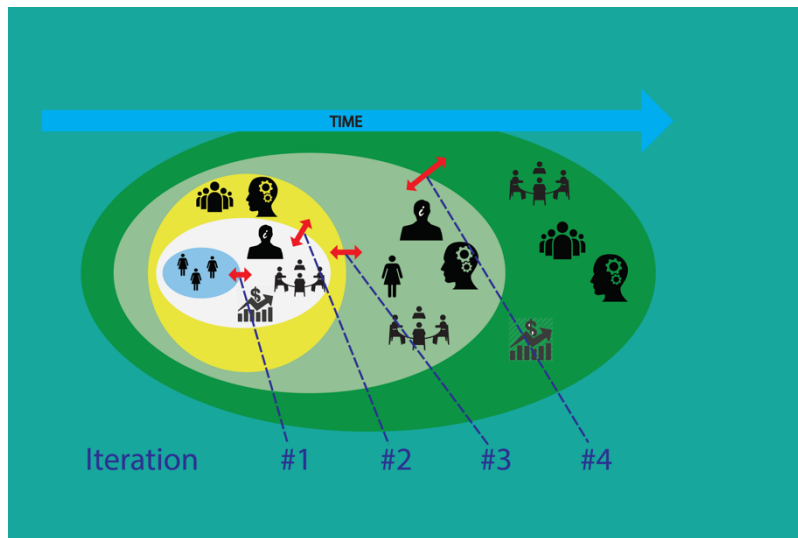
Figure 5. The iterative process schematised.

information about those that seemed to be thematically close to our plans. Thirdly, the financial aspects of participating in the Research Minor supply needed clarification. With a list of (im)possibilities, we reflected upon the Minor plans and the position of the minor within the university. The first three stages of development meant in practice: have many conversations with several persons within and outside the own organisation and trying to combine links, networks, content, and topics.

At the same time, the topic was discussed externally with companies with an interest in the topic. During discussion with those companies, the issue of awareness was raised on the aspects of people/society, the products/services and/or on production/logistical issues. Companies and section-clusters we have spoken to were keen on our first ideas and willing to support the further development. They offered to participate in the first pilot years of the Minor to give the students concrete and real cases for research.

After gaining a lot of initial internal and external information, we then searched for possibilities to tackle the question of 'how' such a Minor should be set up, since the 'why' question, based on the content of the plans, was already answered.

The 'how' to implement an interdisciplinary study programme like this Research Minor was not that easy to answer, because in a university that is still in the early phase after a merger, basic administrative infrastructure is sometimes missing. To make it workable, we set out to talk to other Minor teams who work in similar fields (economics and entrepreneurial topics) and/or who have been using the DBE strategy for a while.

Basically, this first iteration was related to the 'how'-question: we figured out that we would have several possible ways to implement the Minor plans:

1. Introducing the topic as shorter assignments within existing Minors,
2. In a cuckoo's egg construction (our own term), i.e., we could "borrow" an existing Minor that has a strong affiliation with the topic to make a pilot for this minor,
3. Making the minor part of an existing Master's programme (cf. Chance, 2010), or
4. Lifting the idea to the level of an Master's programme

This iteration round reflects the expertise phase from the Stanford model.

The second iteration round was a workshop that we organised with a group of students who participate in the 'Claim your Future' educational programme by NHL Stenden and Friesland College, and which was related to the content of our Research Minor plan. This round, we tried to answer the 'why'-question: we wanted to discover 1) whether the initial idea of 'awareness products' is an issue of interest for the students, 2) whether the students and the professors 'spoke the same language' when discussing awareness products and 3) what the students wanted to learn about this topic, like the design work as described by Adams and Atman (1999).

This was done in a brainstorm session with three rounds. In each round, the students would get a very short introduction about the questions above. The students would each get a pen and they were asked to use free association in relation to the questions on a large piece of paper. Afterwards, the discussion leaders asked the students for explanations of their written content. Those findings were also written down on the same paper. The photo in Figure 6 shows the atmosphere in which we did the brainstorm session. This round reflects the empathy phase from the Stanford model.

Very soon after start of the workshop, it became apparent that the way we defined a category of 'awareness products/services' was not the way students would define it. Listening to the students' opinions and their explanations of their experiences of daily life, meant that we had to adjust our own definition slightly, which we did in the introduction of the topic.

From the short description of what the Minor planned to do, the associations the students had were immediately leaning much more towards general sustainable products such as food items, beverages, and stationery. In the reflection session, this led to shifting the focus from specific 'awareness products' as a category of 'luxury products' towards more general, everyday products that can be bought in sustainable ways and that are sustainable alternatives for common products.

Furthermore, in this round it became apparent that students have a strong interest in the topic and very specific ideas about what kind of educational involvement they envisioned for themselves, such as staffing an information desk for one-stop shopping advice. They also initially associated different products with 'awareness' than the organisers, e.g., products for daily use rather than luxury items, making it clear that expectation management around the Minor needs to be clear when introducing terms that can be new for students, like 'awareness'. The results from the second round of iteration fuelled the third iteration. Here, the result inspired a reflection on, and subsequently an adaptation of, the Minor design, taking into consideration the viewpoints and suggestions expressed by the students.

Later in this process, a lecturer joined our group, and the four of us shaped the content of the Minor plan. The aim and learning outcomes of the Minor were also further defined after the brainstorm, taking into consideration the learning goals of the three programmes involved.

Although a Research Minor usually stands on its own and can function as a widening of students' horizons (rather than a specialisation), and the design is interdisciplinary in

Figure 6. Students in a brainstorming session

nature, we also found it useful to look at what outcomes the study programmes connected to the three research groups might have in common. All outcomes mention 'ethical responsibility' as an important quality for students that the study programmes should foster. This is a useful bridge between the different research disciplines as well as the connected study programmes – a foundation which students will most likely have in common.

For example, a student from Creative Business is working towards an entrepreneurship learning outcome described as "[performing] commercial activities in a sustainable fashion and/or contribute to sustainable and social responsibilities while working. Have a sharp eye for a wide range of sustainability issues relevant to development, production and distribution" (Teaching and Examination Regulations Bachelor Programme Creative Business 2018-19). At the same time, Business students are described as follows: "Value oriented professionals, our business bachelors are not simple followers, but are professionals who relate to societal and sometimes ethical questions, they have the cultural background, knowledge, the critical attitude and curiosity to be reflective towards well-being and welfare in life" [authors' translation] (Landelijk Opleidingsprofiel Bedrijfskunde, 2018). Finally, an International Business student is supposed to show ethical and social responsibility by "[formulating] one's own position concerning ethical and social responsibility in a professional environment at societal level." (Teaching and

Examination Regulations Bachelor Programme International Business 2019-20, appendix 3)

For this Research Minor plan, 'ethical responsibility' is a clear focus and therefore needs a solid definition, combining aspects deemed important by the different stakeholders. Seeing this, the idea of awareness products and services, responsible consumers and producers seem to fit in the current Zeitgeist, but also in the learning aims of the several academies involved. As such this contributes also to the development of 21st-century and research skills.

As a general framework, four general learning outcomes present in existing study programmes within the research groups will be used. These outcomes are linked to the content of the Minor, the goals of the research groups, the learning outcomes of the study programmes involved, and to students' personal development.

Afterwards, another brainstorm session was organised with our group to clarify the precise goal and construction of the future Minor, following models by Chance (2010). The content of the Minor was tweaked to give greater emphasis to sustainable consumer dilemmas, and the 'cuckoo's egg' construction was given preference for the moment. The described processes reflect the re-framing phase of Stanford model.

The now more specified content and future programme of the Minor resulting from this third iteration round formed the starting point for the fourth iteration. This fourth round was conducted once more in a workshop setting with 'Claim your Future' students, this time from a different cohort, so the students were completely fresh to the idea. The group was confronted with the new ideas about sustainable consumer dilemmas and discussed how this would be attractive to potential students following this Minor in the future. This round reflects the explore phase of the Stanford model.

CONCRETE PLANS: FIRST IDEAS OF REALISING THE DESIGN-BASED MINOR

Next to the iteration cycles to define the content of the Research Minor, formulating learning outcomes also must be a step in the development process. The general learning outcomes connect the research interests of the three research groups and can be formulated as follows:

1. Generate a value system within the future professionals for ethical responsible consumers, and future employers and entrepreneurs
2. Enhancing research skills
3. Being able to work and think in an interdisciplinary context by cooperating with staff and students from different disciplines and backgrounds, allowing a problem to be approached from various perspectives
4. Being able to do primary research to create empirical evidence on topics related to (international) requirements/certifications/labelling of products and services. Students will create a working knowledge of the theories behind their topic
5. Provide students with a set of 21st-century skills, with an emphasis on leadership

The concrete output of this research-based Minor can vary from a classical business plan to designing a new product or setting up a distribution strategy. The aim is to split up bigger questions from the work field into smaller sub-questions, which can be investigated by interdisciplinary student groups. To get students out of their comfort zones, the students will work in fields with which they are not familiar. To provide each

group with some guidance apart from the lecturer/supervisor, students who do have experience in a field will be asked to be mentors. This means that student groups will work on sub-questions, and, at the same time, members of the groups will support other groups in a mentor role. This way, students will be provided with the possibility to develop leadership skills and will also be able to work and cooperate in a team.

CONCLUSION AND FUTURE OUTLOOK

Developing this Research Minor according to design principles has given all stakeholders a chance to be involved. DBE as well as DBR is involved in this Research Minor twice: on the one hand, the Research Minor will adopt the DBR way of working and students will conduct research in interdisciplinary groups together to create solutions. On the other hand, the method used for setting up this Research Minor has also been based on DBR. Carrying the design out in different iterations helped the collaborating research groups to define the needs and wants of the stakeholders more precisely, and led to meeting these stakeholders to create heterogeneous networks for students as well as professionals. We have found that DBE and DBR allow the Professors of the research groups "to realise crossovers to answer complex questions from companies at all 3 levels: regional, national and international" (Strategisch Onderzoeksbeleid, par. 9 b). As such, the DBR-based Research Minor can be a highly suitable platform for collaboration on all fronts.

As stated in the introduction on the main topic of 'awareness products and services', the idea for the Minor ''Being Aware: Responsible Consumers Asking for Purposeful Products and Services. Designing an Interdisciplinary Research Minor at NHL-Stenden" started with the mutual research interest of three professors of NHL Stenden. All three had an interest in sustainable consumer choices as well as purposeful entrepreneurship, albeit each from their own research field: meaningful communication, purposeful entrepreneurship, and international entrepreneurship. The preliminary idea was to focus on the production process of a sustainable product throughout the value chain, focusing on products in the luxury segment (natural cosmetics, circular shoe wear etc.). Moreover, the design of the Minor would have to suit three objectives: interest of the students (and students' learning objectives), the research goals of the professors, and the Design-Based Educational concept of the University.

Concluding, we can argue that designing an educational programme through DBR/DBE principles does provide the inclusion of the end-user (i.e., students and companies) in an early stage and hence generates many options for adaptability to specific wishes and expectations from all stakeholders. Especially the empathy and explore phase of the Stanford model are very helpful to get a grip of all wishes and demands. We feel that going through the iterative phases of the design of this Minor is an important contribution to the University's mission of 'worldwide innovation' - a symbiosis of education and research creating a community of learners, aimed at finding sustainable solutions to practical questions." (Strategisch Onderzoeksbeleid 2019- 2024 (p.7). The one dilemma we did encounter, is when to stop involving more parties. More input can certainly lead to more ideas, but an endpoint (or, at least, a pausing point) is needed to proceed in a practical sense.

For the foreseeable future, the cyclical nature of the design-based method combined with the cyclical nature of the academic year will also afford us the chance to (re)evaluate and improve the Minor. The same methods used in the design of the Minor will allow us to keep shaping it, making sure we can keep up with the latest research questions from the field and the latest knowledge.

Chapter 6

Ocean Technology - From KAOS to new balance

Rob (R.E.) van Ree

Abstract
Ocean Technology is based on Terschelling. The four-year BSc course was initialised in Amsterdam 1979 as "Hydrografie" and moved to Maritime Institute Willem Barentsz in 2002. Since 1982 the training programme has been recognised as Cat. A by the International Hydrographic Organization, so it satisfies an international definition of the profession. Through the years the course was successful also when audited by NVAO[1]. Early 2018 the management team was challenged in a three-day session named KAOS (www.kaospilot.dk) to see how DBE could be applied – the core notion being that designing is a great way to learn. As measurement is a central theme in hydrographic applications, design planning comes naturally. The process of brushing up the course programme applying common sense principles like those provided by DBE is in full flight. The current request to inventorise the state of the course programme and introduce amendments halfway audits (both by NVAO and IHO) is a natural opportunity to implement DBE concepts in the basis.

Keywords: marine environment, international, flexible, contract, measuring, 21st century skills, design-based education (DBE), new programme.

The professional field – developments and application
Mission
The four-year hydrography course Ocean Technology at Maritime Institute Willem Barentsz aims at providing students a comprehensive and actualised reference of knowledge and skills based on the hydrographic requirements[2], to enable their competent performance when entering the professional field at operational level. The application of the body of knowledge and skills, as well as communicational and learning capacities and a critical judgement on issues relating to hydrography form an essential part of their competence. This includes awareness of personal talents/gifts and development of human and social skills and competences. Students completing the course, graduate with a diploma BSc Ocean Technology.

Vision
Traditionally the central focus of hydrography is the determination of water depths. In a modern setting the hydrographic surveyor provides an image of the invisible world under water by deploying acoustic techniques. Closely related subjects are positioning, both above and below the water surface, tides, waves and currents and associated data processing and imaging techniques. A hydrographic surveyor is predominantly occupied with physical measurements in and around the sea or inland waters. He or she works

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[1] Accreditation Organisation of the Netherlands and Flanders
[2] S5 FIG/IHO/ICA FIG = Fédération Internationale des Géomètres, IHO = International Hydrographic Organisation, ICA = International Contractor Association

autonomously or in teams in projects for which such measurements and certain human and social skills and competences are essential.

The process of hydrographic activities generally consists of six phases: acquiring projects based on tenders, developing survey manuals, equipment, and software, preparing and conducting data acquisition, processing the data and presenting survey results in reports, charts, and digital products. The IHO Standards of Competence (SoC) are encompassed by these six contract phases. As from January 2017 the SoC were restructured, there needed to be a recap of the course. A great chance to redefine modules and the balance between theory and practice.

New developments within the hydrographic world have nearly all been based on the electronic gear shift of the last decennia. Some key features are continuous highly accurate positioning both with Global Navigation Satellite Systems (GNSS) above water and with acoustic systems under water, measuring depths with swath sounders, seabed classification, and modern current and discharge measurement.

Of course, the ever-stronger automation of data acquisition, processing and presentation is also based on growing computer capacities, extensive software, and clever algorithms. Airborne measurements with Lidar and data acquisition with remotely controlled or autonomous underwater vehicles are also to be mentioned. For the course programme, this means that the earlier generation of radio positioning equipment currently has become less important. The many aspects of multibeam echo sounding are emphasised much more than in the previous decade.

Because of worldwide cooperation and the growing number of international projects in the field, surveyors are far more frequently operating in a multidisciplinary and culturally diverse environment/setting. This requires flexible professionals with a sound package of human and social skills and competences.

In short, Ocean Technology is a well-established educational programme to become a self-assured/confident hydrographic surveyor at operational level. It is comforting to know and of immense value to the programme developers that the main outline of the course content is internationally defined.

Solid foundation – international definition
Sectors
Clients requiring hydrographic information are mainly distinguished in three groups: [1] dredging companies, [2] survey companies for offshore operations, and [3] those for governmental tasks. Several main global dredging and coastal engineering operators are based in the Benelux.

These companies serve a large part of the international market, often in project specific joint ventures. New vessels are produced often with ever increasing capacities to improve their production rates. Dredging is a technically advanced discipline, relying heavily on hydrographic survey work. The more so as the settling of accounts is often based on the dredged or reclaimed sediment volume, as determined by subtracting pre- and post-dredged survey results.

Although most dredging companies employ their own surveyors, they may also hire additional personnel. Survey companies supply personnel, equipment, and expertise to the offshore industry. In many projects survey companies hire vessels of opportunity, equipped with either owned or rented measuring systems and personnel. Such chains of contracted activities, varying from project to project, are typical for the hydrographic world. Many contract forms exist, either project specific or annually varying, such as annual contracts to carry out pipeline inspections, site surveys and/or rig moves.

Government responsibilities include the production of nautical charts and marine data and recording changes related to the navigability of the waters under jurisdiction. These tasks have been formalised in the UN Convention of the Law of the Sea (UNCLOS). For the Dutch continental shelf beyond the territorial sea, and for the coastal waters of the Netherlands Antilles, this work is the sole responsibility of the Hydrographic Service of the Royal Dutch Navy. The Service operates two vessels, new in 2004, for the systematic survey of the continental shelf. Data acquisition is carried out by navy officers, who generally receive their hydrographic training at HMS Drake in Plymouth. Office personnel includes civilian hydrographic experts. Inshore and inland hydrographic management is the responsibility of Rijkswaterstaat, part of the Dutch ministry of Infrastructure and Environment. A close liaison exists between the two institutions. Rijkswaterstaat is a nation- wide organisation with regional divisions, each with their own vessels and personnel.

Career opportunities
With the expected increase in global population, in specific also in coastal areas, the level of human activities on the edge of land and sea is very likely to increase. This is shown by the extended search for fossil fuel – drillings are conducted at ever increasing water depths; the proven reserves are still greater than the total amount used to date – and wind turbine farms, traffic separation systems, fixed shore connections, offshore airports, etc. Dredging operators play a significant role in all such activities.

The starting professional hydrographic surveyor will witness all phases of the survey process. The speed with which his or her responsibilities and degree of autonomy grow is clearly dependent on individual accomplishments and the nature of the organisation. The functions online surveyor and off-line data processor on board will be the most important ones during the first years. Some five years seniority often leads to becoming party chief of small sise operations, gradually moving into larger and more complex projects. Alternatively, larger projects require advising and quality related activities on board, such as survey report compilation, along with leadership and management skills/competences.

When the international character of the data acquisition phase eventually loses its appeal a variety of shore functions is available, such as survey manager, project manager, technical manager, or operations manager, depending on the organisation's structure.

The professional field fully endorses our commitment to the internationally defined space.

Design and implementation of the new structure
During the evaluation of the course programme for the two visitations (IBSC and NVAO), a sense of urgency – to comply and obtain some years of experience with the new edition of SoC – started and continued to grow into an action plan. Coincidentally the lecturers of MIWB had a three-day session called KAOS, introducing DBE to our day-to-day work.
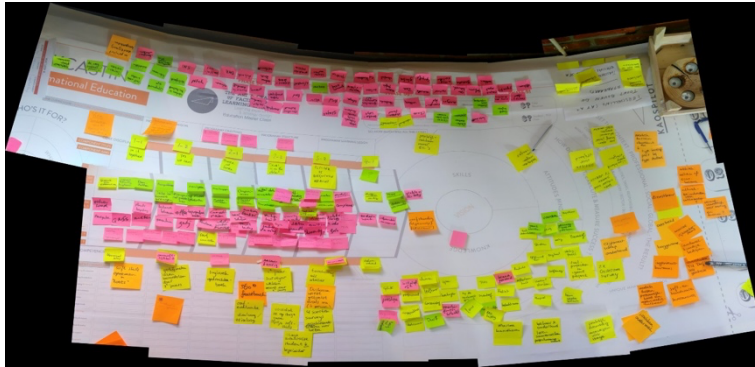
Figure 7. KAOS: three days to develop the ideal structure of all practical exercises for Ocean Technology students

The group size was exactly right to enable lecturers involved with Ocean Technology to co-operate. We selected the "ideal structure of all practical training aspects" as theme to work on. We as lecturer group agreed that any change in course design should start with redefining all practical aspects and then mould the (supporting) theory and complete the design by filling in remaining time with theory not directly related to any practical exercise.

Furthermore – with an eye to students using the seventh semester for completion of a minor not necessarily of hydrographic nature – we agreed to use three years to work on the learning outcomes as defined by the SoC.

MIWB has had a major refurbishment during the academic year 2018/2019. We at Terschelling decided to go for simultaneous introduction of the new programme in the same year.

Previous IBSC audits (1982, 1990, 1998, 2008, 2013, 2016) were compiled around a database containing a comparison of hours spent on the SoC subjects in all programme modules and inversely the composition of each programme module. Naturally, this led to several mismatches, for which a reasonable explanation had to be available.

As it was, the overall match of programme and standards was sufficient, as the course was recertified in April 2015. It was emphasised during the audit (in Brest, France) that the character of changes to the SoC was such that the existing approach would no longer be acceptable. That is the main reason for overhauling the program. Simultaneously DBE was recognised as guiding principle, and it was logical to let the redesign be governed by it.

The relatively small number of students used to make it necessary to combine modules as much as possible for all students of the two main BSc studies at MIWB, Maritime Officer and Ocean Technology. After five to ten years this type of management optimisation has resulted in fragmentation and slight deviation of the intended ideal. The most noticeable aspect was the vast number of tests which the students had to perform.

Spring 2018 was a suitable moment to sit back and have a look at the status, and the way forward with Ocean Technology. In short: If we were to design the entire four-year programme of hydrographic training at operational level, this is the result.

DBE invites all stake holders to speak out and let their arguments, their stake, be heard. Documentation of the project might be with one supervising coordinator, but characteristically the plan is open for amending. After a basic design explaining the limiting conditions, a consulting round was held with colleagues, management, representatives of the professional field, educational specialists.

And the students? Yes of course, they had their views included directly after the previous step. In that order, for two reasons: first it reduces the chance that higher order notifications spoil the fun, as they have already had their moment of reviewing the outline. Therefore, if the plan is committed, chances for completion are getting increasingly realistic. And the second reason is that there still is the leading hand of the lecturer, who has generally the widest field of view.

It's time to introduce the basic guiding rules for the fulltime 208 weeks education Ocean Technology (new style 2019). Many aspects are under review. Changes aim at inspiration, (self-) awareness, efficiency, and actualisation. The two clearest changes are that each module has two co-lecturers, and that the total number of tests is reduced from well over one hundred to just 36.

The new model is made in accordance with the IHO/FIG/ICA Standards of competence for hydrographic surveyors (downloadable publication IHO S5-A). The relation of the education programme/module content to the S5-A chapters has been made one-to-one. The modules each reflect part of S5-A. All parts of S5-A are covered once in one of the modules.

In conjunction with hydrographic education and training a 'strength-based' development programme starts (2nd year). Students become (more) aware of their 'natural' gifts/talents which can/may be used to strengthen one's skills/competences. These will be assessed during survey projects at school (by both students and lecturers) and apprenticeship (3rd year, by external mentor).

The programme has been assigned 240 European credits, 60 ec per year. At MIWB we agreed with the other education (BSc Maritime Officer) to change from 4 to 3 periods per year, extending the periods from 7 to 10 weeks. After 5 weeks of teaching, there is one week for retests of the previous period and for working on assignments. The module ends in its twelfth week when the test is held. Running three of these in one year, leaves four weeks for study aspects like the combined survey week (1OTand2OT), visit of international conference (2OT) and survey summer camp (3OT), in which there is room for assessment of human and social skills and competences.

Extending the period to ten weeks means that the module test will be intensified when compared to the old structure. There will only be one test per module. In the new design the volume of study material per test is about doubled. The more so, as each module is organised by two lecturers.

The objective of deploying assignments in each module is to keep students working on the subject and making them aware of the associated difficulties well ahead of the test. Participation in the test is granted only when the assignments that were issued during the module weeks all have been signed off by one of the module lecturers, i.e., during the last contact hours. Depending on the level of understanding module lecturers may vary the burden of the assignments. If only everyone involved were always informed...

The suggestion to use a Module book for each module (and each year) was easily accepted. In the first year of operating the new model (2018-19), only a few module books were used somewhat in the way they were supposed to. There really was no time during the first run of the new programme to start up this different element in the DBE process. Over the last ten years many bits of information and assignment descriptions, etc. were placed on Blackboard. Blackboard tended to become cluttered with the various contributions. Lecturers went on and on with their personal interpretation of the modules they had been used to presenting; typically, a situation the new approach would like to prevent.

The new NHL Stenden Intranet seems to provide just the infrastructure for this new approach. A dedicated action was required to create a primary layout for each of 36 module books. For each year to follow, a new set of 36 empty module books is generated from a generic basic set. Ideally, the two lecturers have the right – or indeed the weekly commitment – to write, whereas the students may only read.

Benefits of assigning two lecturers to a module are plentiful. The main issue is the effective time spent on the preparation of each lesson. There ought to be a natural way

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The general content of the (generic) module book is:

1. Correct codes for module, test and assignments
2. Module content (exact copy of appropriate SoC section)
3. Programme for each week for both lecturers
4. Assignments (usually more than one)
5. Literature
    a. To be studied for the test
    b. Reference material
6. Wikipedia
7. Test questions + answers
    a. Example
    b. First test
    c. Second test
    d. Results
8. Evaluation of students
9. Evaluation of lecturers
10. Tops and tips
11. Ideas for improvement

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to exchange the status of achievement of the modules at hand. Translating the SoC-content associated with the module from unintelligible statements to meaningful examples and models is really something that lecturers will (must) do themselves. The cooperation between both lecturers naturally will depend on their mutual interaction. Let us assume the professional attitude towards cooperation usually prevails.

Students will possibly benefit from the combined knowledge and interpretations of both lecturers. Also, the students compare the knowledge automatically and (should) ask questions when interpretations seem to differ. There is a natural, healthy, and obvious way to deploy a form of inter-vision. Learn from each other, build on each other's best practice...

Intended outcomes and monitoring

Looking at the characterisation of DBE by Geitz and De Geus (2019) it should be noted that not all six aspects equally apply to the development of the new Ocean Technology curriculum. The main connections may be seen in aspects 4 and 6. Addressing the aspects one by one, the following observations are made:

1. DBE is based on social constructivist, contextual, self-regulated, and collaborative learning, and assumes empathy for the student, the lecturer, and the environment, with iterative processes being deployed to solve complex issues from the professional field.

OT students start with a series of such learning projects from year 1, day 1. There are eight projects not including the two half-year periods of apprenticeship and graduation assignment. This format was first applied in 1998, when "Hydrografie" was still in Amsterdam following the general method to use "object learning problem oriented" to most modules. When the result for many instances proved less than ideal, the small scaled application of the method proved an easy compromise; it is still in effective use after more than twenty years. Students learn to cooperate, to deal with time pressure, to develop their personal and computer skills, as well as to look at the content, which will be at a certain unpolished level. Repeating the planning, reporting, and presenting the result normally is sufficient to improve in a natural fashion. And certainly not with nagging lecturers starting at the negative end.

Students have an open mind for experiences from other disciplines and consider different views respectfully. Students co-operate in a constructive manner finding solutions for complex real-life situations.

2. DBE is focused on the changing demands from the professional field and takes national and international developments into account.

The backbone of the new Ocean Technology is the international definition of the hydrographic domain. Many companies operate in an international context. This requires adequate communication and human and social skills. The main language is English. During the four-year educational program, English is tested and, when needed, extra focus is given in the first two years, to be prepared for the apprenticeship and onwards. Most reference texts are in English, so reading, speaking, and writing (survey reports) in English is practiced throughout. The apprenticeship is reported on in English. The 'strength-based' development programme starts awareness and growth of human and social skills.

Changing demands are recognised in a dedicated module Commercial Innovations. In semesters 6 and 7 students are asked to compile one innovation magazine with contributions from all. During the years this will lead to a log showing how and when changes occurred.

3. DBE is also aimed at developing the adaptability of students in learning environments in which an effective and efficient, future-proof learning process is initiated.

Adaptability to a never-ending stream of innovations is characteristic for graduating OT students. The speed at which the profession develops tends to increase rather than decrease. Upon graduation as BSc, some students (10%) elect to continue studying at academic level, which they often manage to complete successfully. A strongly developed professional identity and a personal (moral) compass often led to proactivity and adaptability to changing circumstances.

4. DBE is intended to construct a solid foundation of knowledge and build skills to transfer knowledge to unknown situations.

Definitely applies to the Ocean Technology program.

5. DBE does justice to the complexity of the macro- and meso-environments and shapes the student's learning environment with an optimum alignment of its various elements.

This aspect, although recognised as important for modern career development does not appear to be of the greatest importance to stakeholders of Ocean Technology. Or it may be that this aspect is already being covered by the reaction at aspect 2 above.

6. DBE results from the relationship between the lecturer, the student, and the relevant professional fields. Alignments and perceptions have a great impact on these relationships.

Any vocational training ought to develop course programmes close to the evolving requirements of the professional field. Based on the authority of the lecturers as selected by the exams committee and the management, students are guided towards the perceived status of actual developments in the professional world. A close liaison between lecturers and professionals is critical for the success, measured by the fit of graduates within their jobs.

Students develop into autonomously learning and responsible professionals, respecting others, other cultures and / or viewpoints, and contribute to an endurable, just, and inclusive society.

Monitoring the result of the new approach applied to Ocean Technology means comparing effectivity and efficiency of new versus old, using the same quality indicators for both situations. After this objective comparison of numbers there will always be the non-quantifiable parameters, such as the look-and-feel, job satisfaction, day-to-day trouble shooting, and so on. The NVAO judges mainly how the course is conducted in a one-day session every 5 to 6 years. With the same interval IBSC compares the programme mainly by its content.

In this chapter we put the focus on developing a new coat for Ocean Technology, thus setting the scale. For students it may be nice to know that a lot of effort has been put in the framework of their education and personal development. They are asked to engage at their best understanding and ability in a fair number of projects of variable size, either alone, in pairs or with a greater number of colleagues. The objectives are always clearly defined. In every instance they are asked to plan and conduct these projects in a way

that should fit in nicely with design-based education. Looking at it this way, DBE comes naturally. And this is indeed what it does for Ocean Technology.

Chapter 7

Stepping Internationally with DBE

Latifa Benhadda and Erwin Losekoot

Abstract
This study was conducted to investigate the impact of applying a Design-Based Education approach to teaching on International Branch Campuses. A focus group was held with staff from Stenden Hotel Management School's IBCs after which themes were identified from the transcripts and the academic literature on Transnational Education, Design-Based Education and Problem Based Education. Four themes were identified – definitions and understanding of DBE; the impact of culture on teaching using DBE; opportunities and challenges of DBE, and Recommendations. Within these themes key findings were that the focus in DBE is on validation and creativity; that local culture plays a role in its adoption; that there is much confusion amongst both staff and students about what is expected of them; that there may be different challenges depending on whether the subjects are social sciences or technical; that management processes must also support DBE in their systems, and that IBCs are sometimes ahead of 'home' campus in DBE implementation and experimentation. For this approach to teaching to be adopted successfully across all campuses, significant amount of time needs to be spent explaining and allowing staff and students to experiment with this new approach. Additional training and support may be required to move students from rote and surface learning to a DBE approach. How this can best be achieved will need to be an act of co-creation between, campuses, staff, students, and industry.

Keywords: Internationalisation of higher education, international campus sites, DBE, lecturers, students.

Introduction
Transnational education is the result of globalisation and internationalisation of higher education (Chan, 2011; Hobson, 2013; Losekoot, Lasten and Cuong, 2018). According to UNESCO (2000), transnational education is defined as the location of learners in a different country than where the awarding institution is based. Transnational education may take the form of branch campuses, franchises, twinning, online learning, and distance education programmes. Knight (2003) argues that transnational, borderless, and cross-border are different terms that are used interchangeably to describe the real or virtual movement of students, lecturers, knowledge, or educational activities and services from one country to another.

The focus of this chapter is on DBE on international branch campuses (IBCs) as one of the transnational education activities. Research showed that the number of IBCs has been growing - from 20 to 230 campuses worldwide (Coelen, 2014). 60% of these campus sites are in the Middle East (Miller-Idriss and Hanauer, 2011). This growth reflects the increasing interest of universities in developing global partners to deliver their educational activities and services and highlights the new competitive strategy in higher education, especially in Western countries. This chapter concentrates on the four areas of the globe where NHL Stenden University of Applied Sciences has International Branch Campuses, Indonesia (Bali), Thailand, South Africa, and Qatar. Chan (2011) states that any discussion

of teaching and learning in a transnational education context would need to be naturally linked to the internationalisation of the curriculum and the effective adaptation of the curriculum to the national contexts by educators on the ground in those locations. Joseph (2008) explains that the transnational context of teaching delivery in foreign soil raises issues of subjectivities and power and the possibility of the colonizing influence of a foreign curriculum. Some studies also tackle the issue of the relationship of culture and education quality in transnational education. Pyvis (2011) asks for a context-sensitive approach to quality in transnational education and avoiding a mono-cultural reference point. He argues that a lack of local understanding of quality results in a mindset that claims that 'sameness of quality requires sameness of approach' (Pyvis, 2011, p. 741). On the other hand, Starr-Glass and Ali (2010) focus on exploring the inefficiencies of implementing one standard model for assessment without taking the cultural aspect into consideration, and Hoare (2013) states that a universalist mind-set destroys the international, intercultural, and global educational dimensions and outcomes of internationalisation as this mind-set ignores the valuable cultural differences between the host and the providers.

This dilemma manifests itself also in the pedagogic and didactic approach used by the parent university in the host campus. Culture also affects the pedagogical and didactic methods used in the home and host universities. A problem-based learning (PBL) approach has been used at the NHL Stenden UAS international campuses, but this was changed gradually starting in 2018 to a design-based-education thinking approach (DBE). The purpose of this chapter is to reflect on and shed some light on the opportunities and challenges lecturers and students will face (or in some cases are already facing) while implementing DBE at NHL Stenden UAS international campus sites. It aims to make the leaders of both home and host campuses, the curriculum designers, and the lecturers delivering the curriculum, aware of the possible opportunities and the challenges because of diverse cultural values and variations while offering DBE.

Cultural variations on teaching and learning in different contexts

Teaching and learning are culturally oriented. The lecturer and student's cultural values and norms impact their teaching and learning attitudes and behaviours. Hofstede, Hofstede and Minkov (2010) categorised diverse cultural settings or contexts into six main cultural dimensions: power distance, individualism/collectivism, uncertainty avoidance, masculinity/femininity, long-term and short-term time orientation, and indulgence. Arnold and Versluis (2019) conducted research about the impact of students' cultural values on their evaluations of teaching. They found out that power distance and individualism and collectivism are the most influential factors when students evaluated the teaching they received. In high power distance regions such as Asia, Middle East, and Africa, students opted to evaluate their lecturer positively based on the level of knowledge and authority they show in class (Arnold and Versluis, 2019). In low power distance regions such as Europe - mainly, The Netherlands, Sweden, and Finland - students appreciated the opportunity the lecturer gives them to solve problems by themselves and by doing so the lecturer is taking the role of the facilitator more than instructor. The NHL Stenden UAS international campuses need to be aware of such cultural differences. Table 3 is an overview of the cultural dimensions scores in countries where NHL Stenden UAS has international campuses: Bali, South Africa, Qatar, and Thailand, as well as The Netherlands:

Table 3. Cultural Dimensions Scores (adapted from https://www.hofstede-insights.com/product/compare-countries/)

Cultural Dimensions	Indonesia/Bali	South Africa	Qatar	Thailand	Netherlands
Power distance	78	49	93	64	38
Individualism	14	65	25	20	80
Masculinity	46	63	55	34	14
Uncertainty avoidance	48	49	80	64	53
Long term orientation	62	34	NA	32	67
Indulgence	38	63	NA	45	68

It can be seen from Table 3 that power distance is very high in Bali, Qatar, and Thailand. The lecturer is seen as a status figure with authority and a high-level of knowledge and expertise. In those countries, collectivism is more dominant than individualism as the scores show. As for uncertainty avoidance, the scores are lower for Bali and South Africa, which reflects their relaxed attitude to avoiding uncertainty and prefer harmony and indirect communication. In contrast in Qatar and Thailand the scores are high which means that people in those countries prefer rules and codes and are perhaps less comfortable with innovation and change. In almost all cases (not uncertainty avoidance), the Netherlands scores are considerably different to the other campuses. This suggests that introducing a new pedagogical approach could face considerable confusion and resistance if the same approach is used on the IBCs as in The Netherlands (Hofstede, Hofstede, and Minkov, 2010).

Culture plays a fundamental role in developing students' approaches to learning, affect their expectations of a learning environment, and may create a clash between the teaching method and the students' preferred approach (Lemke-Westcott and Johnson, 2013). The different approaches to learning also highlight the challenge faced in meeting the same expectations, goals, and motivation to learning and therefore arguably dictates the learning and teaching method required (Entwistle and McCune, 2004).

Deep learning is based on interest in understanding the theories and knowing how to apply them in a specific situation to find innovative ideas and solutions (Entwistle, 2009; 1988). This approach shows specific students' skills such as autonomy and self-efficacy. The surface learning approach supports the reproduction and memorisation of the material learned and students stick to the course and lecturer requirements due to a fear of failure. Strategic learning focuses on designing effective strategies to meet the assessment criteria and aiming for high grades (Batteson, Tormeyb, and Ritchiec, 2014). This diversity of approaches to learning reflects the diverse cultural and personal values

that students adopted from their cultural environment. Manikutty, Anuradha and Hansen (2007) studied the relationship between the three approaches to learning adopted by students in higher education and their country of origin. They found out that culture affects the learning approaches of students and their academic performance. Figure 2 is an overview of the outcomes of their study.

Table 4. Relationship Matrix (adopted from Manikutty et al. (2007)

Cultural dimensions	Approaches to learning		
	Deep	Surface	Strategic
Power distance	Negative	Positive	No relationship
Collectivism	Negative	Positive	Positive
Uncertainty avoidance	Positive to moderately positive	Negative	Positive
Short-term orientation	Negative	Positive	Positive
Masculinity vs. Femininity	Positive	No relationship	Positive

As a result of the literature, one of the underlying assumptions of the writers of this chapter was that they would find distinct cultural approaches to learning as seen at the different IBCs because of different national cultures amongst both the students and the staff teaching those students. The assumption was that certain approaches would 'fit' better in some cultures than in others. This was something they were keen to explore with the focus group participants in relation to DBE which focuses on deep learning and reflection.

Implementation of a Pedagogy of Engagement in Transnational Education: PBL vs. DBE

Some years ago, NHL Stenden UAS adopted problem-based learning (PBL) as a pedagogy of engagement (Smith, Sheppard, Johnson, and Johnson, 2013; Johnson, Johnson, and Smith, 2014) to stimulate students' involvement and increase their responsibility for their own learning and experimentation in real world situations (Murphy and Whitelegg, 2006). However, NHL Stenden UAS campus sites faced difficulties in applying this learner-centred approach as it departs crucially from the traditional teaching pedagogy and challenges the cultural norms in Asia, the Middle East and Africa (Hallinger, 2010; Altbach and Umakoshi, 2004). Most of the activities are based on cases and simulations (Salas, Wildman, and Piccolo, 2009). PBL is based on four principles: constructive, collaborative, self-study, and contextual. The collaborative nature of PBL challenges the status difference between the lecturer and the student:

> *"Blaming Asian schools for focusing on memorisation – as opposed to 'thinking' – is too pat an excuse, as schools reflect the basic values of a society. It is ingrained in the Asian psyche that 'correct'*

answers always exist and are to be found in books or from authorities. Teachers dispense truth, parents are always right, and political leaders know better." (Shaw, 1999, as cited in Hallinger, 2010, p. 402)

Moreover, there are only a few studies that evaluated the effectiveness of PBL in Europe or other international campus sites outside Europe. Therefore, the efficacy of the use of PBL is still uncertain in those regions (Hallinger, 2010). Some studies show that the effect of PBL in different cultural settings differs based on the prior knowledge of students, their assertiveness, the strong lecturer-centred transmissive model of instruction as in Asian universities (Hallinger and Lu, 2011), and a lack of metacognitive skills (Dochy, Segers, Van den Boossche, and Gijbels, 2003; Hallinger, 2010). PBL is well-structured and based on a fixed seven step approach and the lecturer still plays a vital role to constantly guide students to learn the intended knowledge (Assen, 2018). This is something that DBE could build on.

Design thinking is a contemporary response to the needs of the knowledge economy, societal and environmental changes. Therefore, design thinking focuses on identifying and creating ideas and resolving complex problems through viable and novel solutions (Lindberg and Meinel, 2010). Based on research and the constant changing needs of the society and industry, Geitz and Geus (2019) concluded that PBL was no longer able to effectively prepare students to solve 'wicked problems' (complex problems with multiple stakeholders, causes and symptoms and requiring a sustained effort to solve them). This meant that that there was a need for a novel approach. This has become known as the design-based education (DBE) approach (Geitz, Joosten-ten Brinke, and Kirschner, 2015; 2016a; 2016b). This approach is based on a 'trialogical process' of students, industry professionals and lecturers in terms of gaining multi-disciplinary knowledge, developing metacognitive skills and by supporting social values (Geitz and Sinia, 2017; Geitz and Geus, 2019). In this context, the students will play a more active role in knowledge construction through research, projects, and peer and industry collaboration. They are engaged in learning *how* to think instead of *what* to think and deriving opportunities from real world situations. The process of DBE is shown as follows in:
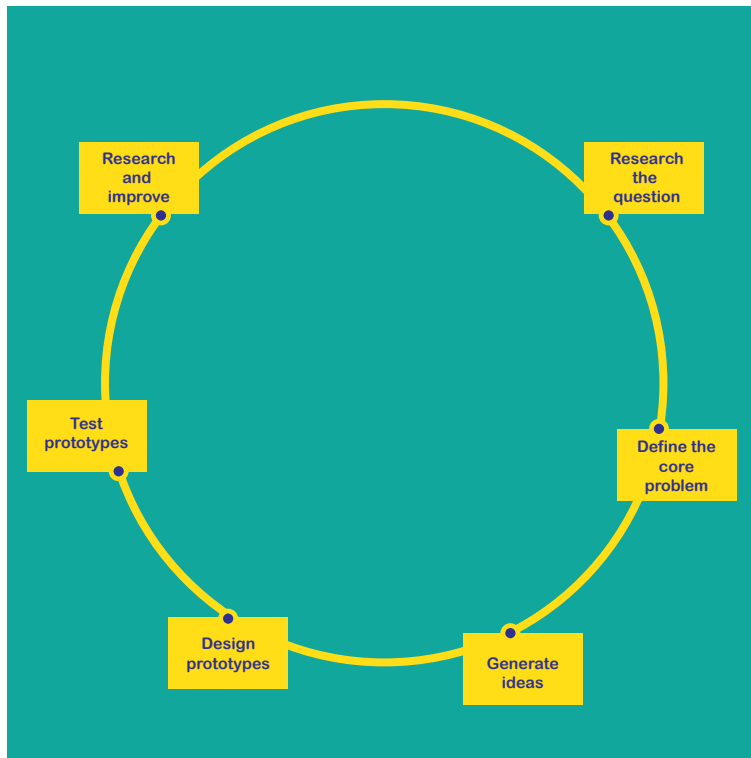
Figure 8. DBE Process as adopted from Geitz and Geus (2019, p. 9)

Steps 2, 3 and 4 are already part of PBL. Step 1 exists also for PBL, but is with that approach often quite clear, prescribed, and specific already, unlike the DBE approach where the problem might not be well defined. DBE adds steps 5 and 6 and requires students to implement their proposed solution and evaluate its success based on feedback received. In DBE considerably more time is required to clarify, understand, and confirm the actual question than is the case in PBL. PBL helps students to achieve two learning outcomes – 'delivering a professional product and displaying professional behaviour. In design-based education, a third intended learning outcome is metacognition ... to prepare students for lifelong development' (Geitz and Geus, 2019, p. 9).

This third learning outcome of metacognition enables students or learners to take ownership of their own learning, check their development, evaluate their achievements, and change their strategies and learning behaviours (Flavell 1977; Batteson, Tormeyb, and Ritchiec, 2014). By doing so, the students become self-regulated learners (Zimmerman, 2002). It is also crucial for higher order thinking skills such as reasoning, problem-solving, and self-regulated learning (Kuhn, 2000). The lecturer is no more the 'owner' of their learning but is instead supporting the development of the students' metacognition skills by setting clear learning outcomes, monitoring their progress, and giving feedback during the whole process (Geitz and Geus, 2019). This may challenge the traditional and cultural perception of the role of the lecturer across all the NHL Stenden UAS campus sites, which was presenting content to be learned by students and

monitoring/controlling their progress. Feedback from industry is also essential in this novel approach. Using DBE, the lecturer must also be a networker with industry and be active in finding companies to collaborate and provide access to their organisations for real world projects. This is a challenge, but perhaps even more so in traditional cultures (Joy and Kolb, 2007). Researchers warn that implementing DBE in different (cultural) settings may be challenging and students may perceive the lack of structure as threatening and they warn that 'it is important to continuously monitor the strategies students use and to provide sufficient instructional scaffolding' (Geitz and Geus, 2019, p. 9).

Methods

Underpinning this chapter is a qualitative study (Bryman and Bell, 2011; Pernecky and Jamal, 2010; Slevitch, 2011), which was conducted to investigate the opportunities and challenges teaching staff at NHL Stenden UAS international campuses face whilst implementing DBE. Each year there is an 'international conference' for selected staff from the campuses. Campuses take it in turn to host the event and in 2019 it was held at the Leeuwarden campus. This provided an excellent opportunity to conduct a focus group into this contemporary issue for academic staff. Attendees from each of the campuses who were invited to take part. All participants were fully informed about the nature of this study and confirmed in writing their willingness to join a focus group. Seven staff representing all the NHL Stenden UAS international campuses took part in the one-hour focus group, which was facilitated by the two researchers. The conversation was recorded and then transcribed verbatim. Both researchers coded the transcript independently and then compared code to achieve a consensus. Participants were also invited to discuss the topic of implementing DBE with their colleagues when they returned to their home campus, and to email any further thoughts, comments, or reflections to the researchers. Several emails with more information were received and incorporated in the analysis. The themes which emerged (Braun and Clarke, 2006) from the focus group and further contributions were:

- Definitions and understandings of DBE
- Impact of culture on DBE implementation
- Opportunities and challenges provided by DBE
- Any recommendations for implementation and further research.

This was a limited study using only one focus group and included further comments delivered via email. The focus group participants did represent all campuses but may have been atypical since all delegates had undertaking significant travel to join the conference and could therefore be considered to be committed to the DBE approach. A larger study with anonymous surveys of individual staff conducted on all campuses may surface other issues about the implementation of this innovative approach to education.

Results

Definitions and understandings of DBE

All the sites have experienced Problem-Based Learning (PBL) which, as was discussed earlier in this chapter, has been a generally successful approach on the IBCs. Especially, in terms of bringing real world learning into the classroom. It is therefore not surprising that focus group participants based their approach to DBE on their past experiences of PBL. This connection was also confirmed by Geitz and Geus (2019). As one delegate noted:

> *"It is about collaboration – based on real problems and the industry. Now we must go to the industry, find a problem, and then work together to solve it. With PBL you were given a problem to solve."*

This comment agrees with the explanation by Geitz and Geus (2019) that DBE builds on PBL but that it requires more work to initially identify and understand the problem, and to not only create a prototype but also to test it out and obtain feedback on the success and viability of the solution created. A colleague confirmed that in their opinion the ontological perspective of the lecturer also plays a role, saying that: "*lecturers who have a strong experience in social constructivist methods such as Problem Based Learning seem better equipped to adopt DBE*". The difference between the two approaches was forcefully put by another lecturer who argued that:

> *"DBE was introduced to our campus as the new PBL which was incorrect as DBE is going to change our entire educational system, whereas PBL was one of the applied delivery methods/lesson methods."*

They went on to expand on this, saying that while PBL helped students develop key transferable skills such as critical thinking, problem solving and giving and receiving feedback, DBE goes much further and addresses the validation of research and creativity. However, others felt the two approaches mapped closely onto one another and that 'good' PBL was not so different from DBE, saying: "*PBL is as Design-based as any of the other design-based teaching methodologies*", but that DBE emphasised "*multiple iterations of solutions design*".

The impact of culture on DBE implementation

This theme was an explicit recognition that DBE could be seen by some as having come from Leeuwarden with a requirement that it is then implemented on the IBCs. It was beyond the scope of this study to review how DBE is explained to students either in Leeuwarden or on the IBCs, but this is certainly something that should be researched in further studies. While the introduction of DBE in Leeuwarden has (and continues to) present challenges, we were interested to see if colleagues felt there were cultural aspects in their countries that affected how DBE was perceived. One participant commented on student skills for coping with DBE, saying that in their country the high school system rewarded students who "listen well in class and replicate the lecturer's material to pass a test. This means that the lack of clearly defined instructions in DBE are at first overwhelming and stressful for students". One confirmed this view saying the challenge would be:

> *"The mindset itself. Our students come from an education system where everything is led by the teachers. It might be like a horse being freed – they will just run around and not know what to do."*

Another participant explained the dilemma that lecturers may face: "*I will look like a joke if I tell students I do not know the answer – as a lecturer I am expected to know the answer!*"

Nor was this just an expectation of student behaviour – "even the lecturers. If I am given the freedom to do what I like I do not know what to do in the beginning. Once I know the system then I can picture it much better."

Power-distance was mentioned as a factor in the successful implementation of DBE. As one person noted, "*in our system a lecturer is a god figure – for the lecturer to leave that educational space open and even get feedback from students – I see that as really difficult to achieve, particularly for older, more experienced lecturers*".

It was also noted though, that this was not always due to national culture, but also that some lecturers are educated and trained in a much more structured way and therefore DBE was felt to challenge that norm. It was suggested that lecturers of more technical subjects who were used to students doing weekly assessments found DBE harder to adapt to than those teaching social science subjects where two or even just one large assessment per module was the norm.

Interestingly, one focus group member pointed out that while students adapt easily as they are young, and that that teaching staff are interested in education and so are keen to try new things, but what about educational management? Are they ready to support the teaching teams with time, tools, and flexibility in terms of KPIs? The point was made that if the roles, responsibilities and KPIs for staff, team leaders, and managers did not evolve in parallel with DBE initiatives in the classroom, then the approach might be doomed to failure. The same could be said for quality assurance systems that focus on having resources online in virtual learning environment such as Blackboard™ at the start of the semester. This, it was felt, is neither workable, nor desirable in a true DBE environment where students, not administrators, determine what they need to know when. This challenge was also highlighted by another person who noted "*students will complain if they do not get enough support.*"

The Dutch education system, where students have a considerable amount of freedom to choose how and what they learn, caused the researchers to assume that Dutch students would find it easier to transition to a DBE approach compared to students at the international campuses. However, one surprising moment in this study was when the researchers were told of the experience of one group of IBC staff:

> *"The Dutch students were annoyed and horrified at the extent of the use of DBE in our courses and our module evaluations were terrible. Those students were used to a system of PBL education which went from Step 0 to Step 10. But in DBE, Steps 1 – 9 do not exist. They saw that as lecturers not doing their job – they thought lecturers were being lazy, and we had to fill that void."*

Interestingly another participant agreed with this, saying "*I deal mostly with Dutch students and their expectation is for a very structured experience and clear goals.*" They then went on to make the very astute observation that in their experience home students on international campuses (IC) are used to a lot of uncertainty in their daily lives and therefore "*they are fine with DBE*". This was in their opinion not the case for the Dutch students studying on international campuses, saying:

> *"Dutch students expect a clarity of path. They hold us accountable for showing them that path and what the result should be. If they do not have an end goal in sight they are not prepared to move."*

However, other campuses did also report similar feelings from their own students, saying: "*Students on our campus are very used to being closely guided by lecturers and this will be a real challenge as we move to DBE as we are telling them to rely on themselves. We are missing the Steps 1 – 9.*" Another contributor disagreed with the emphasis on

national culture – they argued that NHL Stenden UAS students who came to the ICs from departments that had already implemented DBE had no such challenges.

> *"The schools that introduced DBE early – those students were primed when they came to us. If it happens at Study Start Week you get used to it early. It is not national culture but educational culture – it depends on what they are used to as to how much they will resist."*

Opportunities and challenges provided by DBE

DBE provides both opportunities and challenges, and in this section, we consider some of the recurring ones and support these with the voices of the focus group participants. One of the surprising moments in this research came early in the discussion when staff from one campus showed that the 'home' campus of Leeuwarden does not always lead the way and announced,

> *"We designed all of our minors in DBE, and we have run all of our minors in DBE at least once – although there are lots of improvements we can do, and we are constantly getting feedback from our students."*

They then went on to reassure others by saying, "we realised in our first iteration of our first DBE minor that DBE is a tool, and the learning outcomes are still the learning outcomes we have been working on for ever". Another participant said something similar – "DBE is just a tool – our learning goals are our final objective". They also warned, "it is very easy to get overwhelmed with DBE and its terminology and diversity and versions". They advised others to choose those DBE tools that would work for them in their situation and warned "there is a real DBE industry out there" and that academic staff should not blindly accept everything they were being told by educational consultants.

Also, in terms of whether the local hospitality industry would understand and embrace such a 'novel' educational approach one person said that,

"I think industry is already more DBE oriented than we are and we have to catch up with industry. If you look at industry, they are doing product development, product testing, market research – they are doing DBE in every iteration, even though they may not be calling it that!"

One unexpected comment concerned the physical environment that learning takes place in. As DBE requires a 'live' research environment, one participant noted "facilities are a challenge because we regularly have power outages. Also, technology, as we are not so sophisticated and might need help with that". This suggests that it is not always attitude that restricts progress and educational developments!

Not surprisingly, many staff have the student experience at the core of their hopes and fear for DBE. Some were concerned that "doing too much DBE" had led to students not having enough academic stimulation and becoming bored with (as they saw it), just another project. As one participant noted,

> *"The biggest challenge I observe at present is finding the balance between control and creativity – ensuring that students are triggered and empowered but simultaneously monitoring the outcomes."*

Industry attitudes to and support for was a regular topic in the focus group. As one person noted, "A strong and committed external network with industry is vital to ensure relevant cases (and feedback) can be obtained". Not all staff have strong industry contacts or feel comfortable in that role compared to that of the traditional lecturer role. There was also some concern about whether companies would be prepared to share actual problems and actual operational data with students. As one person said, "will they be real problems or just made-up ones because they do not want to tell us the real problems?". Another said, "I think trust is going to be a problem, particularly if you want to build a long-term relationship". One participant commented that for six-month internships there was time for organisations to get to know and trust students, but the speed at which DBE projects need to happen would not allow for that trust to develop. The point was also made that some departments (e.g., finance or HR) deal with much personal or commercially sensitive information – if these departments do not allow DBE projects, then how will students learn the skills they need to work in these fields? However, another simply commented that "whatever information the company is willing to give us, we work with that". Another reflected that they were lucky as there were few higher education establishments in their town, so businesses were keen to work with them, but that in larger cities the competition from other educators may make a constant stream of real-world projects for students to work on much less likely.

There was real enthusiasm for the potential to harness student initiative and enthusiasm – it is well-known that the hospitality industry often recruits for attitude and then trains for skills, so the openness to individual creativity and the opportunity to work in collaboration with other creative individuals was seen as a strength of DBE:

> *"There is no such thing as 'one correct answer' as many answers are possible and together in a group you can find out which answer is the most suitable for a particular situation – you can achieve much more in a group than by yourself."*

Another member of teaching staff summarised the beauty of DBE as "I think DBE is the freedom for the students to reach the learning outcomes through a million different ways".

Recommendations for implementation and further research into DBE

The overwhelming response from the participants in this focus group was that DBE (in some variation) was a good thing. What was necessary to make success more likely was that "It might be good for the students (and for all the stakeholders) to know exactly what should be done during the DBE process." A fundamental part of DBE is the idea of 'prototypes' where the ability to fail leads to innovation and new approaches. This must therefore also be a part of the implementation – staff in the Netherlands and on international campuses must have the freedom to fail and thereby learn from that failure. However, what was also clear from the discussion is the importance of helping students with metacognition – what the transferable skills are that come from 'doing DBE'. They will possibly never face the same challenge again in the 'real world', but the approach of identifying a problem, ensuring they understand what is going on, creating a possible solution/prototype, testing it and then acting on that feedback is something they will spend their entire careers doing. While a student's focus is naturally on doing the best, they can with the task in front of them, as educators we must find ways of allowing them to see the 'helicopter view' which will enable them to apply what they have learned from that experience to many others in the future. Many of the concerns raised by staff (and their students) on the IBCs could perhaps be alleviated by ensuring there is sufficient care taken to make sure students understand that rationale – DBE can give staff and their

students a lifelong advantage and create truly 'sustainable education'. An important first step towards this would be ensuring this overarching goal is a clear learning outcome in all courses that use DBE.

Opportunities for further research should be apparent from this discussion. The NHL Stenden UAS Professorship 'Sustainable Educational Concepts in Higher Education' has several longitudinal studies running, including the 'HowULearn' research, as well as investigating approaches to learning, student well-being and others. To these could be added a study of the hospitality students' experience of DBE focusing on the close relationship between hospitality education and preparation for industry, one on the staff experience of DBE; a study of the changes in administrative systems required to support staff and students in DBE; reactions of large and small industry partners to DBE; the differences in graduates who have been through a DBE educational experience compared to those from other establishments that have not, and other approaches to hospitality education. Results from these studies could feed into Master and Doctoral research and be presented at conferences and in journal publications.

Implications for educational establishments

One participant saw at the end of the focus group that "the non-profit sector is more used to this kind of discussion and reflection". They suggested that there had not been a forum in which staff felt free to post their concerns and reflections on DBE, and that such a forum (perhaps through an online message board) might provide a valuable tool to share challenges and successes, or to ask questions in a 'safe' environment – "the conversation we are having today is happening without our supervisors and managers, and that is very valuable". What this comment surfaces is the crucial importance of having a safe environment in which it is okay to fail. While the sciences may accept that many experiments do not yield the desired results, perhaps social science subjects still have some way to go before this becomes their educational paradigm. While some have commented on the importance of having the resources to support DBE in terms of buildings, technology, and time to develop materials and new skills, others have stressed the importance of managerial and administrative systems support. Without those, little can change in a sustainable way.

Conclusions

This chapter set out to consider Design-Based Education and what this means for 'Transnational Education', in specific at the international campuses of NHL Stenden University of Applied Sciences. It has considered the careful balancing act between valuing and benefitting from cultural differences across International Branch Campuses and learning from best practice without ending up in a 'universalist mindset'. there are considerable differences in scores across Hofstede's scales between The Netherlands and Indonesia, South Africa, Thailand, and Qatar. Earlier experiments with Problem-Based Learning approaches were generally considered successful, but the very structured approach of PBL compared to DBE may have been a factor in this. It could perhaps also be argued that the structured nature of PBL allowed some students to adopt a more 'surface learning' approach. Although DBE builds on PBL, it requires considerably more engagement and commitment from students, staff, and industry. Despite the international backgrounds of both authors, it would be fair to say that the starting point for this research could have been described as 'mono-cultural'. What has come out of the focus group research underpinning this research is not only that DBE may work very well on the IBCs, but that in some cases the IBCs have much to teach the 'home' campus as they deal with enquiry-based research and activities daily, or their close contacts with industry. This is not to diminish the challenges faced by academic staff and their students on the IBCs (such as staff being expected to know the answer), but the conclusion of

these two authors is that the 'wake-up call' that DBE brings to established educational models, approaches and assumptions is perhaps not as different on international campuses to those faced in Leeuwarden.

What DBE provides the opportunity for is to bring more of the industry into the classroom earlier on. The flexibility of using real life projects and challenges in the classroom and gaining feedback from practitioners provides a priceless feedback loop not just to academic staff, but also directly to students. Over time this should lead to graduates with a clearer, more accurate understanding of the reality of our industry, and how their education has prepared them for that. This is true for staff working in Leeuwarden and Emmen, but also for those on our international branch campuses, if only because NHL Stenden UAS students are strongly encouraged to move between campuses, and therefore will be expecting a recognisable form of DBE to be used wherever they are studying. DBE provides an opportunity to capitalise on the unique chance our students must gain different cultural experiences to the one they (mainly) grew up in. As one of the participants in the focus group noted, "It is a massively cultural experience". As discussed in this chapter, there are many types of culture. While it may be easy to 'blame' a 'national culture' for challenges in delivering DBE, the authors of this study see as many (if not more) challenges to changing the status quo coming from people's personal and organisational cultures as from the possibly convenient scapegoat of national culture.

We conclude this chapter on the implications of applying the DBE educational model internationally with the words of the originators of this concept (Geitz and Geus, 2019, p. 13),

> *"Educators are challenged to apply these theoretical insights to new sustainable learning environments, such as environments that are aligned to the real world. The design of new forms of learning environments, such as workplace education, is challenging. Traditional forms of organisational education (are) not valid anymore in these (more) authentic learning environments."*

Trying to do so across international campuses and different cultures adds to the challenge but perhaps also to the rewards for students, industry, and the education sector. We look forward to many more opportunities to collaborate across campuses on research into this important development.

Chapter 8

A Multilevel Perspective on Design-Based Education, based on 12 Year Development of the MySchoolsNetwork Social Learning Platform.

Peter Joore, Frank Scholten, Roelien Wierda, and Ron

Barendsen

Abstract
The effective development and implementation of DBE not only requires changing the way lectures are conducted. It may also require changing the way that physical learning spaces are organised, changes at the level of the overarching curriculum, changes at the organisational school level or even changes at the national policy level. Therefor the introduction of DBE may be regarded as a complex system transformation, where changes take place at different levels of the educational system, mutually influencing each other. To understand this type of transformation, the development of the MyschoolsNetwork Social Learning Platform is being analysed by means of the Multilevel Design Model, following its 12-year development from a small local initiative into an international educational platform connecting thousands of students in over 200 schools in 34 countries. Based on the analysis, an adapted Multilevel Design Model for Education is presented, which is particularly suited for understanding the complex changes required to successfully implement DBE.

Introduction
Effectively implementing Design-Based Education (DBE) is a challenging process. After all, the successful implementation of a radically new educational approach may require more than changes at the level of the student, the lecturer, and the associated teaching materials. For instance, changing the way in which the classroom and other physical learning spaces are organised, may require changes in the way that the school building is managed, and even in the way that the building is designed. Besides changing the building, changes may be required at the level of the overarching curriculum, at the organisational level and at the policy level, to name but a few. All these changes together mean that the introduction of DBE can be regarded as a complex system transformation, where changes take place at different levels of the educational system, mutually influencing each other.

If the process of implementing innovation in education may be compared to a design process, the teacher can be considered as a designer who develops, tests, and evaluates all elements of the new educational system (Garreta-Domingo et al., 2018) (Kali et al., 2018) (Laurilland et al., 2018) (Persico et al., 2018) (Scheer, Noweski et al., 2012). Although the design approach may be of great value, it certainly does not eliminate all challenges at once since many of the innovation bottlenecks may fall outside the sphere of influence of the individual teacher or even outside the influence of the educational institution. In other words, when introducing a new educational approach like DBE, we are dealing with a systemic design process. This means that experts involved in educational change processes must learn to deal with the systemic challenges they encounter.

Education is not the only area that encounters such systemic design challenges. In other sectors too, the question arises how to deal with these complex constellations of traditions, regulations, infrastructure, policy, laws, ways of financing and other systemic aspects. In several sectors, experience has been gained with a framework in which both the design perspective and the systemic perspective are being addressed by applying a Multilevel Design Model (MDM) which combines an iterative design approach and a hierarchical system approach. A cyclic iterative visualisation of the MDM is presented in Figure 9. A linear visualisation of the same model is presented in Figure 10. A brief description of the content of the various phases and levels is presented in Table 5. The MDM has been applied to clarify the relationship between the development of new technologies on the one hand and the corresponding societal change processes on the other. Examples of this application can be found in healthcare and humanitarian development where introducing new medical technology may present a complex challenge due to strict protocols and financial limitations (Boru et al., 2015a, 2015b) (Joore 2008, 2010) (Rodrigues Santos, 2015) (Santos and Wauben, 2014). Other applications focus on the transport sector where the introduction of new electric vehicles involve major changes regarding infrastructure and legislation (Joore and Brezet, 2015). Again, other examples focus on innovations in the domain of sustainability (De Los Rios and Charnley, 2017) (Da Costa Junior, Diehl et al., 2018). Thus, the MDM has proven itself to be useful to map systemic design challenges in a complex societal context.

So far, the authors are not aware of a description of any application of the MDM in the educational domain. However, based on the experiences in other domains, the authors expect that applying the systemic perspective that the MDM provides, may be beneficial when analysing and managing the introduction of DBE. This expectation is based on their own experiences when developing a specific educational innovation, the MySchoolsNetwork platform. This platform has evolved over the past 12 years from a small local initiative into an international educational platform connecting thousands of students in over 200 schools in 34 countries. Looking back to their 12-year development process, the use of the MDM helped the authors – three of which are the developers of the MySchoolsNetwork platform - to come to grips with the complexity of the innovation process and to understand the different layers of change. Using the MDM has helped them understand just how complicated this process is, and how technology, research, societal developments, and tradition interact and influence each other in ways that can only be partly predicted. Based on these positive experiences, the authors expect that applying the MDM may also be beneficial for the introduction of DBE and other educational innovations.
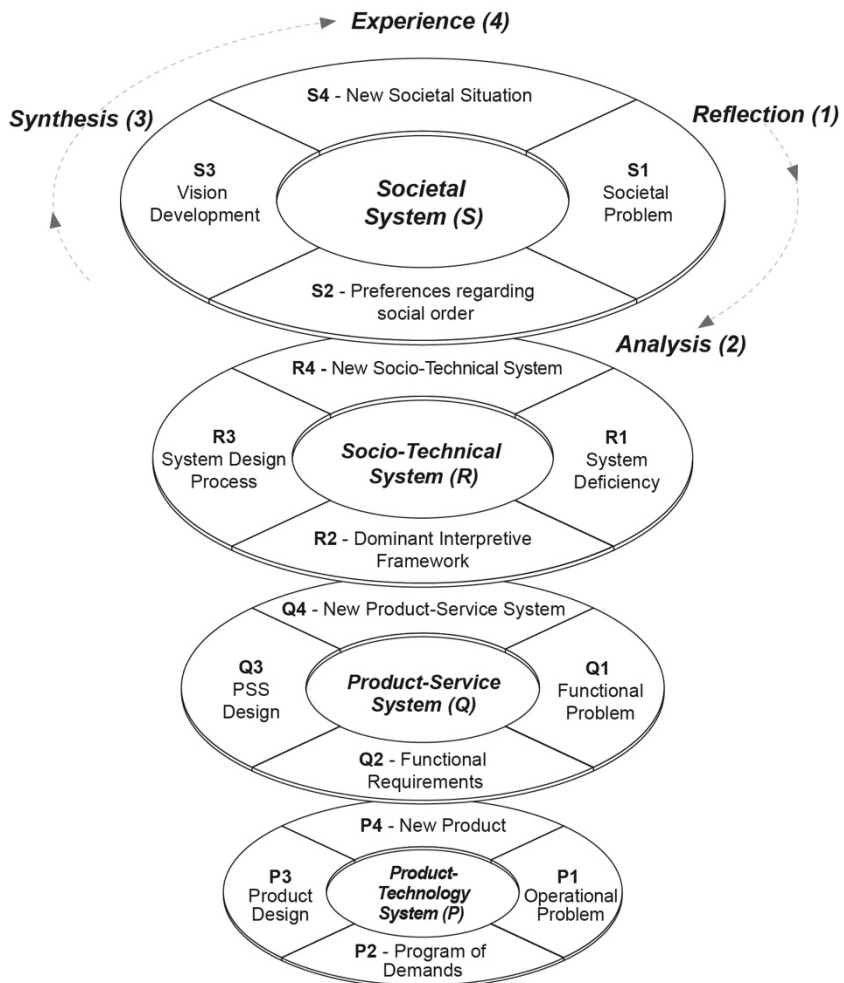
Figure 9. Multilevel Design Model (MDM) - Cyclic Representation (Adapted from Joore and Brezet, 2015)
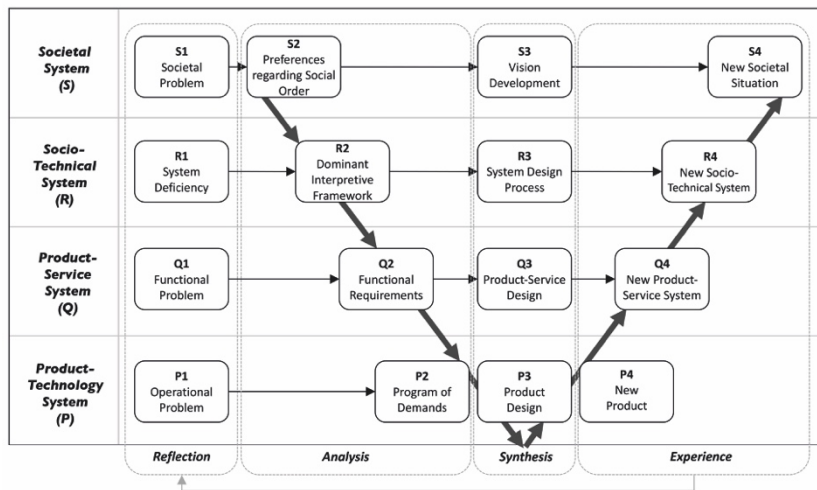
Figure 10. Design Model (MDM) - Linear Representation (Joore and Brezet 2015)

In this article we will first introduce the MySchoolsNetwork project and explain why experiences in this project may be relevant when analysing the introduction of DBE and similar educational change processes. Second, we will map the events that have taken place within the MySchoolsNetwork project based on the MDM. Third, we will discuss the potential benefit of the MDM for the development of DBE and similar educational change projects. Finally, we will slightly adapt the MDM to make it specifically suitable for application in the educational domain.

Table 5. Multilevel Design Model (Joore, Brezet 2015)

Design phase / System Level	(1) Reflection on the problem	(2) Definition of preferred new situation	(3) Synthesis, designing new situation	(4) Experience of new situation
Societal System (S)	S1 – Value judgement problem definition, 'discover' phase.	S2 – Preferences regarding social order, based on worldview and values, resulting in objectives for ideal new societal situation	S3 – Vision development process, resulting in future vision for new societal situation	S4 – Living in society, executing societal experiment
Socio-Technical System (R)	R1 – Value judgement regarding societal situation, definition of societal problem	R2 – Dominant interpretative framework, leading to objectives for new socio-technical system	R3 – System design process, leading to proposal for new socio-technical system	R4 – Experiencing new socio-technical system, e.g., by means of niche experiment
Product-Service System (Q)	Q1 – Value judgement regarding functioning of Product-Service System, resulting in functional problem	Q2 – Determining functional demands and requirements to be met	Q3 – Design of a new Product-Service System	Q4 – Using and experiencing new Product-Service System
Product-Technology System (P)	P1 – Value judgment regarding functioning of product-technology system, definition of operational problem	P2 – Target definition regarding new product and technology, leading to programme of demands	P3 – Product design process, leading to (prototype of) new product-technology system	P4 – Simulation, testing, using, and experiencing new product

Relevance of MySchoolsNetwork project for Design-Based Education
As a basis for our analysis, we will describe the development of the MySchoolsNetwork platform, which is an ongoing project conducted by NHL Stenden lecturers and students. According to its website, 'MySchoolsNetwork.com is a safe and free online, educational platform broadening the horizons of pupils, students, and teachers all over the world' (MySchoolsNetwork, 2020). The platform was founded in 2008 and has over the years developed into an international social learning platform that supports authentic learning, global citizenship, and digital literacy in primary and secondary education. In addition, it offers preservice student teachers an excellent opportunity to practice their content development and mentoring skills. MySchoolsNetwork celebrated its 12th anniversary on 15 November 2020, at that moment linking 17,696 students and teachers, involving 217 schools, including 5 teacher training departments, in 34 countries, spanning 6 continents.

Although the educational approach was not yet officially called Design-Based Education at the start of the MySchoolsNetwork development, the approach within the project is perfectly in line with the concept that has been named Design-Based Education since the merger of NHL and Stenden Universities of Applied Sciences in 2018. In additions the following considerations played a role:

The MySchoolsNetwork project involves developments at the level of the teacher and student in the classroom, at the level of the whole school, as well as at the level of the whole national education system. This in contrast to projects that have taken place at the level of only a classroom or a school, which would have been less relevant for our analysis.

The project takes place at the national as well as the international level. This allows for developments at the highest macro system level to be considered in the analysis.

The project consists of a long-term, multi-year process, in which several design iterations have taken place at each system level. This contrasts with short-term projects in which educational changes have been tried out for just a few days or weeks. Such projects would have been less relevant for our analysis. The MySchoolsNetwork platform was developed by three of the authors, thus they had access to all relevant data in the project.

The project is ongoing and "multi-level" in that it involves NHL Stenden staff, student teachers, ICT students, schools in the region and a wide variety of international partners. The direct involvement of three of the authors during the development of the MySchoolsNetwork platform has on the one hand, been essential for the description of this case. At the same time, this involvement can be considered as a limitation of this article, as the authors are not objective and neutral outsiders, but have been actively involved in the project. However, this limitation is somewhat mitigated by the fact that the main author was not directly involved in the MySchoolsNetwork project and has played a more distant and reflective role in the analysis.

Analysing MySchoolsNetwork based on Multilevel Design Model
As a basis for our analysis, the activities that have taken place during the 12-year development of the MySchoolsNetwork platform have been identified. Through in-depth mutual discussions between the authors, three of which are also the developers of the MySchoolsNetwork platform, these activities were then mapped, based on the different system levels and the different design phases of the MDM. In the next paragraph, each of the activities is discussed in more detail, going through them step by step. The MDM (presented in Figure 9, Figure 10, and Table 5) applies four iterative design phases: Reflection (1), Definition (2), Synthesis (3) and Experience (4). This means that the activities associated with reflecting on the problem space are positioned in the first

column of the MDM. The activities associated with the definition of a preferred new situation are positioned in the second column. The activities that are associated with the synthesis or creation of novel solutions are positioned in the third column. Finally, the activities that are associated with the actual testing and experiencing of the innovative designs are positioned in the fourth column. Adding to these design phases, the MDM describes the design process as taking place on different aggregation or systemic levels. Activities associated with the tangible objects that are present in place and time, often resulting from a human action or a machine process, are positioned on the Product-Technology level (P). Activities that are built up of physical as well as organisational components, forming a united and cohesive whole that together fulfils a specific function, are positioned on the Product-Service System level (Q). Activities that can be considered as a cluster of aligned elements, including artefacts, technology, knowledge, user practices and markets, regulation, cultural meaning, infrastructure, maintenance networks and supply networks, that together fulfil a specific societal function, are positioned on the Socio-Technical level (R). The highest level of the multilevel design model is defined as the Societal System (S) being the community of people living in a particular country or region and having shared customs, laws, and organisations. A more detailed description of the different phases and levels as applied in the MDM can be found in (Joore and Brezet, 2015). The summary of the mapping exercise is presented in Table 6. A cyclic iterative visualisation of the results is presented in Figure 11. A linear visualisation of the same results is presented in Figure 12.

Table 6. Multilevel Design Analysis of MySchoolsNetwork case

Design Phase / System Level	Reflection on the problem (1)	Definition of preferred new situation (2)	Synthesis, designing new situation (3)	Experience of new situation (4)
Societal System (S)	S1 – Many students are and will be excluded from the global community because of poverty, communication problems, illiteracy and a 'digital divide' between communities.	S2 – A paradigm shift is required, shifting from inward looking education to externally oriented education where global citizens are connected and learn from one another.	S3 – Worldwide, many initiatives are designed to support an open exchange of knowledge, information, and experience. MySchoolsNetwork is one of them.	S4 – Step by step the goal of bridging the digital divide and creating inclusive and equitable education for all is coming closer.
Socio-Technical System (R)	R1 – Schools are closed institutions with closed curricula; they do not meet society's demand for competent and flexible future professionals.	R2 – Schools all over the world require a natural connection to the outside world to foster the development of key competencies and talent of students.	R3 – Design of a network of schools in which stakeholders all over the world collaborate and learn creatively and on an equal basis.	R4 – A well-established network of 189 schools in 32 countries is connected. Many of them have incorporated the use of MySchoolsNetwork as integral part of their curriculum.
Product-Service System (Q)	Q1 –Teaching programmes are not effective in preparing students for a life in the real world. Education has an inward focus and relies almost entirely on disconnected book learning.	Q2 – Reality must be brought into the classroom, enabling language learning and the development of global citizenship in a safe and up-to-date manner.	Q3 – Design of MySchoolsNetwork as a social media platform, through which pupils, teachers, and students all over the world can communicate with each other and collaborate on cross-border educational projects.	Q4 – A well-functioning online educational platform is up and running, bringing 14.659 students into contact with each other. As a result, students are motivated to develop their language and global citizenship competencies.
Product-Technology System (P)	P1 – Existing educational material is boring and outdated, with little or no connection to the real world.	P2 – New educational materials are needed that make effective use of global digital developments and can be used in countries with different degrees of development.	P3 – Design of a safe and easy-access profile site with an attractive interface, based on PHP5 and MySQL software technology.	P4 - A stable and up to date software system is running, enabling more than 150.000 profile messages over a period of 10 year.
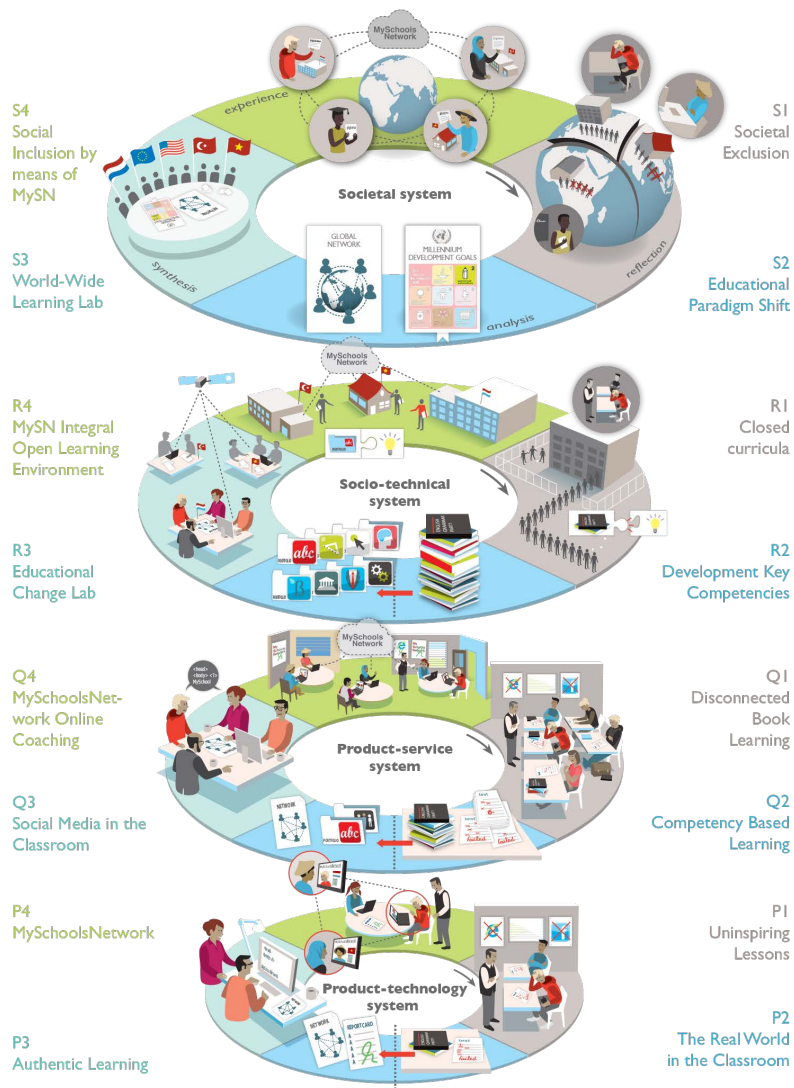
Figure 11. MySchoolsNetwork Case –Multilevel Design Model (Cyclic Representation)
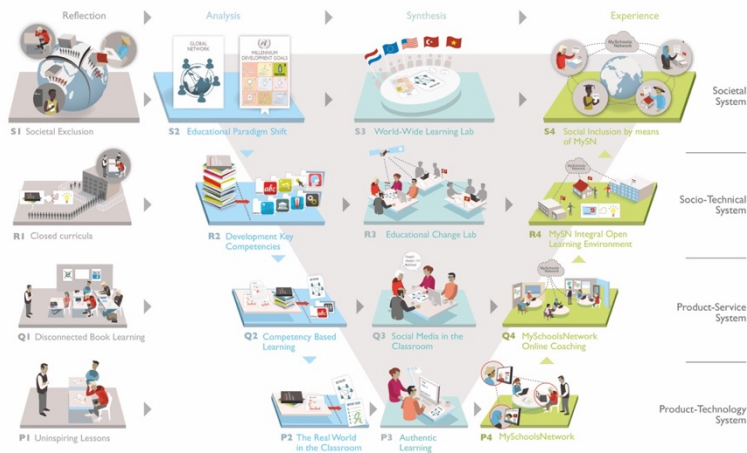
Figure 12. MySchoolsNetwork Case –Multilevel Design Model (Linear Representation)

To avoid repetition, the description of the MySchoolsNetwork project and the results of the mapping exercises are presented together as a single story. It must be emphasised that the mapping is not intended to be a sequential description of activities that have taken place, nor as a timeline of events, but as an arrangement of different types of activities and events in relation to each other. The MySchoolsNetwork project involves a complex educational innovation process in which a range of related developments have been completed, taking place at diverse levels of complexity. Different developments have run simultaneously and have influenced one another, This means that the 'real' development of the MySchoolsNetwork would probably be somewhat like Figure 13. However, in terms of presentation, the order as presented in Figure 14 will be followed. First, the developments at the societal level (S) will be described. Next, developments of the product-technology level (P), the product-service level (Q) and the socio-technical level (R) will be described.
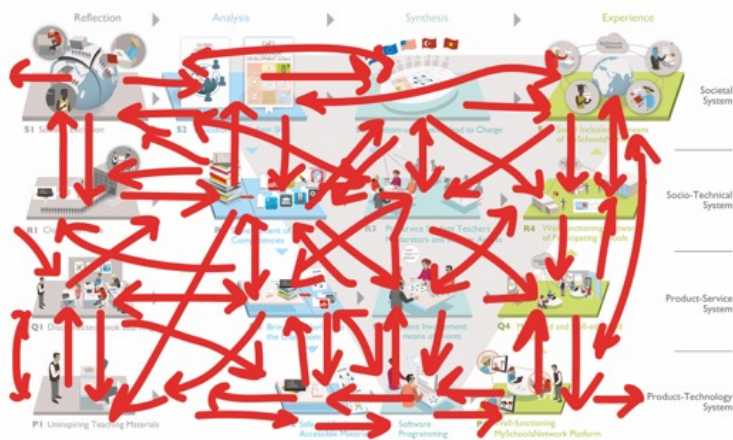
Figure 13. Realistic representation of order of events in MySchoolsNetwork project.
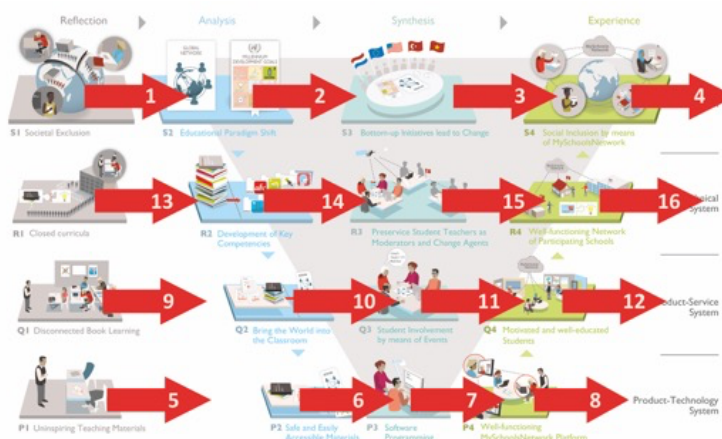
Figure 14. Developments at level of the Societal System (S)

First, developments at the societal level are being presented. This relates to the overarching perspective and philosophy that stakeholders have regarding their preferred social order, based on worldviews and values. The developers of the MySchoolsNetwork indicate that all their actions have been driven by their long-term philosophy with regards to the future of education and the way that society is organised.
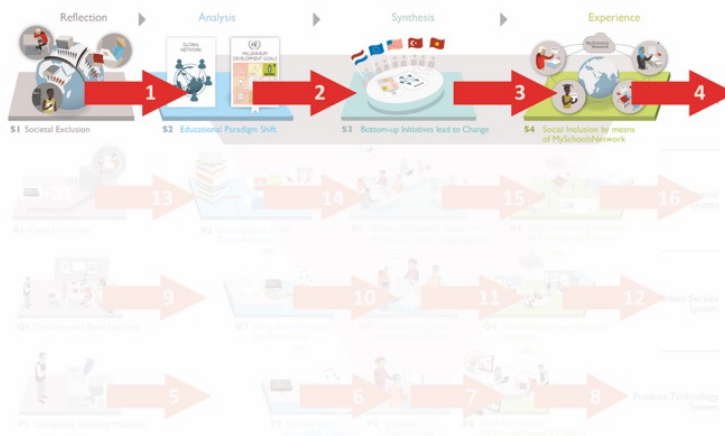
Figure 15, Visualisation of Societal System level (S)

S1 - Reflection on initial Educational System: Societal Exclusion

From a global perspective, education is still not available to everyone and to a considerable extent supply driven. The world is confronted with a 'digital divide,' referring to the inequality in access to technology existing between communities due to regional and demographic differences (Mossberger et al., 2008). This was one of the main reasons for launching a joint four-year project between the Vietnamese Ministry of Education and Training and the Association for Universities of Applied Sciences in The Netherlands, titled 'Institutional strengthening for selected Vietnamese Universities in Profession-Oriented Higher Education - PROFED' (Visser 2007) (London, 2011). MySchoolsNetwork was developed during this project to make authentic language learning accessible to Vietnamese students and to bridge the gap between Dutch and Vietnamese pupils.

S2 - Defining preferred Educational System: Educational Paradigm Shift

The initiators of the MySchoolsNetwork project defined their overall ambition at the start of the project as an attempt to contribute to the realisation of Millennium Development Goal (MDG) number 2, specifying that children universally would be able to complete a full course of primary education. To achieve this goal, a paradigm shift from inward looking education to externally oriented education where global citizens learn from each other would be essential (Black, 2008). The exact wording of the UN goals changed slightly in 2015, when the United Nations adopted the 17 Sustainable Development Goals (SDG), the fourth of these new goals being aimed at inclusive and equitable quality education and promoting lifelong learning opportunities for all (United Nations 2015, 2017). Overall, the objectives for the future of education have remained the same in the period between the definition of the MDGs in 2000, the start of the MySchoolsNetwork platform in 2008, the definition of the SDGs in 2015 and the current situation.

S3 - Synthesis of new Educational System: Bottom-up Initiatives lead to Change

Although the initiators of the MySchoolsNetwork platform have always had a visionary ideal about the future of their innovation in mind, they did not design a 'top-down' blueprint for the current worldwide network of schools. Rather, the design of the network

Figure 16. Visualisation of Product-Technology System level (P).

can be seen as a bottom-up development that has taken place and gradually emerged over time, using a Design Thinking approach and involving both NHL Stenden instructors and students of various disciplines.

S4 - Experience of new Educational System: Social Inclusion by means of MySchoolsNetwork

Although the full realisation of a world-wide educational paradigm shift and complete societal inclusion of all students may still be a utopian perspective, several positive indicators can be distinguished. First, MySchoolsNetwork has developed into a suite of tools, both for K12 students and (prospective) teachers to interact, collaborate, design, and create. Second, both target groups (K12 students and student teachers) are increasingly using the platform to show learning outcomes within the institutional curriculum such as online content creation, global citizenship, and cross-border collaboration. Ambitions for the near future include the launching of a MySchoolsNetwork Academy, where high-quality educational content is created and shared world-wide. Expanding the global network of connected schools is not only an ambition but also a means to reach an end: bridging the digital divide and creating inclusive and equitable quality education and promoting lifelong learning opportunities for all.

Developments at level of the Product-Technology System (P)

Based on the long-term societal perspective as described in the previous section, the description of the project now moves to the most concrete and practical level. This illustrates how the large-scale vision was gradually created by developing smaller building blocks on the work floor and in everyday life, tracing the developments of the actual hands-on design of the MySchoolsNetwork platform from its inception phase in 2008. Which brings us to the Product-Technology (P) level of the MDM.

P1 - Reflection on initial Educational Materials: Inauthentic Teaching Materials

At the beginning of the project the available educational material that could support the connection between Vietnamese and Dutch schools was insufficient. The traditional approach of a pen pal project where students write to each other by sending letters was quickly dismissed. Several digital applications and platforms were examined but were

rejected for various security and accessibility reasons. Facebook, which had become publicly available in 2006, appealed to the project group because of the international reach of the platform. It was however rejected by Vietnamese schools on account of security and its Western orientation. Thus, existing tools and platforms could not provide the functionality the team was looking for.

P2 - Definition of preferred Educational Materials: Safe and Easily Accessible Materials

Based on security and accessibility requirements for the new platform the basic set-up was designed. The main requirement was that the system had to be accessible even in remote areas with a slow internet connection. Regarding the user interface, each user profile was required to at least indicate a user's name, age, school they attended, their birthday and their country of origin. This way the administrators of the system could make sure users were who they claimed to be.

P3 - Synthesis of new Educational Materials: Software Programming

Programming of the new digital platform started in September 2008 and the first version of MySchoolsNetwork was released in November 2008. The software was radically updated twice in the period 2008-2018, by completely rewriting it to a different technological platform. This time a framework was used since technology had improved considerably over time. Several smaller changes were implemented, some of them visible to the users, but many of them taking place 'under water' for the users, as the basic functionalities remained the same.

P4 - Experience of new Educational Materials: Well-functioning MySchoolsNetwork platform

The first version of the MySchoolsNetwork software was introduced and tested in November 2008. On 31 December 2008 the system recorded 3200 profile messages, doubling to about 7800 messages a year later. At the 12-year anniversary in November 2020, more than 180.000 profile messages had been posted by students and teachers. Over the years, continuous testing resulted in updates and improvements. These improvements covered technical, functional, graphic, and didactic aspects. The current state-of-the-art version of the platform (MySchoolsNetwork 3.0) was put into use in the summer of 2018 and is expected to be robust enough to provide a stable basis for MySchoolsNetwork to run for several years to come.

Developments at level of the Product-Service System (Q)
Based on the development of a well-functioning software platform as presented in level P, the related challenge for the developers was to find ways and strategies to move the development of the MySchoolsNetwork to a higher level and have school organisations embrace personalised, authentic, and cross-border kinds of education. Which brings us to the next level of the MDM, the Product-Service System.

Q1 - Reflection on initial Classroom Situation: Disconnected Book Learning

The problem in Vietnamese classrooms was that although students were receiving English lessons at school, they did not have any opportunity to practice their English language skills with real foreigners. Vietnamese teachers expressed to their Dutch guests how they felt that this closed-off situation caused students to lose motivation. They discussed how they would be able to use a more authentic environment. As one of the founders of the MySchoolsNetwork recalls a question of a Vietnamese teacher: "Can you please give my students a window on the world?" For the students in the Netherlands the problem situation was slightly different. Although their country was open to contact with other countries, in practice it turned out that Dutch students showed little interest in contact with other cultures. As one of them at the beginning of the project said: "Why should I be in contact with those spring roll-eaters in Vietnam?" The teachers involved saw it as an important challenge to change this uninterested attitude, considering the relevance of the development of the social and cultural skills of their students.
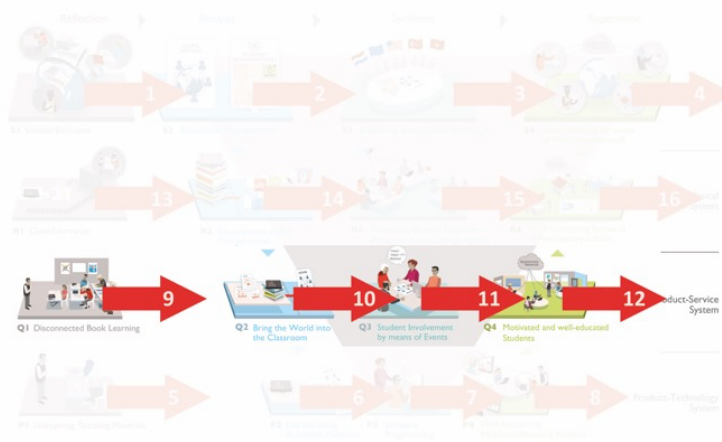
Figure 17. Visualisation of Product-Service System level (Q).

Q2 - Defining preferred Classroom Situation: Bring the World into the Classroom

In consultation with the teachers in the countries involved, the possibilities of bringing 'the world into the classroom' were considered. Gradually, the requirements for the MySchoolsNetwork platform were defined. The new solution had to be secure, user friendly, and it should provide room for exciting educational tasks – so-called 'sparks' (Salmon, 2003) or 'events' - designed to enlarge students' motivation to engage and learn. The platform was to include profiles and an event system offering the opportunity

to add challenging learning tasks. Users should be able to write and add a message to someone's profile. As a precaution to prevent secret bullying of students among each other it was decided that no private messaging possibility would be added.

Q3 - Synthesis of new Classroom Situation: Student Involvement with Events

The 'sparks' or 'events' are in essence small design competition between students of various classes, stimulating contact between schools from different countries. During the first two years of the project, the project team designed about 20 events aimed at motivating students to practice their English and to allow them to feel the relevance of the language. Over time more events and more features were added to the MySchoolsNetwork platform, facilitating the creation of personal websites, blogs, book reports, and portfolios. By 2020 the platform featured over 200 events, all of them based on subjects and themes common in English lessons and with the hobbies and interests of the age groups in mind.

Q4 - Experience of new Classroom Situation: Motivated and well-educated Students

A participating teacher described the effect of the platform as follows: "The students are often enthusiastic when they can work with MySchoolsNetwork, often it's also a part of the weekly assignment. The motivation of the students comes from communicating with children from other countries and the feedback they receive, which they really need." As for an effect of the moderating programme and the virtual internship by preservice student teachers, participating secondary school teachers experienced a decrease in workload, for teachers-in-training now tutored their students. As for the effect on the teachers and teachers-in-training, they saw their role shift from instructor or corrector to online coach, and a study in 2016 showed that of the 150 teachers-in-training who participated, 93.9% indicated that MySchoolsNetwork is an appropriate medium for teachers-in-training to practice their feedback skills (Barendsen, Kaçar et al., 2018).

Developments at level of the Socio-Technical System (R)
Events taking place at the previous two levels of the MDM (the Product-Technology level and the Product-Service level) were within the span of influence of the MySchoolsNetwork developers, or at least within the span of influence of their own organisation and the regional world of work. Aligning the results achieved with the wider national and international context proved to be a more complex challenge. Nevertheless, steps have been made, as will be demonstrated when describing events that took place at the Socio-Technical level.

R1 - Reflection on initial School System: Closed Curricula
Existing ways of teaching were insufficient to deal with the growing need of intercultural understanding between different peoples. In the PROFED project, the Dutch teacher
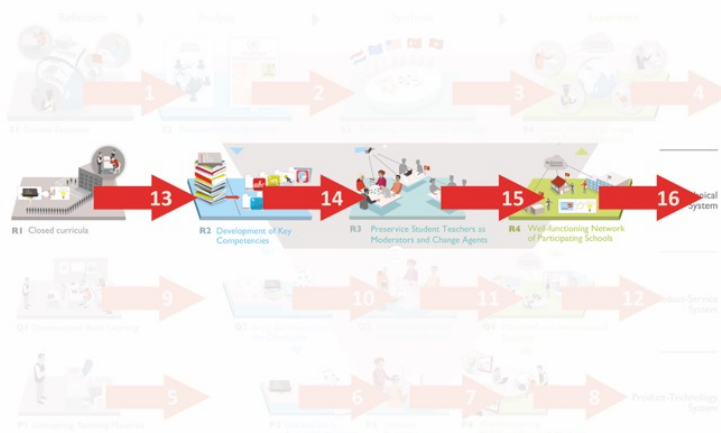
Figure 18. Visualisation of Socio-Technical System level (R).

educators from then NHL University of Applied Sciences (now NHL Stenden) collaborated with staff members from Thai Nguyen University of Education, with the aim of making Vietnamese education more practical and profession oriented, and to set up a network of professional development schools in the region. They reflected on the quality of the school system in both countries and discussed whether schools were adapted to the increasing internationalisation and digitisation of society. Most of the schools they were dealing with were relatively isolated from their surroundings and this closed-off situation was insufficient to train competent and flexible professionals who are ready to function in the 21st century.

R2 - Defining preferred School System: Development of Key Competences
To respond better to developments in society the developers wanted to support schools to be more closely connected to the outside world, allowing students to practice their English language skills, while at the same time developing their European key competences and 21st century skills (Trilling and Fadel, 2009; Rotherham and Willingham 2009). The MySchoolsNetwork team agreed that a digital approach would be very well suited to connect different schools. At the same time, there were major differences between the countries involved, both in terms of politics and culture, as well as in terms

of technological possibilities. Vietnam was a relatively closed communist system, in which too much Western influence was considered undesirable (Boas and Kalathil, 2003). In addition, the digital infrastructure in Vietnam was still in its infancy, while in the Netherlands it was already rather advanced. This meant that it had to be possible to use the new solution in both situations.

R3 - Synthesis of new School System: Preservice Student Teachers as Moderators and Change Agents

Through the increased involvement of various teacher training departments in participating countries the role of MySchoolsNetwork has shifted from incidental to more structural and systemic; preservice student teachers function as platform moderators, designers of content and change agents.

R4 - Experience of new School System: Well-functioning Network of Participating Schools

Initially, MySchoolsNetwork was tested by a small number of teachers who experimented with the platform on an ad hoc basis in their schools. Not all participating teachers felt it was easy to adapt their curriculum to make systematic use of the platform. Sometimes an individual teacher was enthusiastic while their colleagues were hesitant to adopt new digital ways of teaching. In other schools the platform was formally integrated into the official curriculum so that its use no longer depended on the individual enthusiasm of a single teacher. During the project, the number of participating schools has increased from less than 10 schools in 2008, to 217 registered schools in 34 countries across 6 continents at the end of 2020. The number of registered users increased from a few dozen to 17,696 in December 2020.

Benefits of applying the Multilevel Design Model

After mapping the MySchoolsNetwork project by means of the Multilevel Design Model, the next issue to address is the question in what manner this mapping exercise proved to be useful for the analysis of the MySchoolsNetwork project. Based on this experience, we will then determine if and how the MDM may be beneficial for the development of Design-Based Education and similar complex educational innovations.

The conscious separation of both the different design phases (1-Reflection, 2-Definition, 3-Synthesis, 4-Experience – as well as the different system levels (P-Product-Technology, Q-Product-Service, R-Socio-Technical, S-Societal) at which these change processes take place, turned out to be useful to map out the different developments during the development process.

With regards to the Reflection phase, the distinction between the various system levels helped to clarify the different types of problems and challenges to be dealt with. For example, emphasis could be placed on a concrete issue such as the quality of educational material applied, which relates to developments at level P. Or emphasis could be on more systemic challenges such as the global digital divide between different communities, which relates to level S. Using the MDM helped to identify which actors should be involved in each initiative. Sometimes these are challenges that relate to a single student and a teacher, related to level P. In other cases, these are issues involving the entire organisation, related to level Q. Or they may even be challenges where stakeholders need to be involved at the level of the national or international educational system, relating to level R or S.

With regards to the Definition phase, distinguishing between the various system levels helped to determine what requirements should be met during the design process. This

could be technical specifications for a new software system or the requirements for a new curriculum in a classroom or a school (relating to level P), or about much broader goals such as the Sustainable Development Goals, aimed at inclusive and equitable quality education and promoting lifelong learning opportunities for all (relating to level S).

With regards to the Synthesis phase, distinguishing between the various system levels helped to determine what specific expertise and involvement was needed during the project. When developing new educational software (related to developments at level P), specialised programming expertise would be needed. When designing new curriculum material (related to developments at level Q) specialised pedagogic expertise would be required. To involve larger numbers of schools (related to developments at level R), specific management expertise was needed.

With regards to the Experience phase, distinguishing between the various system levels helped to determine how a new solution was be simulated and tested. The evaluation of a new software system (level P) would first typically be tested in a confined setting. Testing out a new curriculum (level Q) could be done in a pilot setting with a limited number of groups and a limited number of students. While testing the effectiveness of a worldwide network of schools (level R) was only possible by implementing it and subsequently monitoring what happens.

All in all, the MySchoolsNetwork developers indicated that the use of the MDM helped them to come to grips with the complexity of the innovation process and to understand the different layers of change. Using the MDM has helped them understand just how complicated this process is, and how technology, research, societal developments, and tradition interact and influence each other in ways that can only be partly predicted. The real gain of using the MDM was for them to understand that innovation is not a linear journey from A to B, and that for innovation to succeed one should keep the larger picture – innovation at a societal level - in mind while simultaneously celebrating the smaller successes on the level of the school system, the classroom situation, and the educational materials itself. Based on this reflection, the next question to be answered is if – and in what manner- applying the MDM may be useful to support other educational innovations, specifically in relation to the deployment of the Design-Based Education approach.

Adapting the MDM for Design-Based Education and other educational innovations

After addressing the benefits of the MDM from the perspective of the development of the MySchoolsNetwork project, the next question to be addressed is the extent to which the model may need to be adapted, to be suitable for the development of DBE and other educational innovations. While the original MDM-model is primarily based on technological innovations, applying the model to the online MySchoolsNetwork platform worked well since this involves the development of a digital innovation, facing the same issues as technological developments in other sectors. However, applying the MDM to the development of DBE and other educational innovations means that the terms used for the four system levels could be reconsidered. Terms suggesting tools, technology or products may be too limiting and not doing justice to the all-encompassing nature of DBE, where tools and technologies are just part of the range of artefacts embodying the educational philosophy. When adapting the MDM for educational purposes, we therefor suggest renaming the different system levels to be more in line with the educational domain.

To make the MDM suitable for educational purposes, we suggest renaming the Product-Technology System level (P) into 'Educational Artefacts'. The term 'artefacts' in relation to education was first used by Yrjö Engeström (1999), who described human functioning as a triangle in which subject, object (goal) and artefacts (all man-made means, concepts and instruments, structures and processes) interact. With regards to the development of specific educational artefacts that are linked to the introduction of DBE, it could be about new educational materials and learning arrangements. It may also be about the development of a new school environment, for instance related to the development of design studios or labs. While some of these elements may be readily available, several of the new artefacts may need to be newly developed. In this case, the design phases of the MDM, which largely correspond to the design steps as defined for DBE, may be followed. First, the problem may be defined (Reflection), after which the requirements for the new educational artefact may be defined, for instance based on context analysis and desk research (Definition). Next the artefact needs may be created (Synthesis), for instance in the form of a prototype, after which the new educational artefact may be experienced in practise (Experience).

With regards to the terminology of the second level of the MDM, we suggest renaming the Product-Service System (Q) into 'Educational Service System'. When introducing an educational innovation like DBE, it is vital to realise that educational change involves more than introducing several educational artefacts in the form of new courses or programmes. Just introducing a cool lab or new tool will not work unless the entire educational context is ready for their effective implementation. After all, it is the combination of different elements that together comprise an effective new educational service system. Also at this level, following a carefully planned design process is essential for success. At this level it is about the integrated development of an integrated educational approach, in which new courses, ateliers and educational materials, are easily accessible, user-friendly, and bug-free. Following a proper design cycle will result in a well-tested innovation, which is a condition for large-scale acceptance by both students, faculty, and administration.

With regards to the name of the Socio-Technical System (R) level, we suggest introducing the term Socio-Educational System. Besides technological systems and tools, this level also involves national standards, government policy, laws, regulations, competences, buildings, and other physical facilities, to mention just a few aspects. At this level, it is about creating a perfect alignment between the artefacts of DBE (learning outcomes, content management systems, syllabi, labs, online courses) and national educational standards. A lack of alignment will result in a total or partial halt of the intended innovation or a quasi-innovation that exists on paper only. This means that an educational institution that wants to introduce a radical educational change, like introducing DBE at NHL Stenden, needs to be in constant dialogue with relevant stakeholders both at regional as well as at national level. The world of work is in constant flux, which makes this level one of the more challenging. Therefore, an active and open communication process between the world of work and the academies and programmes is vital.

With regards to the highest level of the MDM, we suggest that this may still be defined as the Societal System level (S), which means it doesn't need to be renamed. At this level, having a shared philosophy on education that is valid within current world-wide societal and educational contexts is a prerequisite for the successful and sustainable implementation of DBE and other far-reaching educational innovations. In the case of NHL Stenden, the choice for DBE was based on the concept of Design Thinking and is related to a world-wide movement marking a paradigm shift from 19th century reproduction-
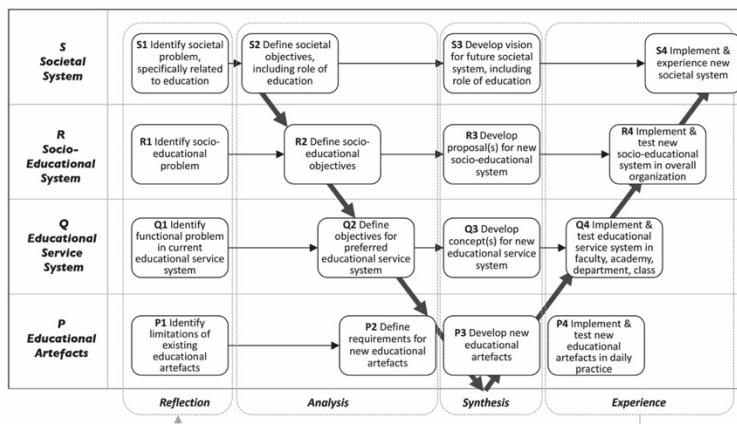
Figure 19. Multilevel Design Model for Education.

oriented education to 21st century creation and problem-solving education. NHL Stenden have chosen for this philosophy based on a believe that this approach covers the societal role of the university, i.e., training future professionals to be creators and problem solvers. Of course, other institutions may adopt a different educational philosophy, based on their specific preferences and vision.

The combination of the four design phases and the four system levels, leading to an adapted Multilevel Design Model for Education, is presented in Figure 19 and in Table 7.

Table 7. Multilevel Design Model for Education

Design phase / System Level	(1) Reflection on the problem	(2) Definition of preferred new situation	(3) Synthesis, designing new situation	(4) Experience of new situation
Societal System (S)	S1 – Value judgment regarding current Societal System, identify societal challenges.	S2 – Defining objectives regarding preferred Societal System, based on worldview and values, including the role of education in society.	S3 – Creating vision and design of a new Societal System, including the role of education in the new ideal situation.	S4 – Implement and experience new Societal System, e.g., by means of policy change and adoption of new types of education such as Design-Based Education.
Socio-Educational System (R)	R1 – Value judgment regarding current Socio-Educational System, identify system deficiencies.	R2 – Defining objectives regarding preferred Socio-Educational System, based on dominant interpretative framework.	R3 – System design process, leading to proposal for the new Socio-Educational System describing the envisioned functionalities of the new situation.	R4 – Implement, test, and experience the new Socio-Educational System within the educational organisation as a whole.
Educational Service System (Q)	Q1 – Identify functional problem in current Educational Service System, for instance related to the role of the physical environment.	Q2 – Defining functional demands and requirements regarding the preferred Educational Service System.	Q3 – Design and development of new Educational Service System, such as the cooperation with external partners in student projects.	Q4 – Implement and experience new Educational Service System in specific faculties, academies, departments, schools, lectures.
Educational Artefact (P)	P1 – Value judgment and identification of possible limitations regarding current Educational Artefacts.	P2 – Defining demands and requirements regarding preferred Educational Artefacts, in line with the overarching educational vision.	P3 – Design and development of (prototypes of) new Educational Artefacts, such as innovative educational materials or adapted physical environment	P4 – Implement and experience the functioning of (prototypes of) new Educational Artefacts in educational daily practice.

Conclusion

The initial purpose of this article was to investigate to what extent the application of the Multilevel Design (MDM) Model may help to reflect, in retrospect, on complex educational change processes such as the introduction of Design-Based Education (DBE). A secondary goal of this article was to map the extent to which the application of the MDM may help steer and structure complex educational change processes, such as the introduction of DBE, in advance. In this article, we have explained that innovation processes in education take place at different system levels and posed the question how the changes at these levels may be described. With this question in mind, the possible added value of using the Multilevel Design Model was investigated. The analysis of the MySchoolsNetwork project has demonstrated that the MDM may be beneficial to structure the events that take place in complex socio-educational change projects. Based on this experience, we have adapted the MDM for general educational use, as presented in table 3. The concluding issue to be discussed is what benefit the MDM may bring to various actors involved in educational change processes, specifically with regards to the implementation of DBE.

First, we expect that the MDM may be beneficial for educational researchers investigating DBE and similar complex educational innovations. The MDM may provide researchers a tool that may help them to structure events that take place based on different categories, looking both from a systemic multilevel perspective, as well as from a design process perspective. We expect that the MDM may also be useful for teachers that want to investigate their own classroom efforts as reflective practitioners, analysing their educational innovation projects based on the adapted MDM, as an addition to other research tools and models.

Second, the model may be beneficial for experts who are developing educational innovations like DBE themselves and have been caught up in the complexity of their efforts, incorporating their new approach within the overarching socio-educational context. Mapping a new initiative with the MDM, both before and during their project, may help them to determine on which level they want to focus their efforts. For example, if the successful implementation of a particular educational innovation requires a substantial change in government regulations, the question may be whether this initiative can be redesigned to fit in with existing regulations after all. If this is impossible or undesirable, the developers must decide whether they want to invest energy in approaching the government authorities to adjust the necessary rules, or that they may have to discontinue their intended innovation because it does not fit into the existing system.

Third, the model may be beneficial to educational managers that are involved in complex change projects such as the introduction of DBE, helping them to determine what kind of expertise needs to be involved for a specific task and what kind of skills are required for a particular endeavour. If a project is exclusively focused on the implementation of existing educational technology in one classroom of a single school, they may want to involve a different type of expertise compared to a situation that is aimed at a complex educational change process, involving several schools or government organisations. Applying the MDM may also help managers to determine how a certain new solution can be tested, choosing between for instance short term experiment in a single classroom or a long-term experiment involving several schools and other organisations.

The analysis presented in this paper demonstrates that using the Multilevel Design Model may be helpful in recognising the complexity of the different levels and challenges of implementing profound changes in education, always keeping the ultimate firm goal in

mind. NHL Stenden University of Applied Sciences is currently in the middle of shifting to a new educational concept, Design-Based Education, for all their courses. Using the MDM to analyse the change process that is currently taking place at all levels of the organisation might prove beneficial. Thus, it would be interesting to further explore and research A) what the ultimate objective of the adoption of DBE is at a societal level, B) What the current stage is where NHL Stenden and their educational philosophy are acting, C) what assistive artefacts need to be developed and implemented in order to facilitate the transition through the different stages of development, and D) what barriers can be identified and mapped by analysing the introduction of Design-Based Education based on the Multilevel Design Model.

Section 3. The role of the lecturer in a DBE informed curriculum

Chapter 9

Design-Based Education: changing the role of the lecturer in contemporary learning

A case study of DBE within the Bachelor of Communication and Multimedia Design and honours programme X-Honours

Marije Boonstra and Merlijn Torensma

Abstract

Design-Based Education (DBE) challenges the lecturer to mediate between the internal (university) and external (society) resources of social capital to be able to accept unpredictable challenges of the changing society as a significant part of the curriculum. In this chapter we introduce three mediating lecturer roles when using the DBE method: the content, personal, and societal mediator based on Illeris' (2016) model of learning dimensions and social capital theory. To understand these roles in practice, the Bachelor Communication and Multimedia Design, and honours programme (X-Honours), both already experienced with design-based lecturer roles, were used as case-examples.

Keywords: Design-Based Education, lecturer's role, social capital, learning dimensions

Introduction

Today's world is rapidly changing, on technological, societal, as well as environmental aspects. This causes wicked problems: ill-defined problems which scope and nature changes daily whereas today's apparent solution is no guarantee of tomorrow's success (Krause, 2012). To cope with these wicked problems, higher education must adapt (Ramaley, 2014). Educational institutions need a sustainable approach in our changing world, one that helps us understand and move along in our interactions with society. It needs to be an approach that stimulates creativity, innovation, and learning. We need our students to become creative, innovative problem solvers that work together in an interdisciplinary setting to solve complex challenges and become lifelong learners. To fulfil this need NHL Stenden has introduced the educational concept of Design-Based Education. This educational method integrates real-life challenges into the curriculum and therefore brings the "outside world" within the boundaries of the university.

Inviting wicked problems of the changing society as a significant part of the curriculum challenges the lecturer in many aspects. In the first place the lecturer must mediate the continuous flow of changing educational content, understanding the real-life challenge, and adapting to judge the different solutions students create. In addition of considering the individual needs and choices of students, the lecturer becomes responsible for mediating the interaction of students and clients, such as institutes and organisations that present the challenges and for guiding students in finding external experts on certain topics or up-to-date knowledge to answer complex questions. Thus, the active learning the Design-Based approach requires, changes the lecturer's role from that of lecturer to a mediator on a personal, content, and societal level as well as a partner in the learning process (Prince, 2004 in Doppelt, Mehalik, Schunn, Silk and Krysinski, 2008). The goal of this chapter is to clarify these roles of the DBE lecturer using the sociological perspective

of social capital (Nahapiet and Ghoshal, 1998 in Adler and Kwon, 2002) and Knud Illeris' model of learning dimensions (Illeris, 2016). This chapter is structured as follows: first we will explain our theoretical framework to construct the three mediating roles of the DBE lecturer, that are personal, content, and societal mediator. Second, we will elaborate on these three roles based on practice and experience of the Bachelor Communication and Multimedia Design and the X-Honours programme. In the last paragraphs we will take a glance towards future practices and give some recommendations for implementing DBE at our University of Applied Sciences.

Design-Based Education: Education as an open system

Design-Based Education is based on social constructivist, contextual, self-regulated, and collaborative learning that results from the relationship between lecturer, student, and society (Geitz and de Geus, 2019). Within the Design-Based practice students combine processes of inquiry and reasoning to generate prototypes for example in the form of innovative artefacts, systems, and solutions (Puente, van Eijck and Jochems, 2013). Through iterations students explore, test, validate and communicate these potential prototypes to end-users and external stakeholders (e.g., clients) to receive feedback and to improve them. When you compare this process to classical hypothesis testing, imagine the prototypes (ranging from intangible concepts to concrete designs) as hypotheses that students test and adjust every time based on feedback and reflections. Therefore, this approach engages students in solving real-life design problems using contextual content while (self-)reflecting on the learning process (Mehalik and Schunn, 2006). DBE integrates wicked problems into its education and therefore is considered as a sustainable approach of education in our ever-changing society (Geitz and de Geus, 2019). Since real-life societal challenges are part in shaping the educational content, society plays a very important, guiding role in this educational approach. The result is that DBE intensifies the characteristics of education as an open system since the openness towards the outside environment increases.

The lecturer's role of mediating social capital

Since DBE has the potential to intensify the characteristics of education as an open system, it necessitates careful management to balance internal needs and to adapt to the external environment (Daher, 2016). Working with real-life problems, external stakeholders such as clients and users, and often unpredictable knowledge and outcomes requires initiative, flexibility, and innovation of both the DBE lecturer and student (Daher, 2016). Within this discontinuous setting of education that challenges the coordination of content and multiple stakeholders, social capital functions as an important source of continuity (Bartsch, Ebers and Maurer, 2013). Social scientists have offered a few definitions of social capital. Adler and Kwon (2002) distinguish three groups of definitions: an external perspective where social capital is seen as a resource that inheres in a social network and ties a focal actor to other actors. The second group of definitions has an internal perspective and considers social capital as a collectivity, an internal web of relations such as an organisation or community. According to this internal perspective, education is an example of an institutionalised structure within our society that comprises a network of relationships and the assets that may be mobilised through that network (Nahapiet and Ghoshal, 1998). A third group of definitions combines both internal and external perspective, based on the philosophy that internal and external social capital don't necessarily exclude each other.

In this chapter we choose for this combined perspective that considers the relations between students, lecturers, and other stakeholders of education as external to the actors but internal to the social network of the educational institute. Therefore, we use the definition of social capital as "the sum of the actual and potential resources

embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (Nahapiet and Ghoshal, 1998 in Adler and Kwon, 2002). These internal resources for example indicate networks, values, norms, social trust, culture of education. An actor's personal network and the knowledge, support, and opportunities that can be derived from that network can be considered as external resources.

The network of relationships and the potential resources expands because DBE involves the interaction with real-life design problems, external stakeholders, validation, and feedback processes with, often, external end-users, experts, and stakeholders. Therefore, it becomes even more important to carefully manage the social capital of an educational institute and its actors. Empirical research shows that social capital represents a possibility for sustaining knowledge within a discontinuous and fragmented learning environment, such as for example in project-based working teams (Bartsch, Ebers and Maurer, 2013). Also, research has shown that different attributes of social capital, such as an actor's access to specific resources through a social structure of interactions and an actor's trust and trustworthiness as embedded and involved in relationships, function as important catalysts and have a significant positive impact on organisational learning in a rapidly developing environment (Liu, 2018). Thus, social capital functions as a glue to capture fragmented knowledge and manage the diffuse boundaries of an organisation. In this way DBE provides a key role for the lecturer to mediate the social capital development and its resources, such as the knowledge possessed by the student, the educational institute, external stakeholders, and the lecturer, as well as the augmented network of relationships.

Social capital learning: The interaction of content, motivation, and society
To understand social capital in the context of learning and what resources the DBE lecturer mediates, the learning model of Illeris (2016) offers a suitable framework. This model explicitly places learning in the context of society, reflecting on the learning process as a social and societal interactive encounter. Illeris (2016) defines learning as "any process in living organisms that leads to permanent capacity change, and which is not solely due to biological [change] or aging" (p. 3). The way we learn is determined by both our biology and social structures. According to Illeris, all primates, not just humans, learn by interaction with others. Learning is any process that causes a change in our actions, and in our thinking. It is independent of the changes we go through due to our biology or natural disposition. This definition includes all kinds of developments such as socialisation, qualification, and competence development. Learning is in fact part of the overall development to sustain you in the surrounding world. Social capital is inextricably linked to the way we learn and integrated in our communities and society.

The core of Illeris' theory is built around a model (See Figure 20. The Learning Dimensions by Knud Illeris (2016)Figure 20) in which there are three dimensions of learning: 1. the incentive or motivation for learning something which determines that there is willpower or motivation, 2. the content or the body of knowledge, understanding and skills, and 3. the interaction with the environment, which means that there must be a certain degree of communication, action, and interaction (Illeris, 2016). From the lens of social capital theory motivation and content can be considered as resources, whereas the interaction with society influences the body and consistence of these resources. In other words: learning is embedded in a social structure, and it is the (social) environment that constantly provides new impulses. Since the social capital of DBE is considered as an
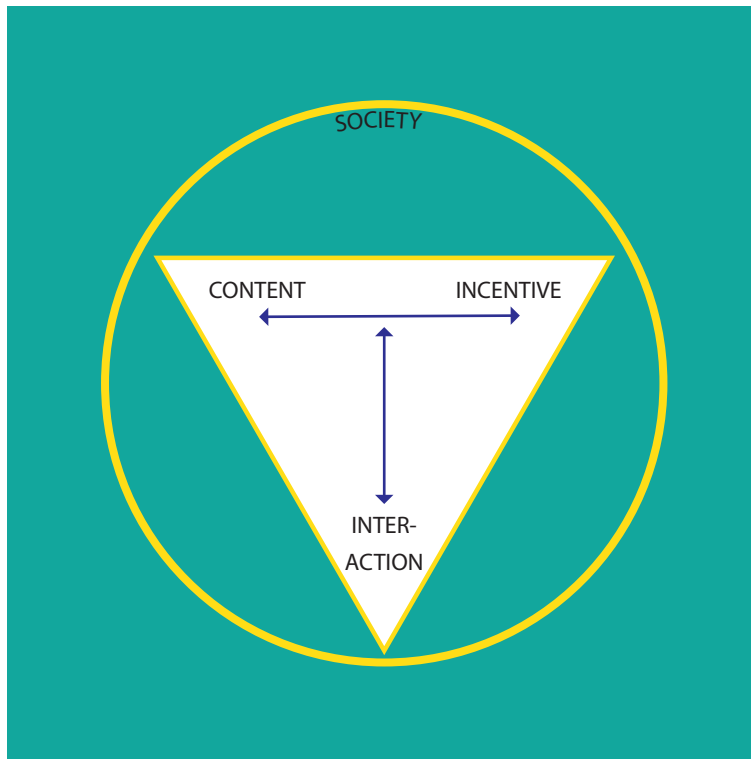
Figure 20. The Learning Dimensions by Knud Illeris (2016)

open system, blurring the boundaries between university and society, both motivation[3] and content (the first two dimensions of Illeris' theory) can be easily influenced by its surroundings. This means that within DBE interaction with the social environment (Illeris' third element) is even more important than in traditional education: the motivation (1) and content (2) are determined by society (3), in terms of real-life challenges. When considering DBE, the dimensions of learning mentioned by Illeris imply that a DBE lecturer has a role in both stimulating or at least understanding motivation, mediating content, and being a mediator between the student and external stakeholders/society. Three lecturer's roles arise: the personal motivation, the content and societal mediator.

Conclusions: the three mediating lecturer roles of DBE
When we translate the abstract theory of social capital and the learning dimensions to concrete lecturers' roles, we conclude that the DBE lecturer positions itself as a mediator between the three types of dimensions motivation, content, and society. This means that the DBE lecturer fulfils at least three mediating roles in relation to social capital: a mediator in relation to motivation (personal mediator), a mediator in relation to content (content mediator) and a mediator in relation to society (societal mediator). We call these roles respectively personal mediator, content mediator and societal mediator. As a mediator the lecturer helps to initiate a learning process in which exchanging knowledge,

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3 Whereas Illeris refers to incentive we choose to use the word 'motivation'.

being connected to society, real-life problems, and active participation are brought together. The interaction dimension serves the personal integration in communities and society and therefore social capital is crucial. When using DBE, the lecturer is a key for the interaction dimension, facilitating interaction to mediate motivation, and content in relation to society. In the following paragraph we will further elaborate on the mediating lecturer roles based on the experiences and practices of the Bachelor of Communication and Multimedia Design and X-Honours programme of NHL Stenden UAS. Although the three mediating roles influence each other and are inextricably and interactively connected, we describe them separately to get a better grip. We explain about them in the order of (1) Personal mediator, (2) Content mediator, and (3) Societal mediator.

Current Practice: The three mediating lecturer's roles

NHL Stenden UAS has a small number of programmes that have many years of experience in a method of education that closely resembles DBE. Two of them are the Bachelor of Communication and Multimedia Design (CMD) and the multidisciplinary X-Honours programme.

Communication and Multimedia Design (CMD) started back in 2001 with fully demand-driven, talent and competence-oriented education. The students work in communities of practice on real life challenges or so-called wicked problems. A few years ago, CMD introduced Design Thinking as a working method for all student projects. A characteristic of CMD is that there is no fixed curriculum and that the learning outcomes are not predetermined by the lecturers. There is close collaboration with the business community that provides (real) assignments and experts from the field of, for example, advertising agencies, game companies, and social foundations. From the beginning of their studies, students learn that they themselves, in consultation with the lecturer, must determine which knowledge and thus which learning outcomes are needed. In 2018, the Bachelor programme received for a second time an excellent review from the NVAO (Dutch Flemish Accreditation Organisation) with respect to standard 2 'The Educational Learning Environment.'.

In 2016, the X-Honours programme was established based on the national Sirius programme and this programme is based on the same philosophy as CMD. Thus, honours students shape and conduct their own learning process. X-Honours offers a programme for students who want to do and learn more than their own educational programme can offer. In this programme the lecturers and students work together in a community of learning with lecturers, clients, and experts. The major difference with CMD is that students come from dozens of different study programmes and work together at X-Honours. Multidisciplinary working is one of the pillars of the programme, as well as personal leadership, innovation, entrepreneurship, and value driven.

To compare theory with practice, we conducted a semi-structured focus group interview with four respondents in the fall of 2019. The participants (see Table 8) were a former CMD lecturer who was also the former head of education, a lecturer and coordinator of the mentorship of CMD, the coordinator of X-Honours and a lecturer researcher. During the interview, the three mediating lecturer roles were used as a guideline or topics for the conversation.

Table 8. Participants in a semi-structured focus group interview.

Participants	Function
Respondent A	Former lecturer and former head of education at CMD
Respondent B	Lecturer and coordinator of the mentorship of CMD
Respondent C	Coordinator of X-Honours
Respondent D	Lecturer and researcher at X-Honours

Lecturer as a personal mediator in practice

According to the interviewees the personal mediator motivates the students and functions as a mentor, a personal coach. (S)he mobilises the internal resources of social capital like values, social trust, and culture to provide an open atmosphere. (S)he asks open questions in a way that students have the space to construct their own learning profile and to reflect on their actions. According to X-Honours respondent D the lecturer encourages the learning process and is therefore a mediator but also a motivator: "Our students are independent and seek the knowledge they need at that moment. The students work in groups within the online programme Basecamp4 and they coach each other. Every lecturer must have skills to stimulate the group process: it is primarily about the support of the process rather than the transfer of knowledge." (S)he empathises that the personal mediator gives the responsibility of the learning process to the students and that (s)he stimulates student interaction in a way that students support and coach each other in peer groups. CMD's respondent A agrees with this and describes the lecturer as a catalyst: "(S)he promotes the process without becoming part of it. This also means you need smaller groups of students per lecturer. When you want to give a lot of freedom in education, intense guidance is important."

CMD distinguishes the following roles for lecturers: tutor for the group process, mentor for the study career guidance, and content lecturer for the transfer of substantive knowledge. The lecturer is also a handyman who organises guest lectures, museum visits, and international trips. The three roles of the DBE lecturer are easily recognised. According to respondent A the role of personal mediator is by far the most important and plays a key role in the quality of education. "We started in an era when competence-oriented learning was on the rise and many secondary vocational education institutes (MBO in Dutch) were already deeply thinking about how they wanted to deal with this new way of learning. From the outset we wanted to give students more responsibility compared to traditional education. This would require a lot more guidance. "The coaching role of the lecturer is therefore the backbone of our programme and that is in

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4 **Basecamp (1999-2020)** is a real-time communication tool that helps teams to organise and manage projects and collaboratively work on individual segments (e.g., resource planning and long-term scheduling, client interaction).

some regards more important than the expertise of a particular field," says respondent A. This also means that what is expected from the students, also applies to the lecturer: (S)he reflects on their own actions, asks for feedback, and keeps on learning.

To facilitate the role of personal mediator, the lecturers of CMD and X-Honours receive extra training in mentoring skills. At CMD, lecturers are trained in conversational skills and neurolinguistic programming, in giving and receiving feedback, and using practical self-coaching tools such as the Belbin team role test (2010) and Myers–Briggs Type Indicator personality test (MBTI test, n.d.). At X-Honours the lecturers only have one day a week to supervise students, but the role of the lecturer as personal mediator or coach is considered eminent. "Some other programmes or courses do not provide what is necessary to be a good coach. Teachers only get a few hours. You should provide tools and time to coach because it is precisely this role of the lecturer to encourage students to learn, that they enjoy teaching and appreciate their study programme," says X-Honours respondent C. At both CMD and X-Honours, they emphasise that a lecturer is not a therapist. The role of personal mediator indirectly affects the personal emotional and psychological development of the students, but according to all interviewees, the focus should be on how a student wants to develop professionally and understands the mindset and skills that are required for this professional role.

Lecturer as a content mediator in practice

At CMD and X-Honours the course content is not solely dependent on the lecturer but arises from an interaction between the real-life assignments, the students' ambitions and wishes, and societal interaction. Therefore, course content can also be outside of the field of expertise of the lecturer. Some problems can be complex and cross-domain in a way that the lecturer doesn't necessarily have the answer or is not yet is familiar with the matter. This results in a mediating role according to course content. The question then becomes "how can we get expertise on this?" This is most evident at X-Honours: there is collaboration with students from 37 different study programmes and a relatively small team of lecturers is available for this. None of the lecturers has all the knowledge that the students need to properly implement a project. As a content mediator, the lecturer then helps to mobilise external resources of social capital such as personal networks, knowledge, and expertise, of both themselves as well as the students. As a result, lecturers and students learn together and benefit from one another's networks. As respondent C explains: "At X-Honours, we already work interdisciplinary, so every student has their own network. The lecturer then trains students on how to do research, to work design-based by testing and adjusting prototypes or to system think." Also, at CMD students sometimes need expertise that the Bachelor programme has not necessarily in-house. "The student then has to take action to visit an external stakeholder for consultation, but this can also be supported by a lecturer who organises a consultant. "An interaction that the lecturer stimulates or facilitates," explains respondent A. The content of lectures and workshops is also adapted or even determined based on the students' need.

At CMD every lecturer is expected to be a good coach, although a distinction is made between those lecturers who have coaching as their core task and those who are delivering content. The programme therefore works with people from the professional field who share their knowledge for six months or a year. To help students in finding who they need to consult, there is a special website that shows the various lecturers' expertise. For student assessments the mentor, the content lecturers, and often experts from the industry are consulted to get a fair and meaningful judgement and feedback. The website supports a feedback system so this expert feedback can be collected for the learning processes of individual students. "Providing feedback is essential for both

personal and professional growth", states respondent B. "During a module or semester, the student receives continuous formative feedback from lecturers, fellow students, and maybe experts from the field. At the end of a curriculum, the student receives both summative feedback and feedforward: meaning feedback with which the student can continue in his professional career." So even in the role of content mediator it is important that the lecturer also keeps an eye on the personal development and learning process of a student. In the role of content mediator, the interviewees empathise that the lecturer is a learner as well.

Lecturer as a societal mediator in practice

As is evident from the descriptions above, the societal mediating role of the lecturer is intertwined with the roles of content and personal mediator. Respondent C explains "The DBE lecturer has to practice all three mediating roles. As an X-Honours lecturer you are a networker who responds to supply and demand. We take in questions from the outside world for students to work with and we ask those people, partners, and organisations to participate in education. In this way we create an interaction with the professional field, the industry around us. To develop world wise students." The interviewees acknowledge the power of a community and the interaction with the society: getting together and complementing each other in knowledge, practice, and experience.

The lecturer as a societal mediator is an obvious choice for both X-Honours and CMD: both educational programmes involve close collaboration with clients from industry and government. Also, at CMD lecturers mediate between these clients and the students. "Teachers know people in the field and ask them for guest lectures and as external assessors. This creates an interaction with the professional field or an industry that DBE also requires. We are involving people who do not necessarily want to work as educators - otherwise they would have chosen to do so that long ago - but who can still participate with students, lecturers, and researchers and that works fantastic," says respondent A. CMD has a special facility, a knowledge centre that coordinates the partnerships and cooperates with coordinating lecturers, so the external network expands and stays relevant.

Discussion and future perspectives

The lecturer's roles as societal mediator, content mediator, and especially personal mediator are clearly defined at X-Honours and CMD. The experience of both educational programmes is that these roles can be combined in one lecturer, but according to respondent A the quality is improved if the roles are divided within a team, with some lecturers putting more emphasis on content and others more on coaching. However, the interviewees point out that the roles are essential to DBE education. Where DBE education differs fundamentally from more traditional education is that it is constantly subject to change. These changes must go at least as fast as the societal changes. This means that the content of an education programme is not centrally determined: the curriculum will differ per semester and even per assignment. The curriculum is determined more by the interaction of demands of the clients and the wishes of the students than by the knowledge of the lecturer. This requires a fundamentally different attitude from the lecturer: personal, societal, and content mediation have become more important than ever before.

Respondent A thinks it is very important for universities to recruit staff in a different way: "The human resource management department must recognise the needs of DBE. If HRM cannot develop a DBE mindset, it will be difficult to implement this educational approach university-wide. This also entails a very big task for our university of applied sciences. If you give a lecturer a work plan or schedule per half hour, DBE will not work: "Then a

lecturer will work according to those hours and not according to the DBE-cycles." Having a design-based curriculum also means that the programmes and its lecturers develop according to design-based principles: iteratively and in dialogue with different stakeholders. Therefore, it can be difficult to predict how the programmes will develop, since development happens continuously. To educate students for a future we don't yet know, it is important that also educators keep iterating and developing all the time and that students acquire skills that allow them to effectively respond to continuous change. However, respondent A points out that in the development of CMD he aspires more "cross-pollination" between different academies, lecturers, and students, working in a multidisciplinary way like what they do in X-Honours. "To open up the mono-disciplinary environment," respondent C affirms. According to the interviewees communities or ateliers should have a cross-domain character. And to support the mediating roles and the use of social capital it would be interesting when HR captures and visualises the available knowledge within the university.

Chapter 10

TAMARA - Lecturers' stories about Design-Based Education

Riemke van der Meer

Abstract

The transition to Design-Based Education (DBE) has great significance for the lecturers who develop and implement it. That significance is highlighted in what eight lecturers tell passionately about it in the interviews conducted in this narrative research. These statements are of great value because they offer a glimpse into the undercurrent of the organisation in transition and thus form the narrative truth, including the emotions, the sensemaking that instructors give to the process of DBE. The change to DBE requires lecturers to move in the domains of competencies and behaviour, but also causes shifts in the spheres of feelings, culture, and identity. The interplay of stories of the lecturers who are involved, which we could call "Tamara" after Boje (2008), are a snapshot, an illustration of the NHL Stenden University of Applied Sciences organisation in this phase of educational innovation. To do justice to their complexity, it was decided not to interpret and analyse them, but to arrange them according to the structure of Joseph Campbell's Monomyth, to form a metaphor. This can be used as a starting point for professionalisation, so that the support can be consciously directed towards development and improvement, necessary for a learning organisation, which is a model for the vision of DBE education: continually working together on improvement and learning.

Keywords: educational innovation, narrative research, professionalisation, meaning / sensing, undercurrent, learning organisation

Foreword

"How's the development of Design-Based Eduation (DBE) going, anyway?" I have often heard that question around me and often asked myself the same question. But how do you answer this? It can be answered in many ways. For example, by looking at the product: to what extent (perhaps which percentage) are the curricula of the courses taught according to the DBE method? But you can also look at the process, which is even more complicated, also because the development of DBE is not a linear process. This has also been explicitly chosen: Systematically where should be, development-oriented where possible; from A to B via B (Stenden and NHL UAS, 2016). Another distinction that can be made in DBE is the thinking in the lower and upper streams. If you organise something in the upper stream for the change to DBE, such as facilitation in time, training offers, the appointment of a project leader DBE, nothing really must change yet. Because the people in an organisation make sure that this change really comes about, by adjusting their behaviour. And to adapt their behaviour, people really need to want the change. And then it is about subjective things like beliefs, values, culture and emotions, aspects that I am very curious about. But how do you measure and research these aspects? For me it was obvious to question people involved in the process of DBE. How do they experience this process? I interviewed several colleagues at various times, and I was very impressed by their stories. Because what I experienced was a flow of involvement,

emotions, and passion. The interviews are stories and those stories in themselves are the truth about DBE now for me. Because we usually only hear them in corridors, over coffee, at work meetings, but not from managers, at official evaluation moments or in investigations. With stories I do not mean that there is a logical beginning and end, no coherence, and patterns and not my interpretation of them, but to give the statements, thoughts, feelings, the stories themselves and these the attention they deserve. In this chapter I therefore want to let them speak for themselves as much as possible, without analysing and interpreting them, which deviates from what you would normally expect in a research report. Because you cannot see the question "How is the development DBE going?" separate from the meaning given in stories by the people who carry it out.

Introduction

The introduction of Design-Based Education is a major educational innovation with significant impact on the people who make up the organisation. The transition has a substantive side, the educational innovation, but also has to do with a change of culture. All these changes create a lot of movement, involvement, and energy, but also frustration and resistance. This research tries to sketch a picture of this complex reality of the first two years of the transition to DBE. The aim of this research is to supply narrative "truths" for the experience of s involved in the development of DBE. The story that is found can serve as an anamnesis, which can be used to reflect on the process. Not by predetermined indicators, as in project-based work, but by giving meaning to it.

This chapter first provides a theoretical framework, with the first section examining the theoretical knowledge there is about innovation in education. It first discusses the concept of 'giving meaning'. Next, it discusses what educational innovation means for learning and professionalisation. Then, narrativity in organisations and the structure chosen according to the Monomyth, after which attention is paid to the stories of the s involved. The conclusion discusses several striking issues and gives consequences of this research for the educational innovation DBE at NHL Stenden University of Applied Sciences.

Learning and change

When it comes to educational innovation, it is essential to bring in s; educational innovation has no chance without support (Bergen and Van Veen, 2004). To involve s in the innovation, it is necessary for the whole organisation to learn. The involvement and motivation of staff must be considered by broad participation, stimulating experimental behaviour, learning from mistakes, and giving and receiving feedback (Oreg, 2006; Miedema and Stam, 2008; Coppoolse, 2018). Creating support is mainly about emotional aspects. When a change is introduced, s each give meaning to the information in their own way, so that each constructs his or her own reality (Oreg, Vakola and Armenakis, 2011). Emotions, about culture, identity, and core values, give meaning to it. People go along with a change when they understand it with their head (cortex) and feel it with their heart (limbic system). The emotions, the limbic system, gives change energy (Bartunet, Rudolph and Depalma, 2006; Thieke and Leeuwen, van, 2013).

The design of an organisation depends entirely on the meaning that is derived from it. Meaning is given through language, speech, and communication (Weick, 2005). This formation of meaning comes about in a complex way and is constantly subject to change. Narratives and stories are the vehicle for this complex signification (or sensemaking) and therefore play a crucial role in the process in which the organisation takes its form and interpretation. By considering the organisation as a whole of Storytelling Organisations, one does justice to its complex reality (Boje, 2008). Insight into the "undercurrent", the invisible facets, provides insight into the learning culture of the organisation (Van Es,

2008). Creating such a learning culture is about transformative learning (Ruijters, 2015), which is aimed at joint knowledge construction, resulting in the innovation itself. In a complex changing environment, it is important to recognise the need for support (Rafferty and Griffin, 2006), which can take shape through collective learning in an investigative dialogue (Assen, 2018). Teams learn by working on the innovation, with the supervisor as facilitator rather than expert (Walsweer, 2015). By focusing on participation, learning can be viewed in a distinct way, leading to a changing way of supporting learning (Coenders, 2008). By using these forms of learning, the entire system, the entire organisation, learns (Fullan, 2009) and you achieve participants feel emotionally supported (Lankveld and Volman, 2009).

Organisation and narrative
Organising can be viewed as a process of social meaning construction between the actors, each contributing to this process from their own interests and perceptions. An organisation comes about through communication between people in the form of stories that are as diverse and changeable as the organisation itself. Therefore, one cannot really speak of organisations, only of organising (Wierdsma, 2005; Weick et al., 2005). The stories that are told in an organisation (narratives) can be examined to explain the meaning behind the facts, giving a representation of a possible reality, or sensemaking processes (Weick, 2012). Boje (2008) uses the term Tamara for this, as a metaphor for the interplay of distinct types of stories, in which meaning is given. By telling stories without interpreting and analysing them, we represent a reality, so that insight can be gained into processes of giving meaning. In this way the change is understood, and the movement can arise (Boje, 2008).

The aim of this research is to tell the stories (Tamara) of the introduction of DBE. As structure for these stories the Mono myth was chosen; the basic structure of all classical stories, after Joseph Campell's "Journey of the Hero" (Campbell, 1949). Campbell's model is distilled from all the great classic stories, myths and fairy tales that exist. Each story is about a (metaphorical) journey that, through highs and lows, eventually leads to growth and development. The primal structure of each story is order chaos, resolution and with those stories, processes, problems, change resemble each other. The 12 phases of the hero's Journey are intended as a metaphor for the story of the lecturers.

Research method
Research question
This research focuses on the following question:

What significance do lecturers at NHL Stenden University of Applied Sciences, who are involved in the development of the new educational concept Design-Based Education, give to the process of change over time?

Data collection
Narrative research has been chosen as a research method, which provides insight into the personal and shared stories of the s involved in the development of the educational concept DBE. To this end, a choice of eight s involved were interviewed (semi-structured). Four interviews were held with each instructor and a joint session was held. The interviews were spread over a period of two years. The first interviews took place at the start of the development phase of DBE, the last one at the end of the academic year in which the courses in question started implementing DBE.

The interviews and panel discussions were transcribed, after which patterns were found by open coding (grounded theory approach), which were made visible in the story. A first phase of data collection, the first interviews, was followed by analysis, on which the researcher reflected, to make choices for the next step in data collection. In this research, this led to a division into phases of the hero's journey. This division is separate from a linear time division. The researcher has made choices to place a statement at a certain phase. This is about a representation of reality.

Respondents
A mix of lecturers was chosen, which together reflect the total lecturers' population.

- Lecturer A: lecturer and team leader. From 2017 liaison*, in 2018 team leader, member "core development team".
- Lecturer B: lecturer, deputy head of department, and liaison.
- Lecturer C: (relatively new).
- Lecturer D: lecturer, member development group DBE
- Lecturer E: lecturer, chairman of the curriculum committee, project group DBE
- Lecturer F: lecturer, developer for own team of social subjects
- Lecturer G: lecturer, initially involved in the "sounding board group" of the Academy.
- Lecturer H: lecturer, project leader DBE

The stories of DBE
The story is formed by statements of eight different s, which are structured according to the different phases of The Journey of the Hero (Campbell; 1945).

Prologue
Before the merger, Stenden and NHL educational delivery was based on different educational concepts. They were respectively Problem-Based Learning (PGO) and competence-based education. In the run-up to the merger between NHL University of Applied Sciences and Stenden University of Applied Sciences in 2018, the first sounds about Design-Based Education reached the s. Curiosity was aroused:

> *Lecturer E: This curiosity was really the beginning. I thought, "Hey, this is interesting." PBL had its limitations. I wanted the student to be more central. A colleague had been working on it for some time, Kaos strengthened it. The curiosity is still not gone.*

What DBE meant was still virtually unknown to many lecturers:

> *Lecturer C: It started with DBE as a slogan. I liked it a lot, because it brought educational development, but also a bit of searching. I still think it's wanted, but it has been adopted.*

It is appreciated that there is reason to talk about education with colleagues:

> *Lecturer C: I especially liked being so busy with education as a team and whether you call it DBE, or redesign, or whatever, I haven't been working here that long, almost 2 years, and you don't often talk to colleagues about how that fits in with the subjects and how it interferes with each other, and what it means for the curriculum, what it looks like.*

Several lecturers cite the change in society and the student population as a reason for changing education. They are looking for a form of education that appeals to students:

> *Lecturer F: Eh because society is changing very much. And I think that there will be many more cross-curricular issues, and that we also must try to create flexibility, also among students, so that you don't educate them in one direction but that you educate them in different directions...that the students will ultimately also be flexible to respond to the issues in society.*

The tone of the conversations in the beginning of DBE was very involved:

> *Lecturer E: In the end it comes down to a kind of passion that I have, because I like 1 to be busy with education in a kind of overarching way, but 2, because I very much believe, from the training that I also did, in that design thinking process, in lessons, in a different way than the PBL system that we now know...".*

Call to adventure

Lecturers' motivations to take part in the development process vary from being asked, to being rolled into it. A lecturer puts it into words as follows:

> *Instructor F: Well, there are two sides to it, on the one hand we cannot escape the fact that we have to get to work on it and then I like the fact that I am the first to do something with it instead of bumping into it, and on the other hand I like the concept that students become more owners of their learning process, at least that is the image I have of it, more than they are now.*

> *Lecturer G: I was very happy that I was asked. That was the first moment of: think along. Before that, I had the idea, I'm just someone to do boxes. And in the team, we now say, we are responsible for our own training. That wasn't before.*

Energy was released and people got moving. Tension was felt, the adventure was taken:

> *Lecturer D: I heard people shouting something. And later something more. I thought: "Okay, apparently there's going to be a new wind blowing". But what? We don't really know, but we're already shouting something. That was September for me. Pretty soon my name was on a list for a design group.*

> *Lecturer E: And I have that confidence now, that I really can, but it does require an open mindset and a kind of adventure and daring to dare to meet yourself in that as a student, perhaps, but also as a lecturer.*

Some courses had already started with DBE, before the official start:

Lecturer A: I thought we are going to evaluate the studios anyway, we had already had them for two to three years, so I thought: then we can put that along the yardstick of DBE. Then we planned the Kaos, and we did it in November, half the team and I was there too. It was still very vague then, but I thought, why don't we do it?

Lecturers try DBE elements in pilots and experiments:

> *Lecturer A: Well, I notice that people are already experimenting on their own within a profession, people who have followed the training. I hear things like "Hey, we did a bit of a DBE thing today" and "Oh, it was a lot of fun".*

Resistance and refusal

In the first year of development, the initial experiences with resistance came from colleagues. One of the s was no longer involved in the development group:

> *Lecturer G: Then I thought: it looks like I fell out of the mailing list. So, then I think: is it because I was too critical? But I still don't know.*

People also run into colleagues who don't want to participate:

> *Lecturer B: And people who say: "I've been through so many educational developments, and I believe it, because in the end it's back to the old way". These are people who we then focus on things for which we can use them very well, within the organisation, but less on educational development.*

Other difficulties have to do with facilities: scheduling, ICT, available space for workshops and, above all, time for development:

> *Lecturer A: We have interpreted "atelier" as only the physical space. But at the scheduling office we now must start planning atelier as a work form. And it isn't, so that gives a lot of confusion, that talks very difficult.*

And what we ran into very hard is that before the development, for example, we had applied for things, but the Executive Board waited months before we could do it. So yeah, it can't...Then it doesn't feel like it's being seen as a priority by the college. And I think that's a very bad signal to send out.

> *Lecturer B: Resources and facilities are there, but with us it's mostly on time. Will it all work out before September?*

> *Lecturer C: But colleagues are so busy, a lot have fallen off. They want to, and it's going to be a lot of fun, but no time. So maybe the need is there, but the time is not there.*

Outside help

They went looking for tools. This was for example organised by exchanging with colleagues inside and outside the training:

> *Lecturer H: We had a design thinking workshop and every Tuesday we set up a design thinking lunch, with sandwiches, where we could talk to each other about what it is exactly, because we need more depth in the very short term. So, we also invited people from Leisure who have already started integrating things.*

Lecturer D: In the beginning we exchanged with a small club; "Why do you do that and what do you do". "I use energisers", "Well I don't".

The KAOS pilot training is also mentioned as a tool:

> *Lecturer F: Um... it makes you think. I found it inspiring and very interesting the training and three days, you were really 3 days busy with the training, that was very interesting.*
>
> *Lecturer E: But interesting is that... the rest of the team hadn't done anything with KAOS yet and when they got the KAOS training they suddenly said, yes and now we want to continue.*
>
> *Lecturer B: Such a KAOS pilot brings something with it. That's why the cooperation started. People were very enthusiastic. But the delusion of the day will reign again. So, you must follow up on that.*

Or the training Your Ideal Classroom:

> *Lecturer C: And we did something else, YIC, that was also very good. Personally, I think that YIC is the most useful.*

Over the threshold/The new world (phase 5 and 6)

When DBE has become better known, people realise what DBE can really mean. Self-confidence grows because the first successes are experienced:

> *Lecturer A: Lecturers are very proud of the workshops. Absolutely.*
>
> *Lecturer D: And I thought, "Here's what's happening and now we have to hang on."*

Even though we still must get used to it:

> *Lecturer B: It's also letting go of old ways. That bothers you, that is true, but I do think people are open to it. There is a lot of talk about it. Yes, we have room for that, because we have less intake of students...We must get more new young lecturers, that is very important. They will easily go along with that renewal. Until then, we are going step by step, we're not going to introduce a revolution.*

It will become clear what the changing role of the lecturer really means. There is a parallel process among students and instructors:

> *Instructor A: But it is also what strikes me. We expect a certain attitude from students, and we must live up to that, but it is not done that way. I also notice it in student complaints. Also how is assessed, how is communicated to students. ...And then someone came to me: "We don't have an assessment form at all". I said, "Yes and?" And then we asked them, "How would you like to be judged?" Well, they knew that very well. And then independently came*

almost identical points and students had an extraordinarily strong opinion about it.

Lecturer D: And then I thought: I am going to see how I can help in something we don't know where we're going yet. At PGO I was a bit more steering. Thinking open-ended, then you don't know how to do it and then you have those iterations, that was the most important thing in the end and slowly you get something of metacognition.

Lecturer G: Because you get much less in the situation: "I know and I have to tell you", but we all sit here and learn something. So, I'm learning too. Your role is different.

The initiation

In this phase DBE is really chosen, but the difficulties, the challenges that go with it, also become clearer. People are aware that they can really innovate. And that it is important to think from a more holistic point of view:

Lecturer E: But they already start with a blank page for year 1 as well, so first they look at what we want and what we have, instead of what we have and how we are going to cycle DBE as a technique. So, it is looked at holistically and I was happy with that for everyone... that hasn't been an issue for the rest of the team.

There are also questions about how to incorporate design thinking into education:

Lecturer H: We want to prevent form from taking precedence over content. That you always must design something. While you're only busy managing people. And that learning. That it's not about delivering new and adjusted prototypes. Sometimes it doesn't quite rhyme. So, we're trying to figure out how that can work.

A lecturer at the teacher training college thinks that the work field hasn't gotten that far yet:

Lecturer F: but you may wonder to what extent the work field is waiting for lecturers who want to design a lesson this way .... but that is why it is so important that the work field is involved when we train students, because I don't think the work field is waiting for it.

The crisis

There were also real lows:

Lecturer D: Time compels. At some point a colleague starts:" Yes but I disagree". Then everyone shot into the stress. Someone started crying: "I don't have time". At NHL they were a bit more sympathetic, but we didn't get time at all.

Lecturer G: But at one point I became very angry and sad, because it was only about the soft things. It was said that I disrupted the

process. It wasn't about who's right and who isn't, but in the end how can we get together. It was so incredibly instructive to see that such a crisis is a possibility. Those crises made it much clearer what the personal interests were. After that, all interests could be much better reflected in the design.

The time pressure is high:

Lecturer E: I sometimes work 60 hours a week. There must be a few who keep an eye on the line. Development time is not considered. The lessons must run as well. I must put out a lot of fires and that takes a lot of time.

The dagger

In this phase it's all about the finals, the big battle. There are trainings that decide to take a step back in their ambitions:

Lecturer E: Well, the biggest change is that we didn't introduce it in September, we postponed it for a year. With the reason that we just want to take more time, because we know where things can go wrong. What disappoints us tremendously is that there is nothing clear at all about preconditions, so actually it comes down to the fact that we're not going to do it.

A few lecturers are frustrated because there are not enough resources available:

Lecturer H: But a lot of people are also used to working from PBL where you do a lot of the same things by default. And that gives us a lot to hold on to. It's also nice that you don't have to prepare so much. And we must make a move somewhere towards looser forms, but you don't have to do that a two or three; that's quite a cultural change, because there just hasn't been any attention paid to it yet.

For example, there is no college testing policy. That may go into effect as of September, but we must work according to that testing policy. And testing is preferably done early in the process.

And he looks up to what is yet to come:

Lecturer H: And I don't see that happening before next year. Those studios are still not being built. Our groups are just going to sit in the Chancellery. I find it shocking that nothing is being done with them. It gives me the impression that the Executive Board doesn't really believe in it either, because then you must bet on it. I try not to worry about it all the time. We've brought it up again and again. There was nothing we could do about it, and we got it on our plate. That literally made me sick.

The return

If DBE has been introduced and it has been running for six months to a year, one is going to look back a bit:

> *Lecturer H: We've had a lot on our plate. The development of a Master and AD, this, the visitation still to come. So, it's been a lot, and it still had to be done. And it just didn't have the full focus. That's starting to come now.*

> *Lecturer C: You look at the learning moments to see how it could be better. Our original idea was too expensive. I'm not disappointed, that's a normal development process. That's part of it, I'm just sorry that we didn't have those frameworks clear at the beginning.*

> *Lecturer A: We evaluated a lot. One thought it was too tight, the other too often. You can't make or keep everyone happy. We are now making the big assignment a little more structured. We did make decisions about that.*

And forwards. We are realising that the development of DBE is an ongoing process. It is never finished:

> *Lecturer E: So, we learn from that. We should not think, we've developed education and we'll do the same next year. It does have to get better and better and sometimes I felt I had to communicate that again.*

Death and Resurrection

What does the transformation to DBE look like now that DBE is being introduced? With the experience one has with DBE, concerns stay. For example, whether the knowledge is sufficiently secured:

> *Lecturer D: I do think this is a point of concern. That I still think of eh, I don't have to evaluate myself dull, but I often have the feeling, we are doing it we are busy but where do we secure a solid BoK, so you can look back where we started. Just grab somebody in the neck and ask, "What's it based on?"*

One has the feeling of not being able to reflect enough, learn with each other and thus grow in DBE:

> *Lecturer D: I also notice, just on the brakes, what do we do and are we aware of it? Above all, we are running. And when you're busy with development and formation, that's contradictory. That's what I sometimes think, the express train has become what we do and what we don't do. I'm sorry about that.*

People are overall positive, but not yet completely satisfied:

> *Lecturer H: Those conversations I have had with students, I have never had with students before. They are very valuable and show that they oversee their own process, so we have achieved something. They are also capable of much more than before. So,*

there are plenty of bright spots, if you do it well it can be incredibly good, but we have not developed it well enough yet.

The elixir

At the end of the first year of implementation of DBE, the lecturers are satisfied with what DBE has delivered. There are also ideas to make a next step in DBE:

> *Lecturer E: Harvested this year, we have experienced a lot. Tuesday, we finished it with a group of students and then you will see what it has yielded. People do want it to be finished at some point. I think that's what happened with PBL, but you must keep looking: how can it be better? There are still so many things we can do.*

The strong point, space for the student, can also tip over:

> *Lecturer H: We are already harvesting, that depends mainly on what we get back, there are students who say they like going to school. In the beginning there was a lot of confusion, but the moment that that is a little gone, students like it a lot. The assignment is less fixed. They like that very much, that they have room for creativity. It also creates confusion, but students like being challenged. What doesn't work, I also think we have gone through too much, that they have too much space.*

However, one of the lecturers has the idea that students are less satisfied:

> *Lecturer A: Students last year were very positive, this year much less. To the first students, we said: "You are guinea pigs". Well, you shouldn't say that to law students, who were going to put salt on every snail... The first graduate was very positive. DBE seems to have a disturbing effect.*

Pride is also expressed, while at the same time caring:

> *Lecturer D: We just did it. For this year I am very satisfied. But I do feel the need to give it more hands and feet.*

Another lecturer makes a cautious relationship with student drop-out:

> *Lecturer H: Strangely enough, we have far fewer dropouts. There are students who dropped out, but more for that. We don't have a good explanation yet, but we think it works.*

And there's a lecturer who thinks it's too early to harvest:

> *Lecturer G: No, the harvest is at Harlingen. That's the end and we'll never make it. DBE is never finished because it can't be finished, because it's against what you're doing.*

Conclusions

In the previous sections you could read what different lecturers involved in the development of DBE think, feel, and say, about what this process means for them. What

was particularly striking in the conversations with the lecturers was the high degree of involvement that manifested itself in the passion in the conversation. There were almost no questions to be asked, they wanted to talk about their experience of DBE development. In the beginning of the research period, when the lecturers started developing DBE, there was excitement and enthusiasm. There were some critical noises, but real resistance was not observed. Even though there was not a very concrete sense of urgency, there was a real sense of adventure, hopefulness and full of ideas. Because DBE was not yet concrete, it was possible to associate creatively. The discussions were again about education and there was a desire to improve it. When DBE became more concrete, the first experiences with it, a greater uncertainty developed and with it the requests for more frameworks and more help from outside. There was always a tension between the need for room/time and the need for frameworks. In this respect staff and students went through a parallel process: Students also experienced difficulties with the room they were given to regulate their own learning process.

In the first instance the tutors saw difficulties mainly with the design. In terms of content, tutors sometimes met with problems, but most of the obstacles were concerned with facilities: lack of development time, lack of studio space, problems with scheduling and ICT, etc. People complained about a lack of supporting material in the form of policy, they felt stress, powerlessness, and frustration about the haste needed to finish the design on time. In the stories of the lecturers, you could also read about the participation that remained and the development of lecturers. This is seen by some as a parallel process to that of students. In the end there was pride in what was achieved, also surprise with the yield, and confidence for the future.

So how is the development of DBE going? Lecturers' stories about DBE tell us about the meaning they give it, how they think about it, what they feel and how they learn about it. The story shows what is good and hopeful, and wrong and difficult in the process. But above all it shows how longing and overcoming difficulties encourages change and growth. This could be seen as the shared story of the organisation (culture) and understanding of the change process, which can help those involved in the future to steer a process of learning and innovation, so that education is not a one-off but constantly renewed and improved. To discover which interventions help to achieve this, follow-up research is needed (design and/or action research). What can already be thought of is managing the change (and therefore learning) process, also in a DBE way. By learning by design: professionalising, team coaching, designing education, managing, and supervising, in an integrative way, in which learning with and from each other, in a collective way, takes place. With attention for the emotional aspect. In which we follow the lecturers in their idea that people make the NHL Stenden DBE, by continuously improving education.

Chapter 11

Design-Based Research at the core of the innovative development in the field of multilingual education

Mirjam Günther-van der Meij, Joana Duarte and Myrthe Coret-Bergstra

Abstract
The chapter illustrates the ways in which Design-Based Research (DBR; McKenney and Reeves, 2013; Cobb, Confrey, diSessa, Lehrer, and Schauble, 2003) stimulates recent developments within the field of multilingualism and (primary and secondary) education. The chapter illustrates how DBR fits seamlessly into Design-Based Education (DBE) by incorporating students in conducting research that is based on authentic questions from the field. It presents three research projects within the NHL Stenden University of Applied Sciences that aim at developing, implementing, and evaluating design-based interventions for holistic multilingual education (Duarte, 2017; Duarte and Günther-van der Meij, 2018a; Günther-van der Meij, Duarte, and Nap, 2020). The primary and secondary schools that participated in the projects each benefitted in their own unique way from the projects, which shows that, following the DBR-approach, the developments were adjusted to the specific needs of each school. Moreover, in-service teachers benefited from the cooperation with pre-service teachers, who have a different point of view, and vice versa. This emphasises the fruitful collaborative nature of the projects, which stems from the DBR-approach.

Keywords: DBR, multilingualism, multilingual education, holistic approach, minority, and migrant languages

Introduction
As part of the current teacher training programme at the NHL University of Applied Sciences we work with Design-Based Education (DBE). Design-Based Education is based on social-constructivist, contextual, self-regulating, and collaborative learning (Geitz and Sinia, 2018). It is based on empathy for the student, the lecturer, and the environment. The current complex questions from practitioners and the student's learning question form the starting point for learning and collaboration. DBE thus aims to train students to become entrepreneurial, resourceful, and world-wise professionals by focusing on learning by trying and doing. DBE is an innovative education concept in which valuable elements from the competence-oriented and problem-based education are used. The teacher training education of NHL Stenden and the research group of Multilingualism and Literacy closely cooperate in designing the DBE-curriculum. This research group contributes to the teacher training education, by offering content for essential themes and projects in the research curriculum, which can both be accommodated in DBE-workshops and ateliers. In this way, students are introduced to design-oriented research in a natural, appropriate way and learn to design, implement, and test interventions themselves. Under the supervision of researchers and lecturers, students work on authentic issues in the professional field and learn research skills and methodologies.

The design-based approach is also important in the research group's projects in which a Design-Based Research (DBR) approach (McKenney and Reeves, 2013) is used. DBR centres around acknowledging the complexity of educational contexts by carefully examining the different processes, levels and actors involved in carrying out a jointly engineered educational experiment (Cobb, Confrey, diSessa, Lehrer, and Schauble, 2003). As in the case of an intervention, these experiments are based on previously gathered theoretical knowledge. However, design-based approaches are of formative nature, in that they must possess an iterative, cyclic design intended to systematically improve the original experiment and report back to all participants involved. They are thus specifically adequate to yield sustainable results in lecturers' professional development (Collins, Joseph, and Bielaczyc, 2004; Kirsch, Duarte and Palviainen, 2020). In the research group's projects DBR is used to cooperate with different stakeholders (e.g., lecturers, researchers, students, policy makers).

Starting at the end of a DBR-cycle, let us look at the final reflection of one of the practitioners participating in a primary school project on multilingual education:

> *If a child is eight or ten when they arrive in the Netherlands, and they speak Chinese at home and no one else speaks this language in class, it is difficult [to succeed at school] but possible. They have learned how to learn, they know how to sit on a chair at a table, how to pay attention, how to write. Skills like that enhance learning of a new language. We also had children from Eritrea who had no education at all in their home country. They don't even know what it is like to sit on a chair at a table all day or to write with a pencil. So, they first must learn the motor skills to write (4th grade teacher in the province of Fryslân, the Netherlands).*

This quote shows firm knowledge of the heterogeneity of situations of multilingual pupils and a high degree of reflection on how skills can be transferred from one language to the other. Such open attitudes, diversified knowledge, and pedagogical skills were not the *status quo* in most of the schools with which we started DBR a bit over two years ago. The present chapter reports on three projects that were set up to work with teachers around multilingualism and education and on the outcomes of our DBR approach.

Although multilingualism and forms of multilingual communication were always the norm in Europe, with several dialects co-existing in one region, modern education systems have a mainly monolingual orientation. Throughout the late 18th and 19th centuries, the formation of larger nation-states became at the root of the modern ideological triad in which an alignment is expected between one nation – one people – and one shared language (Duarte, 2020). This monolingual mindset has since then harshly affected attitudes towards minority and migrant-induced language diversity, as languages became associated with one national standard language. This has been described by several researchers: drawing on Bourdieu. Gogolin (2002) speaks of the monolingual habitus of nation-states and education systems, Cummins (2008) reflects on how monolingual ideologies affect the teaching of languages in schools by keeping them strictly separate, and Heller (1999) claims that studying multilinguals through a monolingual lens, results in an analysis of forms of parallel monolingualism, rather than of multilingualism. The Netherlands offers a unique example of the rise of nationalism and of the new discourse of one language-one nation, leading to extensive standard language policies and the rise of cultural nationalism (Rutten, 2019). This monolingual mindset also leads to a serious achievement gap between the multilingual pupils and those who speak the language of instruction at home (Gubbels et al., 2019).

Recent research identifies an urgent need to 'unlearn monolingualism' (Scarino, 2014; Spence-Brown, 2014) and suggests an alignment of teaching and learning approaches at schools with the language practices of the changing populations they serve. To address the issue of adequate educational provision for multilingual pupils, several projects have been developed in our research group, focussing on the implementation and evaluation of multilingual education programs. To guarantee the sustainability of the developments within these projects, DBR has been chosen as a framework to work with the different stakeholders.

In the current chapter we aim at answering the following research question: to what extent can DBR support the development of multilingual education approaches from the perspective of pre- and in-service teachers?

Current practice
The field of multilingual education
Today's globalised world has brought people with different language backgrounds together. In many classrooms, this has resulted in an increasing number of children who speak more than one language. While there is evidence that a good development of children's home languages facilitates the learning of a new language (Cummins, 2000; Krashen, 1982), most current educational systems leave little room for such multilingual approaches. The educational system needs fundamental changes to adapt to the growing linguistic diversity. Accordingly, the challenge is to incorporate the concept of multilingualism in educational practices. Since the beginning of the 21st century, new teaching approaches have been developed. Yet, their implementation in school curricula has proved to be a difficult task, due to the many parties involved: Researchers, linguists, teachers, school directors, pupils, politicians, etc. (Van Avermaet, Slembrouck, Van Gorp, Sierens, and Maryns, 2018). This is also referred to as the "multilingual turn" in multilingual education (Conteh and Meier, 2014). Research calls for a change of paradigm from traditional immersion or bi-/trilingual models based on monoglossic ideologies (Flores and Baetens Beardsmore, 2015) to multilingual education approaches within regular schools based on heteroglossic ideologies.

The increase of multilingual students and the growing awareness towards their competences and needs has resulted in a rise of research focusing on dynamic models of multilingual education (Cenoz, 2009; Duarte, 2018; Hobbs, 2012). A common feature within multilingual education is that several languages and varieties are acknowledged and imbedded in teaching (e.g., home language(s), language/s of schooling, foreign languages, regional and minority languages). Several pedagogical approaches have been put forward to include multiple languages in mainstream instruction, such as Content and Language Integrated Learning (CLIL), language awareness or intercomprehension. While several approaches are available and have produced positive academic, attitudinal and socio-affective results for all students involved, "it appears that the most important challenge is not so much a lack of evidence-based strategies in highly diverse classrooms – although clearly more research is needed – but rather the availability of this knowledge and the need for a shift in attitudes of those who work with highly diverse classrooms on a daily basis, teachers, educators and policy-makers" (Herzog-Punzenberger et al., 2017, p. 33). As a result, the focus of research should be on finding ways to facilitate available knowledge for sustainable implementations.

Multilingual education in Fryslân
Until recently, rural areas were generally less concerned with super diversity compared to large urban areas. Regional minority languages and regional languages have had less contact with migrant languages. But this is changing fast. In the past ten years, the

population in the province of Fryslân in the north of the Netherlands has grown solely due to the arrival of new immigrants (Duarte and Günther- van der Meij, 2018b). This results in a complex language ecology: Dutch, Frisian, regional languages, English as a foreign language, other foreign languages (German, French, Chinese, etc.) and a variety of migrant languages (Arabic, Tigrinya, Polish, etc.). Fryslân is therefore also in need of a 'multilingual turn' (Conteh and Meier, 2014) in education. To address this need and in a cooperation between teacher training, schools and researchers, several projects have been developed to pinpoint concrete needs in the domain of multilingual education. As a result, three goals have been defined for the multilingual turn in Fryslân (Duarte and Günther-van der Meij, 2018a):

1. A holistic approach to languages in education

2. Knowledge and skills about languages and in languages

3. Integration of migrant languages in education.

Teacher training education

A study by van Beuningen and Polišenská (2019) in the Netherlands on how pre-service language teachers think and act regarding multilingualism showed that there are prevailing misconceptions about (the use of) multilingualism in the classroom. An important outcome of this study is that teachers indicated they need more knowledge and tools about (implementing) multilingualism in the classroom so that can acknowledge and use the multilingual repertoires of their pupils (van Beuningen and Polišenská, 2019). A survey study in Flanders by Pulinx, Van Avermaet and Agirdag (2015) showed that teachers often struggle with the practical implementation of multilingual approaches, due to both language separation ideologies and to the current fragmentation of approaches for multilingual education. To change the monolingual ideology still present in schools into a more multilingual ideology, one needs to create initiatives that are bottom-up and not solely implemented top-down from policy makers and school boards (Pulinx, Van Avermaet, and Agirdag, 2015). Recent studies have shown that the teacher is increasingly being put forward as the most important 'factor' in the educational process, and as such as the starting point for the implementation of innovations in education (Priestley, Biesta, and Robinson, 2016) instead of policy makers imposing rules top-down. By initiating small-scale projects, tailored at the needs and questions regarding multilingualism schools and teachers and most importantly, including teachers in all steps of the process, lasting changes can be made. Finally, professionalising in- and pre-service teachers with regards to (dealing with) multilingualism in the classroom is an important step to address their lack of knowledge and skills in this area (van Beuningen and Polišenská, 2019).

Holistic model for multilingualism in education

To address teacher professional development in the field of multilingual education, we have developed a holistic model for multilingualism in education to tailor the needs of schools and teachers (Duarte, 2017; Duarte and Günther-van der Meij, 2018a; Günther-van der Meij, Duarte, and Nap, 2020), based on the work of Cenoz (2009) and Cummins (2008). The holistic model for multilingualism in education (See Figure 21) allows a combination of the knowledge and teaching approaches that have proven effective in education of both minority and migrant students into one model and is thus appropriate for different school types. In addition, it combines different approaches towards multilingual education, by placing them along a continuum that oscillates between the acknowledgement of different languages and their use in instruction.

The model consists of five approaches from a functional multilingual learning (FML) perspective (Slembrouck, Van Avermaet, and Van Gorp, 2018). With FML multilingualism can be turned "into a powerful didactic tool". It aims at treating all languages and language varieties that children bring to school "as didactic capital which can be invested in real-time learning processes, so as to increase children's chances of development and education" (Slembrouck, Van Avermaet, and Van Gorp, 2018, p. 18). From FML the model is divided in the following five approaches: language awareness, language comparison, receptive multilingualism, CLIL and immersion. A language awareness approach (Candelier, 2010) is used to explore knowledge about languages and language diversity but not typical proficiency knowledge in the language. To create bridges between the several languages, contrastive language teaching through explicit language comparison is used (Gentner, 2010; Rittle-Johnson and Star, 2011). This creates meta-linguistic knowledge about differences and similarities in typologically related languages but, at a different level, also in typologically divergent languages (Ziegler and Stern, 2014). With the aim of raising receptive skills and developing language learning strategies, receptive multilingualism, which is a form of asymmetrical communication in which each speaker speaks a different language while trying to understand the other (Braunmüller, 2013; ten Thije and Zeevaert, 2007), is used. This works well with related languages. Content and Language Integrated Learning (CLIL) is used to teach subject content in different languages and immersion is used to teach the different languages by using them in instruction. Immersion is used when all subjects are taught in a target language, for example, using English, German, or Frisian as instruction language for part of the day. Finally, knowledge of translanguaging-based pedagogies is used in each of the five approaches, in which several languages are used simultaneously in instruction. Translanguaging refers to the use of the learner's full language repertoire in teaching and learning (García and Wei, 2015).
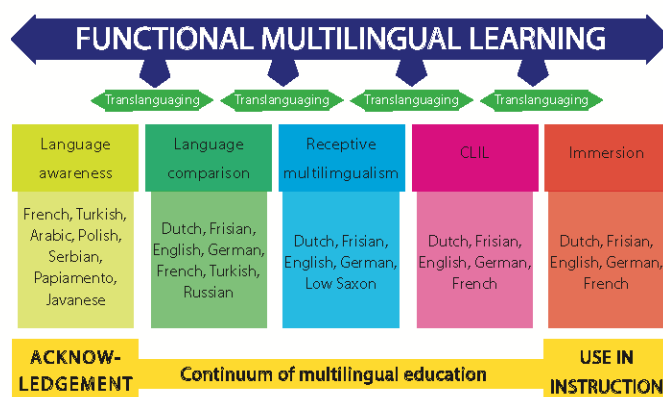

Figure 21. Holistic model for multilingualism in education (Duarte, 2017; Duarte and Günther-van der Meij, 2018a; Günther-van der Meij, Duarte, and Nap, 2020)

The holistic model for multilingualism in education supports teachers in distinguishing between what they can do with languages that they speak themselves but also maps the

possibilities for them to engage with languages which they do not share with their students. A more detailed description of the original model can be found in Duarte and Günther-van der Meij (2018a) and more information on the revised version of the model, that includes FML, can be found in Günther-van der Meij, Duarte and Nap (2020).

Multilingual education projects

The research group of Multilingualism and Literacy of NHL Stenden has launched several projects aimed at integrating multilingualism in education from a holistic perspective. The four-year project More Opportunities with Multilingualism (Meer kansen Met Meertaligheid - 3M), focuses on the development and implementation of a holistic approach to broad multilingualism in the education of the middle classes of four types of Frisian primary schools. Within the one-year pilot projects Talen4all a similar approach has been developed for the upper classes of Frisian primary schools that have an exemption for Frisian as a subject. Finally, the two-year project Holi-Frysk - multilingual secondary education for everyone - focuses on secondary education for three types of Frisian secondary schools. The project schools have each formulated their own research question regarding language education and multilingualism. In total we work with 26 schools and 58 teachers.

Design-Based Research (DBR) at the basis of educational innovation

In the three projects, we work with DBR (McKenney and Reeves, 2013). This is used to work with teachers to co-develop the multilingual holistic approach. To assure co-creation of the developed activities, regular school visits are conducted, and workshops are organised in the different stages of the projects. The developed activities are evaluated by the project schools' teachers by means of interviews and questionnaires and then adjusted because of these evaluations to optimise them. We include students (pre-service teachers) from the teacher training programmes of both primary and secondary school level in our projects through working with them in design-based workshops. In these workshops we provide them with a research question or problem around which they must work. The students work in groups of 4-5 persons and are placed at one of our project schools to conduct the research (e.g., research on language attitudes of teachers and pupils) or teach the lesson series they designed. For example, they must design a lesson series in which they combine a foreign language with a content subject or on combining several home languages spoken in a primary classroom and design lesson activities that include these.

As seen in Figure 22Figure 22, conducting educational research from a DBR perspective includes several phases, during which all stakeholders, including teachers, are seen as experts for their own field. After jointly exploring theoretical knowledge on one of the approaches for multilingual language instruction by means of a workshop with an expert, teachers analyse the situation at their own school and formulate a research question aimed at improving the quality of instruction in terms of multilingualism. Together with researchers, teacher trainers and pre-service teachers, the school team designs a teaching activity and corresponding material. Once the activity is developed, it is implemented in class after which the activity is improved and finalised. Video observations are conducted during implementation. Recordings are analysed by the research team and a feedback form is filled in by the teachers. At the time of writing, for the 3M and Talen4all projects, the developed activities are being implemented at another school to be improved and finalised for inclusion in the projects' online toolboxes. In the

Holi-Frysk project, we are in the phase of designing and evaluating the first teaching activities with teachers, so we have not yet reached the implementation phase.

For an overview of the activities developed by the teachers within these projects, see Duarte and Günther-van der Meij (2018a) and Günther-van der Meij and Duarte (forthcoming). In the current chapter we aim at evaluating the DBR process from the perspective of two different stakeholders: the pre- and in-service teachers that have
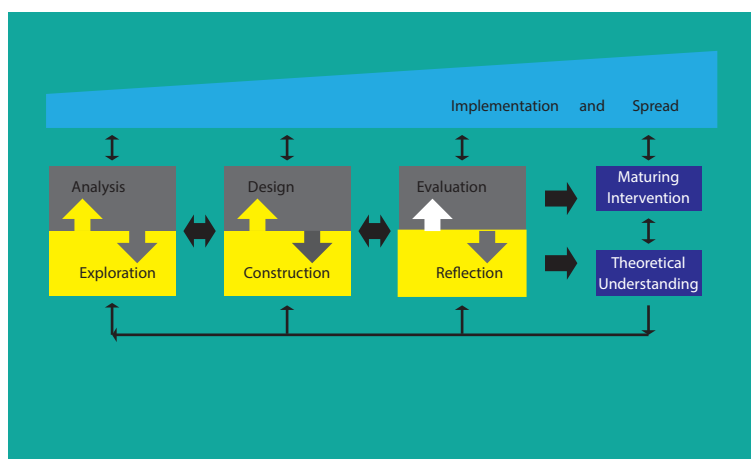
Figure 22. Model for conducting educational design research (reproduced from McKenney, Susan, and Reeves, Thomas C. [2012]. Conducting educational design research. New York, New York: Routledge.)

worked in the design-based workshops in which different multilingual classroom activities were co-created. For this purpose, we will present data from interviews conducted with both pre- and in-service teachers that participated in our DBR approach.

Intended outcomes and monitoring

In the evaluation of our DBR approach, most teachers pointed out that the holistic approach to multilingualism had been very supportive in the implementation of multilingual education. At a secondary school with a high percentage of pupils with Dutch as their home language, most pupils had negative attitudes towards the Frisian language, which was a compulsory subject for them. The Frisian teacher wished to raise motivation and positive attitudes of her pupils towards the Frisian language and at the same time help pupils understand the characteristics of being a speaker of a minority language. Through different activities the motivation and attitude of the pupils was positively improved as was claimed by the participating teacher. In her final evaluation she stated:

> *"My pupils now have more respect for people who speak Frisian. They understand better why people choose to speak a dialect (or Frisian) and in which kinds of situations they do" (Frisian teacher in secondary education).*

At a trilingual (Dutch-Frisian-English) secondary school, the teachers wanted their pupils to learn more about similarities between different languages and language families.

Again, different activities were co-developed and implemented. In his final evaluation the teacher claimed that his pupils had learned a lot:

> *"The relation between languages is clearer and the pupils are interested." (Frisian teacher in secondary education)*

There were also teachers participating that taught newly arrived refugee pupils. The main goal of these international transition classes is to prepare pupils for regular secondary or vocational education, focusing mostly on Dutch and mathematics. In the evaluation of the project one of the teachers pointed out that, through the project and the developed activities - which mainly focused on using the pupils' home languages as a leverage to learn Dutch and mathematical concepts - his pupils now better understood the importance of their home language for learning additional languages.

Such reactions show us that each school has benefitted in quite a different way from the projects, which follows from the fact that the developments were all adjusted to the specific needs of each school, fitting within the DBR-approach. In-service teachers also profited from the cooperation with the pre-service teachers, as, according to one teacher:

> *"Pre-service teachers look at classroom activities in a different way, so we could get the best out of it" (primary school teacher, city school, grade 1/2).*

They furthermore pointed out that the enthusiasm and new impulse which the students brought with them were contagious and very useful to them:

> *"It was an enthusiastic group. They were able to communicate this well to the children, but also to me." (Primary school teacher, trilingual school, grades 4/5/6) and that the level and quality of the materials was high:*

> *"The group gave a well-organised series of lessons. The students could really focus on these lessons, which benefited the quality". (Primary school teacher, newcomer school, grade 1/2)*

Finally, the evaluations also showed positive evaluations of the workshops that were organised by the project teams. The teachers appreciated the cooperation with the research team and pre-service teachers and enjoyed the information exchange with other schools a lot. In short, the teachers reported benefitting from the way in which the projects were organised (the DBR-approach).

While pre-service teachers pointed out in evaluations that the internal communication between their teachers, the researchers and the teachers in the field is a point for improvement, they were happy to get a chance to work together with field experts so early in their careers. They stated that working in the DBR-workshops was very enriching; before this experience they had no idea that there were so many ways to approach multilingualism. One pre-service teacher said she learned that:

> *"Speaking another language, such as Frisian or Arabic, in your own Dutch class can actually improve the school performance of the students."*

Another student stated that:

> *"There are many ways to deal with multilingualism, ways that are often forgotten. Even when teaching a language like English, there are many ways to integrate multilingualism."*

The evaluations also showed that this approach prepared pre-service teachers for their future as they had to work quite independently:

> *"We had to sort out a lot ourselves and therefore take a lot of initiative"*

Another pre-service teacher said that the skills that they learned in the project could be used later in practice. Most students were enthusiastic about the cooperation within their group and with the school:

> *"Good cooperation with the group and good contact with the primary school"*.

The cyclic design-based approach (Cobb et al., 2003; McKenney and Reeves, 2013) allows teachers to develop their own pedagogical experiments and gradually implement those in their teaching, starting at a small-scale. For this to succeed, teachers need to (a) create safe spaces in which to experiment with multiple languages in the classroom; (b) operationalise the various approaches for multilingual education for their own context and particular aims, and (c) combine them in ways that allow them to tackle their concrete challenges. So far, this design-based approach has been successful in fostering a sense of ownership of the developed activities in the participating schools and high levels of acceptance of the model, as teachers acknowledge its potential to provide answers for language education in their complex linguistic settings.

As researchers we believe that cooperating with pre- and in-service teachers helps us to consider all relevant points of view and expertise when designing and implementing interventions. We are confident that the DBR-approach will lead to greater sustainability of approaches, as it is the only way to take the complexity of educational contexts into account and to draw on the varied expertise of all actors involved. The approach is also well-received by both the in- and pre-service teachers, as was shown here in the form of their reflection on the projects as well as their evaluations afterwards. During DBR, we frequently discussed ongoing issues with both groups and developed joint solution for problems. In general, in-service teachers claimed to have learned a lot about incorporating multilingualism in the classroom and pre-service teachers greatly appreciated the opportunity to work closely with researchers and practitioners together and being part of projects that are directly relevant to current societal and educational needs. In short, the approach clearly provides new insights to the in-service as well as the pre-service teachers. By applying these new insights both in current educational practice (the in- service teachers) as well as preparing for the future (the pre-service teachers), we aim at making our developments sustainable in the field.

However, we have also identified some challenges to be addressed by our future research designs. First, as each DBR cycle is tailored to a particular school, teacher, and pupil population, it becomes difficult to achieve comparability in research in terms of developing a taxonomy of what really works in conducting DBR projects and how to successfully implement them. In the research we are currently preparing we plan to overcome this shortcoming by combining mixed methods with DBR, so that quantitative

measures can help identifying factors leading to significant educational change. In addition, we often found it a challenge working with so many different teachers due to the heterogeneity of their motivation, work methods and expectations. We have now planned a more explicit phase of expectation management and discussion of the different ways of dealing with DBR in the schools. We hope that making differences between teachers and schools visible and discussable will lead to a greater commitment of all schools to the DBR way of working.

Section 4. The meaning of the dialogue for students

Chapter 12

Experiencing Design Thinking: developing a new curriculum for Social Work

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Renate Bakker-Schraa

Abstract
During a dynamic process around the merger of two institutes for higher education a new curriculum for social work had to be designed. This article describes the successful story of applying design thinking to achieve this. The importance of close cooperation dedicated and clustered time with lecturers and professionals in the field as designers and developers supported by educational consultants and management. All parties learning on the job by means of dialogue and prototyping. Not only the design process but also the new role of the lecturer in this curriculum and its demand and effect on students are described in first classroom experiences. As a result, a solid educational basis was created for young people to develop themselves to become responsible and capable professionals in a fast-changing society, dealing with complex or even wicked problems.

Keywords: Design thinking, concept of education, innovation, curriculum development, collaborative learning, experiential learning, curriculum design, professionalisation.

Introduction
In 2018, two universities (former NHL University of Applied Sciences (UAS) and former Stenden UAS) in the Netherlands merged to become a new university called NHL Stenden UAS. In 2016 the process of preparing for the merger consisted of various groups discussing and exploring relevant issues that needed a plan before merging. One of the main topics was concerned with the way by which the new institute wanted to educate and train students. What was going to become the new vision or concept of education or institutional pedagogy? Each institute had a strong concept based on social constructivism: former NHL UAS used Competency-Based Education (CBE) and former Stenden UAS worked with Problem-Based Learning (PBL). Both institutes also realised that to better suit the contemporary needs of society and prepare professionals facing complex and wicked problems might require a new way of educating these future professionals. Furthermore, a new jointly developed education concept could also connect professionals from two different institutional cultures and backgrounds and support in this way the transition process. Based on social constructivism, the principles of Design Thinking were added to create Design-Based Education as a new education concept.

In this paper we share experiences in developing a new curriculum for Social Work based on this new education concept. We thereby focus on our own experiences as actors in this process, in a biographical way. It is not our aim to register the experiences of all actors and participants, but to tell a story of what we learned and what was useful in this process and what might be helpful to others in a similar context. Verharen et al. (2008)

has been helpful to us in describing their experiences with educational change in a complex environment. To understand the process by which the new curriculum came about, it is necessary to understand the context in which this took place.

Context for development

The way society is changing and the consequent alteration of the role of social workers urged an adjustment of the Social Work programme to educate and train social workers without delay. The old social quest which dominated much of the 19th and 20th centuries was fighting poverty, illiteracy, and the lack of civilisation. The answers to these problems were found in setting up centralised national systems and structures to guarantee education, health services, housing, social security, and social services. The new social quest according to van Ewijk (2018) is much more about people being overwhelmed by the socially complex, demanding, and stressful societies of which they are part. Systems and structures have become extraordinarily complex. Decreased embedding in the existing structures and higher social demands on a person bring forth risk of vulnerability and threatening marginalisation for certain groups and individuals. Having to accept to live with a social reality of disorder, where the social world itself is seen as an exclusionary mechanism calls for customised approaches in social work. Not just individuals are at stake but also societies as a whole and institutions within it. Beck (1986) refers to this complexity with the term: risk society. Overseeing and understanding our lives and the world has become problematic. We lack a crucial sense of direction.

This created a need for a new national professional profile for social work in the Netherlands. This new profile was a mutual product of all universities providing programmes for social work or equivalent and was officially published in 2017. For our specific local context, it meant that three different programs, two from NHL UAS (CMV, MWD[5]) and one from Stenden UAS (SPH[6]) would have to merge to one to meet the new national standard. However, the merger between the two institutions was ongoing. Management decided to start nevertheless with curriculum development in 2016.

Considerations for the development process

The new education concept of NHL Stenden UAS, Design-Based Education (DBE), was not something that could be readily garnered from the extant literature as it was still being developed. One of the considerations of realizing a new curriculum based on DBE was the idea that it would probably not be possible to realise a new educational programme and new ways of teaching and learning if old ways of development would be followed. Therefore, we applied the formula for the required transition "to go from A to B via B". This meant to start the process with an open mindset (Stompff, 2020). In our case it meant to apply the principles of Design Thinking (DT) in developing a new curriculum, although we weren't experienced with DT.

Design Thinking (Brown and Wyatt, 2010) can be considered a team-based learning method that helps to deal with complex problems by sustaining in-depth learning on problem perception and diverse solution paths. The 'design process' is best thought of as a system of overlapping spaces rather than a sequence of orderly steps. There are three spaces that must be kept in mind: inspiration, ideation, and implementation. Inspiration is seen as the problem or opportunity that motivates the search for solution, understanding and empathizing with people, their problems, and their needs; ideation as the process of generating, developing, and testing ideas; and implementation as the path

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[5] CMV = Cultureel Maatschappelijke Vorming / Cultural and Social Education; MWD = Maatschappelijk Werk en Dienstverlening / Social Work and Services
[6] SPH = Sociaal Pedagogische Hulpverlening/ Social Pedagogical Assistance

that leads from the project stage back into people's lives. In organizing and providing the right conditions for development DT had now to be put in practice by the educational developers.

Role of educational developers

As educational developers we were asked to lead and guide the process of curriculum development. So, what to do and how to set goals in such a dynamic environment of change and uncertainty. In 'The six secrets of change' by Fullan (2008) we found a confirmation of some of our ideas and inspiration for further action. From the beginning we regarded all actors in the development process as professionals aiming to realise a new curriculum. For many years, members of staff of both institutes considered their colleagues of the other institute as competitors as both teams competed in the same pool of students and claimed to have the best programme. Now they had to work together and put the competitive ideas to bed. It meant that first these professionals had to get to know each other and share ideas about a common interest: Social work and social work education. It meant to spend time together, preferably in a relaxed setting without the direct pull or push for the usual tasks or activities. For us, it meant also to spend the time wisely in such a way that lecturers would be able to experience design thinking as a working method and provide more open and creative ways of working and learning together.

This kind of capacity building where people "are committed to putting in the energy to get important things done collectively and continuously" (Fullan, 2008, page 57) was part of the process. As educational developers we knew we wanted to support the development and implementation of DBE as institutional pedagogy (Gibbs, 2013) but we were also looking for ways how to realise this. An experienced and highly skilled colleague from the Frisian Design Factory[7] assisted us to find innovative and creative ways to bring highly accomplished professionals together and work on developing a new curriculum. For example, short assignments were used to produce and visualise ideas (using various sorts of material clay, Lego™, paint, paper etc.) about social work. These creative ways could also be useful when teaching students. In the first year of development, we organised three such days. For an overview of the curriculum development process at programme and institutional level we refer to Table 1 (Appendix). During these days everyone was invited to share ideas (ideate) which were later used to construct prototypes by small working groups for each issue. We worked with the following slogan: "on your own you go faster, but together we go further". At this stage it was more important to get as many people as possible participating in the process of collaborative learning and sometimes collaborative chaos instead of aiming for quick solutions. The following year the emphasis was on training lecturers (all developers followed KAOS pilot training), building trust by working together in development groups, and learn to understand each other's language related to education. One of these development groups designed the first year of the Social Work programme that started in September 2017.

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[7] The Frisian Design Factory (FDF) was founded in November 2015 at former NHL. Its goal was to bring students, researchers, and experts together from various disciplines and create solutions for all kinds of social issues. The Frisian Design Factory was one of the 25 Design Factories in a global network, so that students and lecturers work together worldwide on educational and sustainable innovations. Since April 2018, the FDF is no longer a separate unit but became part of an Academy providing the course Creative Technology.

Curriculum development group year 1 social work

This group consisting of seven lecturers and two educational developers was asked to deliver a first year DBE-curriculum for the Bachelor of Social Work. The curriculum had to meet the principles of Design-Based Education. At that time only the first guidelines were available. As at most levels in the organisation, DBE was still regarded as an open and creative process. A constraint for the development was the need to follow the national standards for Social Work programs. One of the highlights in the process was a development week. For this week, two so called "quiet rooms" were used to create a positive working environment. Lecturers worked in pairs and every day the results were shared and issues were addressed which were unclear, so other developers could give a hand by sharing their thinking. At this stage of development, the role of the two educational developers was to supply the right conditions (based on our KAOS-pilot training[8]). They followed the process of the group, supported them by setting the agenda, registered progress, and kept an eye on time by setting delivery moments. They also shared their educational expertise for a better result. The result of the work of the educational developers was a high-quality learning environment (Gibbs, 2013). During this week colleagues, students, and social work professionals dropped by to hear and view the results. Their questioning and suggestions further improved results. Meetings were often concluded with expressions of appreciation. This created a supportive, positive, and professional atmosphere (Emst and Hawinkels, 1999). Everyone was aware of the mutual interdependence and saw their activities as a shared responsibility. It was of great benefit that all developers could focus on this assignment as the only activity during that week.

- The process of learning and writing the curriculum, within a limited period, increased the pressure for the working group. They needed to decide how to go about this project. Resolving this issue proved very meaningful. Being in a position of virtually having to begin from nothing, was a key feature of educational renewal. It allowed teams to move away from heretofore used concepts. Structure and content had to be developed in the right manner. A main aim was to create space for students to be able to devise their own project to design a working tool (instrument for public service) as a product of each period of ten weeks during their first year.

- The process of developing this curriculum was sometimes practical, and sometimes even a bit therapeutic. Different insights had to be well understood by every member of the group because participants had diverse backgrounds. Some group members had not collaborated before the merger. Misunderstanding and not reaching consensus proved to be important to gain a better understanding of each other's point of view. Not feeding differences but understanding differences towards consensus became an important working strategy of this group. This principle formed a guide to success and a valuable insight of what we would be asking from new students with no experience in higher education. This working process proved to be an important learning process for the group members themselves. In September 2018, the newly developed curriculum was implemented and executed with first year students by a team of lecturers who were brought together for the first time in an organisation in transition. A particularly challenging context.

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[8] Based in Denmark, the masterclass KAOS pilot aims to explore experiential ways of learning to inspire, facilitate, and design for creativity, innovation, and risks in learning spaces and education.

Experiences with the first DBE-classroom

Stepping into DBE meant for me as a lecturer and developer nothing more than stepping into a classroom. Literally stepping over the threshold for the first time with a fresh and new concept in hand. The new concept functioned as a modest guideline and an unsure starting point. Experienced as lecturer in the more traditional sense, but somewhat uncomfortable with this fresh concept, I felt some uncertainty. I was not the expert anymore, but maybe only some kind of guide for a group of new students. What would I tell them? Should I instruct them? Or follow their thoughts and ideas? DBE was a concept, but I had no experience with DBE at work. I was faced with a fresh group of 25 students, who were waiting for something to happen. One of the students even asked at once where the books were. This created an "inspiring" moment during the first session. As I understood, they were going to have to organise their own project, grasp a thorough understanding of what social work is as a discipline and devise their own tool by delivering social service for a specific target group. I felt a gap between my world and their expectations. How would I bridge that gap?

What helped me to get through those first few weeks was past personal experience as a youth worker. In the past I had intensively worked with school dropouts and young delinquents as a youth worker, offering them support in how to find their way in society. Success was a negative category in their lives and hardly a possibility for the future. This former work experience gave me, in this new situation, a steady base of intrapersonal trust. In trying to offer support to these youngsters I often met their, and my own, uncertainties and was more than once confronted with their distrust and rigorous behaviour. A constant feeling of having to start from nothing repeatedly became second nature. There were hardly any guidelines and guarantees for success. Not giving up, being a steady and trustworthy person, and renewing the contact constantly were key elements of my daily practice.

This uncertainty while working, I learned over the years, became a factor of success. "Not knowing" became a source of exploring possibilities and a starting point for research on how to get these youngsters back on track, searching for routes and more desirable outcomes. What could be achieved in a workable manner became a standard. Exploring a basic attitude. In the past, lecturers were trained by setting the standard for students. They had a long history of direct instruction by setting out what and how students had to learn – teacher centred. Long felt and seen as the right way to go about things. Telling them what to do, how to do, and sometimes how to behave. My experience with PBL moved away from teacher-centred education towards a more student-centred approach and a constructivist mode of learning.

Uncertainty as an earlier encountered factor once again played a significant role. This uncertainty was also felt in our social work team of lecturers and had a specific effect on each member. Responses differed from "we will see what happens" to "are we doing the right thing here?". Doubts were not always expressed. Not all lecturers had been developers of this new curriculum, so for them it was a brand-new starting point, and felt expected "to do it right immediately". A schedule for the first period of 10 weeks offered guidance but was also a pricey pitfall if lecturers resorted to the "as usual" mode.

Experimenting, that is trying to make this new curriculum work and accepted, could easily end up in failure. To support lecturers to stick to the new concept and to exchange experiences, guided team sessions were held every four weeks. These team sessions offered more support in gaining insights and sharing ideas on how to perform next time. Evaluating every 10 weeks with students and lecturers offered a moment of reflection on content and working mode. But the dilemma was clear. A certain kind of tension arose between programmatic structure and ease on the one hand and strengthening one's own professional confidence, on the other hand. The lecturers' challenge was set.

Working on my ability as a lecturer

How to handle this new complex form of education and making it workable for all parties involved presented many interesting questions and dilemmas. Thriving on support by

training, evaluation, and reflection on earlier experiences was one way to go about this matter. However, I felt it lacked a theoretical basis. Therefore, I started to search for articles and literature that could help me understand the current challenges as lecturer. I discovered four critical issues which improved my understanding of how to deal with the new education concept of DBE.

Faith factor

The first issue is the faith factor to acquire creative confidence and self-efficacy. Schreer et al. (2012) stated that lecturers should be motivated and enabled to acknowledge side effects of constructivist learning like chaos and crises and seeing these as learning opportunities. Jobst et.al. (2012) argued that the dominant role of expert knowledge as a resource for professional problem solving has come increasingly under pressure since the rise of the information age, and that we, because of increased complexity and wickedness of problems, are faced with a call for creative and empathic problem-solving skills of not only a scientific nature but also an interdisciplinary nature. How to make use of, and transform, cross-domain knowledge in a creative problem-solving process?

The activity of trying to move about in new and different areas of knowledge asks for a strong trust in one's own creative capability. This trust was called creative confidence by Jobst et al. (2012).

The term creative confidence, still a vague term, was supported by Albert Bandura's (1997) concept of self-efficacy. Self-efficacy offers the possibility for people to act under risk. Successful problem solving is not seen because of the amount of knowledge a person has internalised, but as the outcome of belief in oneself. Self-efficacy is seen as a crucial pre-condition for coping successfully with complex challenges in diverse fields, regardless of the actual individual level of skills. The basis of both abilities, creative confidence, and self-efficacy, is that people need to believe their own capability before they can activate it to the best of their potential.

Soft skills

The second issue is aiming for classroom potential by focussing on soft skills. Schreer et. al. (2012) also said that the mandate of schools is to unfold the personality of every student and to build a strong character with a sense of responsibility for democracy and community. This implies developing skills of reflection, interpretation, and different other complex meta-competences of a social, communicative, and creative nature in addition to outright cognitive skills. Education therefore needs a transition from transferring knowledge to developing individual's potential in the light of an ever-changing society. Content learning is important, but to effectively internalise specific knowledge, metacognitive competences, attitudes, values, and action skills are crucial. Teaching needs to go beyond isolated information acquisition in separate subjects towards holistic learning. Selamat et al. (2013) and other writers state that co-curriculum activities (experiences) form an absolute way to enhance soft skills. Soft skills are described as personal attributes and communication abilities needed for success on the job. Soft skills are not about knowledge a person possesses, but rather the behaviour one displays in different situations. They shape how you work on your own and with others. They may be traits or habits.

Self-directed learning

The third issue is aiming for classroom potential by focussing on self-directed learning. Devising classroom potential and bring forth so called "fluid intelligence" (Cattel, 1987) could be realised by turning the attention to self-directed learning, giving space to students by making them managers of their own education, professional development, and success. Fluid intelligence is seen as the ability to think and reason abstractly to solve problems. This ability is considered independent of former learning experience and education, and independent of earlier existing knowledge. When there is a fervent desire to develop oneself, the result of learning will be better. Changing society calls for swift adaptability, a chameleon-like attitude of being able to change colour overnight is seen

as a necessity, to address problems in the right way but also to think and apply solutions in a diverse and creative manner. Transformation of education is therefore conditional and students in classroom sessions are invited not to follow instructions but to develop self-directed learning (activities), and to develop a new mode of functioning to become flexible professionals. As described in the following definition of a highly self-directed learner.

> *"A highly self-directed learner is one who exhibits initiative, independence and persistence in learning: one who accepts responsibility for his or her own learning and views problems as challenges, not obstacles; one who is capable of self-discipline and has a high degree of curiosity; one who has a strong desire to learn or change and is self-confident; one who is able to use basic study skills, organise his or her time and set an appropriate pace for learning, and to develop a plan for completing work; one who enjoys learning and has a tendency to be goal-oriented."*
> *(Guglielmino, 2013)*

In self-directed learning the initiative is expected to come increasingly from the learner. To do so the learner must develop the following five underlying competences according to Stubbé and Theunissen (2008): taking personal responsibility for one's own development, being able to reflect on process and result, being able to apply learning strategies, collaborative learning, and apply what is learned in practice.

Apart from the learner, another factor influencing self-directed learning is the learning environment, including other students and lecturer(s). Learning from students who take responsibility for their own learning also triggers other students to take responsibility. Special attention of where students "stand" in their process of learning is very important. In actual behaviour: are they preparing themselves to take on a task, trying to understand and define what is expected of them in the light of certain professional demands, orienting what to do, and how to go about their task? Or are they busy with executive tasks, selecting and making use of information? Or are they, as a third possibility, evaluating their result and process?

When trying to realise self-directed learning, the lecturer should be aware of student's ability to manage the learning process by focusing on the difference or tension between motivation and competence. Depending on the situation the lecturer can apply various teaching roles. For instance, a student is highly motivated, but is lacking the necessary skills for self-directed learning and therefore a lecturer should decide to step in and guide. Other strategies to be used by a lecturer depending on the situation are instructing, coaching, stimulating, and letting go (Lange and Wintermans, 2016).

Critical thinking

A fourth and final issue is critical thinking. Tilbury et. al. (2010) wrote that there is a strong call for educational strategies that promote critical thinking in social work education and argued that understanding the client or consumer perspective is vital. Critical thinking questions the source of truthfulness and the reliability of knowledge. Possession of knowledge is no guarantee for the ability to think well. Drawing on critical theory, social work practice implies a focus on the structural causes of "individual" problems, promoting client rights, challenging inequality, and recognizing patterned disadvantages related to gender, race, and class, in a changing society. Critical thinking has a purpose: it aims towards deciding what to believe or do. Critical thinking aims to improve human functioning, safety, health, and emotional wellbeing. It is about sense-making as much as it is about problem solving, discovering, and processing information. Social work students are taught to look at the "person in the environment", or the "issue in context". In other words, to look at problems with a broad and open lens, and to connect private

problems to a wider social context. They need to be expert learners and they must meet ethical standards for safe practice.

As a lecturer I have noticed that in the complete process of designing, developing, and implementing the new curriculum various dynamics must be taken seriously to support the principles of the new DBE concept. These are in my opinion:

Table 9. Dynamics that should change to support the principles of the DBE concept

Moving away from	To
Explanation	Exploration
Problem	Challenge
Theory	Applying theory
Fixed intelligence	Fluid intelligence
Teacher centred, dependency	Student centred, independency
Remembering and repeating	Discovering, integrating, and presenting
Knowledge of facts	Understanding processes and development
Listening and reacting	Communicating and taking responsibility
Relying on external structures and sources	Creative confidence and self-efficacy
Possession of knowledge	Critical thinking questions

Conclusion and recommendations

Reflecting upon our experiences we have come to the following conclusions and recommendations. First, people are key. We have learned that people who must do the job are crucial in any process of change. At institutional level it means that adequate time should be made available for real development as core business and means of professionalisation. Connect people with purpose and create conditions so that collaborative learning can take place. We have also learned to often appreciate each member of the development group for their individual contribution. It enhanced mutual respect and gave energy during the process.

Secondly, for superior results it is crucial to personally 'live through' stages of curriculum design-based on design thinking. To us it means immersing in the processes and be mindful in every step. This insight proved helpful in understanding students better and supporting them while trying to apply design thinking. We have learned that soft skills are crucial for students to learn successfully. Razzouk and Shute (2012) confirm that *"Although the design process involves in-depth cognitive processes—which may help our students build their critical thinking skills (e.g., reasoning and analysis)—it also involves personality and dispositional traits such as persistence and creativity. If we are serious about preparing students to succeed in the world, we should not require that they memorise facts and repeat them on demand; rather, we should provide them with opportunities to interact with content, think critically about it, and use it to create new information. Preparation for future work situations requires teaching learners to use their minds well"* (page 345).

Thirdly, theory is a necessity for being well equipped for real change at all levels. We have noticed that it is possible to start a process, as we did, based on common knowledge and experience. However, we made more efficient progress by applying theories or knowledge gained from various sources. For example, in the beginning little was known about the DBE concept. There was hardly any documentation available apart from references to design thinking. It meant we had to learn more about the concept of design thinking and how to apply this concept to further our development. A

recommendation for the future is to continuously pay attention to the principles of the institutional pedagogy or education concept of Design-Based Education to keep it alive (Willemsma and Los, 2018).

As a final remark we would like to refer to Mattieu Segers, professor of European history, in an interview in Science Guide (April 2020, online platform). He said the importance of "Verstehen". Not just between individuals but also between countries all over the world. He specifically focuses on how different partners of the European union go about their own individual problems and their collective problems. He says that other European countries are often judged, and that emphasizing their failures have negative consequences for the whole European Union. "Verstehen" as an active verb is strong empathizing, and helps countries understand each other better and avoiding one dimensional labelling and unwanted consequences. A strong motive for empathizing serves all better in a world where problem-solving calls for interdependent approaches. The choice for Design-Based Education as education concept with its strong accent of empathizing is in our opinion therefore a very suitable way of educating young people to become social workers.

Appendix

Table 1: Overview in time of the development process for a new curriculum Social Work linked to the parallel processes at institutional level specifically about the institution wide education concept Design-Based Education.

Time	Programme level context	Institutional level context
2016 September	New national standards for Social Work (SW)requires new programme. Project group starting with setting out a plan for developing new Social Work (SW) curriculum. Two separate teams of lecturers from two institutes.	Preparations for merge, two separate institutes. Wish to come to new education concept at for new institute.
2016 December	First meeting on how to educate and teach students (mission and vision) in a new curriculum, using principles of Design Thinking for all staff from both institutes.	Merging process ongoing. A new concept was not yet finished, but Design Thinking was used for the new concept DBE.
2017 January - February	Two mixed groups of 4 lecturers constructing a prototype in close collaboration with work field and tested with colleagues, presenting results mid-February.	Intention to merge officially confirmed.
2017 March	Second meeting about generating ideas on how to build and structure the new curriculum using creative ways to do this for all social work staff from both institutes.	Many Academies with Bachelor programmes decided voluntary to start with new curricula based on the new DBE concept in September 2018.
2017 March - June	Developing a prototype framework for a new SW curriculum by a mixed group of 8 lectures. Outcome tested with colleagues and students.	Preparing for a full merger.
2017 May	Third meeting. Presenting final framework and principles. Generating ideas about the contents of the new curriculum for all social work staff from both institutes.	All educational programmes and courses were harmonised.
2017 June	By end of the month the project group stopped. Management took the lead in the project. Various lecturers were consulted to take on a role as developer during the next year.	DBE education concept 0.1 published (Geitz and Sinia, 2017)
2017 August	Educational developers followed a three-day masterclass (KAOS pilot) to explore experiential ways of learning to inspire, facilitate, and design for creativity, innovation, and risks in learning spaces and education.	Start of training activities for staff for delivery of education based on DBE concept.
2017 September-December	Start of developing year 1 and year 4 of Social Work. As part of the development the KAOS pilot training was followed by the lecturers involved. Two mixed groups of lectures for year 1 and year 4. One whole week dedicated to developing year 1 worked very well. Pitches for colleagues, professional field, and students.	All educational programmes of the New University were officially registered

2018 January – April	Development of first 4 modules for year 1 SW in weekly half-day meetings. Various colleagues were asked to ideate or test prototypes.	1st of January: official legal merger date. Start process Integration – Innovation – Transformation.
2018 February	Start development year 2 SW with 8 lecturers. Followed by one whole week focused on developing the new programme.	Clear that new concept asked for a different kind of learning environment or classroom to support creativity and innovation. Building not suited for that purpose yet.
2018 May	Presenting all ideas on the new 1st year curriculum and sharing how to work with students in so called "ateliers". Curriculum week for all staff members about programme for the new academic year. Experts on feedback and assessment trained staff on what to expect about the new role as coach.	Several programmes (over 40) prepare and renew their curriculum based on DBE to be able to start in September 2018.
2018 August	Training 'Your ideal classroom' on how to create impactful learning experiences for students. Experiences that will affect students on a much deeper level and will change their perspectives. All lecturers who were involved implementing year 1 SW.	New building was hired to provide the space needed to execute year 1 and 2 SW.
2018 September	Start new programme for year 1 and year 2 Social work. Ongoing adjustments and finalising, including online testing for all students.	Operational merger.
2018 Sept – 2019 June	Development of year 3 SW Good practices of the new programme were also applied during the development of this part of the SW programme.	Development of Strategic Educational Policy 2019-2024 (follow-up on DBE concept 0.1).
2019 Sept – 2020 June	Development of year 4 SW 2nd year of executing the 1st year programme. Struggle by some lecturers to follow the principles and challenges working with DBE at classroom level. Pull for individual lecturers to follow the classic way of teaching (more teacher centred).	Development of various DBE tools and training programmes for staff.

Chapter 13

Facilitating students' learning processes in the Design-Based Education paradigm

Jacqueline R. Rietveld and Jan Waalkens

Abstract
Higher education has a significant role in preparing young professionals for an uncertain future in which change is the invariable factor. The concept of design-based education (DBE) aims at skilling students for this future by enhancing their research and design competencies. Reflecting on our experience gained during two years of facilitating students' learning processes using this DBE paradigm, we as educators have uncovered heretofore unrecognised issues that require further attention. An action research project in DBE shows that enhancing self-regulation and cooperation amongst students is necessary for the growth of a professional mind-set and willingness to explore and contribute to real life organisational issues. In this chapter we share the lessons we have gradually learned to facilitate students' learning.

Introduction

Societal developments and rapid changes call upon higher education to enhance innovative competencies of students for them to face current complex, wicked problems. It is up to the programmes we deliver to help students develop these important competencies to work on 'world wise innovations' (NHL Stenden University, 2020). NHL Stenden University of Applied Sciences believes this is most effectively carried out using the Design-Based Education (DBE) concept which builds on a preceding Problem Based Approach and solving real life issues in the work field. DBE is based on social-constructivist, contextual, self-regulating, and collaborative learning and makes use of methods like design thinking, multi-disciplinarity and joint learning and working with the regional and international environment (Geitz and Sinia, 2018). Since the introduction of DBE in our Human Resource Management programme two years ago, we, as educators, have an increasing number of instruments to apply in the design phases of empathise, define, ideate, prototype and test. However, educational practice appears to be disorderly as our students seem to require additional competencies to interact optimally through joint learning with peers and the working field. These competencies include:

- Self-regulation to adjust to the ever changing and complex character of real-life issues (Geitz and de Geus, 2019). With self-regulation competencies, future professionals are better equipped to control themselves in facing unavoidable problem solving and problem finding in their professional career (Sennett, 2008).

- Collaboration and the ability to form constructive interdisciplinary networks and learn to draw on the cognitive repertoire, skills, and networks of others (Warhuus, Tanggaard, Robinson and Moltrup, 2016; Rietveld, 2015).

Until now there has been insufficient attention paid to these competencies in a DBE context. In this study, we ask if a course we offered students was helpful in skill training in delivering innovative ideas to companies with HR issues. How do students experience and reflect on this rich educational environment of DBE and what can we, as educators, learn from that? What facilitating and learning strategies do students need that favour self-regulation, collaboration, and innovation?

In higher education, student groups are increasingly the units in which learning takes place (Hommes, Van den Bossche, de Grave, Bos, Schuwirth and Scherpbier, 2014). Several studies demonstrate the benefits of collaborative learning in small groups to optimise learning (Johnson, Johnson, and Smith, 2007; Johnson and Johnson, 1999) and creativity (Baruah and Paulus, 2019). While collaborative educational practices become more commonplace, research increasingly exposes accompanying challenges and obstacles to implementing collaborative learning (Ha Le, Janssen and Wubbels, 2018). Students seem to differ in their individual participation or social-loafing behaviour in group tasks (Harding, 2018; Freeman and Greenacre, 2010) and/or lack the necessary communicative and collaborative competencies (e.g., Borgea and White, 2016). Lecturers face challenges in designing appropriate group tasks for the right groups within the right timeframe (Gillies and Boyle, 2010) and in how to enhance and monitor effective collaboration (Kirschner, Panadero, Malmberg, Phieli, Jaspers, Koivuniemi and Jarvenoja, 2015; Frykedal and Chiriac, 2011). Acting as 'mindful coaches' encourages students to reflect on and discuss the quality of their collaborative group work (Minnaert, Boekaerts, de Brabander and Opdenakker, 2011).

DBE using real-life problems brought to us by industry seem to take interdisciplinary collaboration to a next level. Companies expect their issue to be handled carefully by the students and look towards innovative solutions. When an organisation is regarded as a bundle of routines (cf. competencies/capabilities) performed by a team of professionals, innovation is achieved when these routines or tasks are incrementally improved, accelerated or -more radically- changed (Waalkens, 2006). Students are expected to perform as junior professionals and consultants. Sennett (2008) argues that professionalism is an elementary human desire to perform a task properly. Professionals thrive in a context that allows them to take accountability for their actions. According to Sennett, the heart of professionalism lies in reflection and looking for a balance between solving problems ('what'; 'how') and looking for problems ('why'). The real-life organisational questions used in DBE require a different approach by students and change the role of lecturers compared to what they were used to in conventional learning environments.

In this chapter, we focus on the role of lecturers in enhancing self-regulation and interdisciplinary collaboration of students in two DBE semesters focused on innovation in real life organisational issues. We like to share the lessons we learned from our students as they may be useful for fellow educators to foster the quality of learning in design-driven higher education.

Method
This study adopted an action research framework conducted with students, clients, experts in the field, and lecturers to enhance students' self-regulation and collaboration competencies in DBE. In action research 'practitioners create novel ideas about improving their work and put those ideas forward as their personal theories and practice' (McNiff and Whitehead, 2011). In this action research study, students and lecturers are regarded upon as the practitioners and the clients as evaluators of the innovative ideas

that emerge. The research followed the iterative action research circle in professional acting: observe, reflect, act, evaluate and modify (Whitehead and McNiff, 2006).

The research programme progressed throughout two semesters in a third year HRM program. In the first semester (from September 2018 until January 2019), the four involved lecturers in the research action project monitored and reflected on their planned educational interventions. Did our programme enhance the necessary self-regulation or interdisciplinary collaboration competencies for students to successfully act as innovative young consultants? These evaluations caused the lecturers to modify the educational program, which was carried out in the second semester (from September 2019 until January 2020) and again evaluated.

For the third-year students, the novelty of the project was that after two years of Problem-Based Learning (PBL) experience they were asked to creatively consult for different companies on a variety of real-life HR issues. They were asked to act as junior consultants able to build a professional relationship with an external organisation. The real-life organisational issues varied from developing a block-chain network for temporary work, recruiting young volunteers, to getting warehouse workers to act according to the required safety protocol. An example of an innovative HR idea is the application of positive psychology to develop several 'whish and need' personas of employers of a sheltered workplace who are not very communicative with their team leaders to help prevent above average sick leave. Another example is the promotion of reporting near-accidents in a warehouse by developing transparent and appealing icons in co-creation with order pickers. Framework for these assignments was 'decent work' UN sustainable goal (2015).

In the former PBL method students were asked to systematically analyse and solve fictive organisational or societal problems in groups of 12 at school. DBE provides a variation on PBL where students were tasked with real-life problems. As the students were expected not to copy but to advise companies using out of the box ideas, they needed to immerse in the daily practice of 'their' organisation to collect relevant and meaningful 'user stories' (first phase of DBE: empathise). These user stories were the source of the ideals and wishes of the clients to construct a first prototype. This idea of reversed engineering, from backwards to forwards, is not a new one (Covey 2013: "Begin with the end in mind"), however it is less often applied in descriptive social sciences study programs.

The students were divided in project-teams each with 3 to 4 members. They used Scrum project-management, participated in weekly workshops on critical thinking and coaching, and every two weeks they received instructive lessons about research and design. Halfway through and at the end of the semester, students were asked to hand in a personal report with reflections on what they learned, what they were (very) proud of, problems or bottlenecks and self-ratings of professional attitude. The qualitative data collected consisted of students' self-reports (N = 84, about 40 students per semester; and 168 self-reports with a total of 102,826 words of which 45,810 were used for this study), clients' evaluations (N=16), and the observations of the four lecturers involved in the HRM programme (N=4). The clients assessed students' innovative performance during the project using the following criteria: quality of contact, quality of involvement, and quality of the advice students provided.

To analyse these 'thick descriptions', the open coding and axial coding schemes proposed by Corbin and Strauss (2015) were used. Through open coding seven important concepts linked to student's learning experiences were identified in the actual written language of the students' self-reports. These first-order categories based on underlying

similarities were found with the use of an excel-based narrative analyse technique developed at our university (Basten and Coenders, 2018). In this process a second analyst coded the narrative data which was discussed in consensus meetings to achieve more exclusive categories. Next, to find relationships between these first-order categories axial coding was used to identify second-order themes to understand what students need to be able to come up with innovative solutions for real-life HR issues. Out of the seven first-order categories four second order themes were identified.

Results

The open coding resulted in 15 first-order categories, that were interrelated in three second-order themes that represented the student journey in the DBE semester. After an inspiring but rather unsettling start with real-life HR cases, what followed was a challenging period of skill development in Self-regulation (theme 1) and collaboration (theme 2) that lead in the end to innovative deliverables for client, student, and lecture (theme 3).

Self-regulation

Although students were familiar with advising and brainstorming methods in Problem Based Learning, where they worked on fictitious cases in year one and two of their studies, they indicated that '*we never applied these methods on a real-life case*'. It was their first opportunity to work together with an external client and '*not only for a term assignment coordinated by a lecturer*'. Consequently, they were asked to act responsibly and demonstrate initiative. This real work situation removed them from their comfort zone and exposed to a world that was unknown. The complexity of the task was increased by being held responsible for a project that could change over time. They experienced having to '*deal with the needs of clients that might vary over time*'. One student remarked: '*I had to get used to that, compared to a regular* [study course] *assignment which is mostly clear from the start*'. Students found it difficult '*to find my way*' as they experienced the process as chaotic and complex. It was difficult to understand '*what the purpose of the assignment was and which* [research] *method we could use*' as '*this assignment gives too much room to think freely*'. However, students also reported to have fun performing the assignments and described their project as '*awesome*' or '*I have never been that enthusiastic and involved in a school project before*'. The freedom of '*choosing a nice subject and/or developing a method that suits me better*' made that '*we could not stop talking about the assignment on our way back home*'. The course stirred curiosity. The project, '*totally not comparable to other projects*' released a lot of energy and uncovered '*all these new, for me, unknown issues*'. Looking back '*I could see that I improved my competencies*'. Students seemed committed to keep improving their competencies and became increasingly pro-active in the course. In contrast, another student reflected that the lessons and coaching '*did not bring any added value to the end product*'. The main factor that triggered frustration in students was the amount of time it took to plan an interview, to write interview transcripts and code them. Letting participants tell user stories '*was difficult*' and although it was '*quite scary to wander from the prepared basic questions*' they got to grips with the essence of the stories they heard.

Coding scheme

Table 10. Data-analysis scheme of development of Self-regulation competencies (n = 168 student self-reports)

Fragments	1st order categories	2nd order theme
'partners, not students'	Expectation	Self-regulation in coping with complexity
'chaotic, complex, overwhelming, difficult to understand'	Tolerance of ambiguity	
'to be alert and not wait and see'	Pro-active	
'never been so enthusiastic about a school project before'	Internal motivation	
Total number of words in student self-reports: 18,566 (40%)		

Despite the novelty of the educational setting compared to the usually fictive HRM-assignments the students were presented earlier in their program, these results show that they pro-actively tried to cope with the complexity and responsibility of a real-life case. The development of a certain tolerance for complexity and a growing trust in self-steering opened the way for a mindset to explore. A tolerance for ambiguity and enhanced trust in self-regulation created an environment in which students remained open-minded rather than holding on to fixed ideas. To further enhance self-regulation students could choose their preferred assignment out of a list of offered HR issues.

Collaboration

Learning to cooperate '*starts all over again with every new project*' since the '*tasks need to be performed in collaboration with new people*'. Students experienced communication with fellow students to be '*essential*' for the success of their project. To run the project '*a lot of tuning and planning*' needed to be done, even more since students had to deal '*with limited availability of the employees you want to speak within the organisation*' while synchronising with '*different school schedules of fellow students in the project group*'. During the second phase students learned '*what we could expect from each other, so that we did not have wrong expectations anymore*' and to '*cope with different personalities*', and to agree on a preferred working style in which equal effort and agreement are ingredients for '*a pleasant time together*'.

Establishing contact with the external organisations was '*easy*' for some students as '*several employees at the company were open and helpful*'. Others dealt with clients that did not '*make enough time for contact and did not respond*'. In return they '*tried to call instead of only sending e-mails*' or just had to accept that '*we were of little interest for the client*' but nevertheless moved on with their project. Students made '*weekly progress as a group*' and '*pushed*' themselves to '*visit the organisation more frequently*'. Furthermore, setting limitations was a challenge as some clients wanted '*to have a lot of information and their purpose was rather broad*'. The fact that the students were asked to develop something '*that was actually considered valuable and useful in a real company*', made them feel '*truthfully regarded as real professionals and full partners which was new for us as students*' and motivated them '*together with the client, to figure out what the assignment was all about and how to shape it*'.

Table 11. *Data-analysis scheme of development of Collaboration competencies (n= 168 student self-reports)*

Fragments	1st order categories	2nd order theme
'a lot of tuning, stress, planning, agreements and limited availability and different schedule'	Planning and compromise	Collaboration
'actively figure it out with the client'	Dialogue	
'what to expect from each other'	Empathy	
Total number of words in student self-reports: 8,617 (19%)		

These abovementioned results show the relevance of communication competencies to be able to create an innovative and relevant approach for a client's HR issue. Although communication training is part of the curriculum, students stressed that with the start of every new assignment the group membership changed, and communication became a challenge. This came particularly clear in making appointments that needed coordination and compromises. Effective network learning needs intensive communication and collaboration with stakeholders as the employer, employees, HRM professionals, lecturers, and fellow students. Next to planning, competencies in dialogue and empathy help to figure out the needs and expectations of the different stakeholders.

Innovation

The students experienced a lot of pressure whilst conducting the project. They were particularly concerned with failing. However, this '*turned out to be an unnecessary fear*' as '*they said we are in a learning process, so, you cannot do anything wrong; that gave comfort*'. Developing a prototype based on a user story was '*a rather difficult and lengthy process*', and it '*was new for me, that the prototypes had to be tested, too*'. However, prototyping turned out to be a pleasant activity '*because it asks for my creativity. I can express myself better and I am less bound to procedures and rules*'.

When the project progressed and clients became pleased with the deliverables and activities that showed to be '*at least as important for them as for us*', the students liked '*to increasingly contact the company*' and rated their cooperation to be '*at a very professional level*'. Half-way through the semester clients received a research report with the exploration of the company case (the deliverable of the empathise and define phase). At the end of the semester, they received a consultancy report with tested prototypes (the deliverable of the ideate, prototype and test phase). The sincere interest shown by the clients/companies in these products '*motivated me to deliver a good result*'. As their work turned out to be appreciated by clients, the '*hard work paid off*'. Students were committed and wanted to put their best foot forward and'*put a lot of effort and energy in the assignments*'. Clients positively evaluated their projects and shared their appreciation for being able to collaborate with young people with '*fresh ideas*'. The students were seen as '*enthusiastic and inspiring*' and '*well-prepared*'. Clients stated to have '*learned a lot by constantly having a dialogue*' that lead to a '*beautiful product*'. The DBE programme '*released a lot of energy*' in students and provided clients with new perspectives. *Client evaluations:*

> '*Fantastic job! You were such enthusiastic and inspiring people. For us, it was also inspiring to work with you. Thanks a lot!' 'It's nice to see that social organisations and educational institutions can support each other!' 'Nice and enthusiastic students. Neat presentation. Good luck in the fourth year!' 'What a nice way of*

presenting! You can see that the students were well prepared and that they learned a lot from this project. With their fresh look on analysing and solving problems, and through constant dialogue we learned, too. Thanks for the beautiful product and the informative process'. 'We were very pleased about the cooperation with the students. Is there any opportunity to cooperate with you again next year?'

Furthermore, students reported to have '*learned a lot about themselves*' and to have '*developed a professional attitude as junior consultants'*. They indicated they learnt to '*take more initiative*', '*balance private and school activities more efficiently*', '*handle in deliverables in time*', '*ask for feedback*', '*learnt from mistakes*', '*asked clients what they really need to know*', '*bring in their own ideas*' and '*work independently and take risks*'.

Coding scheme
Table 12. Data-analysis scheme of Innovation (n =16 client evaluations and n= 168 student self-reports)

Fragments	1st order categories	2nd order themes
	Selective coding	
'*it worked out very well*'	Satisfaction/proud	Innovation
'*creative prototyping*'	Self-expression	
'*fresh ideas*'	Creativity	
'*constant dialogue*'	Network learning	
'*interviewing is only learned by doing*'	Learning attitude	Professionalism
'*I wanted to show the best'*	Accountable	
'*first look before starting*'	Effective	
'*learned to be bolder*'	Assertive	
Total number of words in student self-reports: 18,627 (41%)		

These results show that a satisfactory interaction between client and students work as a catalyst for innovation, at least for the Human Resource Management students. In the process of skill training for an innovative and adequate outcome for real-life organisational issues, students in the HRM programme reported to increasingly develop a professional attitude. They developed an openness or curiosity to learn, a sense of responsibility to add value, a willingness to operate effectively, and a willingness to clearly assert one's opinion.

A committed agile learning process of both students and clients resulted in designs that satisfied and even surprised the client. Clients' evaluations showed that they were rather pleased with the work of our students. A number of these clients is again involved in new projects coordinated by our institution, which is another sign of their appreciation.

Conclusion

By performing action-research in own professional context, we gradually learned how to develop solid student competencies as self-regulation and cooperation and how to facilitate a 'world wise' professional attitude. As a result, we added several learning strategies during the two years of facilitating students in DBE (see Figure 23).

To facilitate the development of self-regulation competencies we applied the method of critical thinking in, for example, data collection (literature and research) or extensive reflection and discussion sessions to encourage exploration and self-command. Furthermore, we addressed stressful anxieties or premature conclusions and promoted dialogue, empathy, and the forming of well-founded decisions. In reaction to students reporting that communication with fellow students and clients is essential for a successful outcome of their consultancy project, we intensified individual and group coaching to improve communication and enhance coherence. Technical competencies in performing literature-study, quantitative and qualitative research can be learned during classes, but students need regularly, weekly coaching in communication and project management
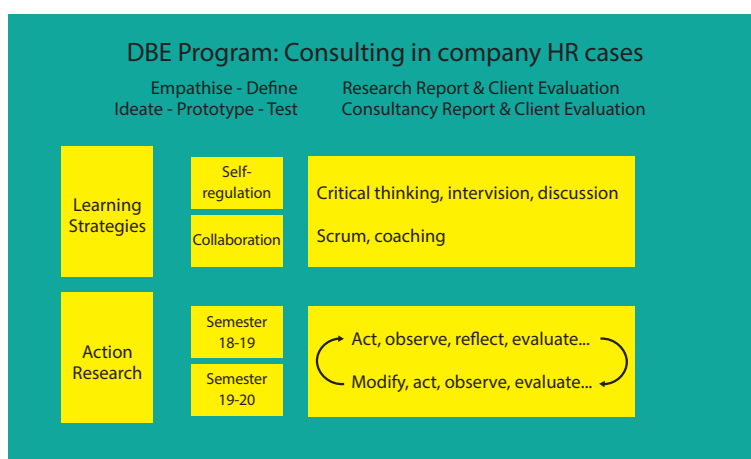

Figure 23. Action research process

tools, like Scrum management, to learn and deal with the complexity and chaos of designing.

We learned that our role had to move from instructing to activating the student's learning process and that the role of students shifted from reproduction to jointly solving problems by network learning with clients. Our role changed from educator towards consultant, partner, and coach. The prevalence of satisfied students, clients, and lecturers indicated that under the mentioned conditions DBE has a strong appeal to students to develop themselves professionally. This action research project in facilitating students' learning processes in DBE showed that enhancing self-regulation and cooperation lead to the growth of a professional mind-set and willingness to explore and contribute.

When we as lecturers started the first DBE course in September 2018, we thought we had it all planned with collecting attractive assignments in the field and a lot of instructions in researching and designing during several lessons and working classes.

However, students taught us that additional conditions in self-steering and cooperation need to be fulfilled for them to successfully consult real-life organisations and work on 'world wise innovations'. Only then the educational concept of DBE proves to be a deliberate method to enhance metacognition of students which stimulates group creativity and professional behaviour in a significant manner, and last, but not least, turns performing the business projects into having a good time.

The reward is the growth of an HRM learning community with sustained relations with clients, motivated students using DBE in their graduate projects in their fourth year, and further professionalisation of lecturers. In this valuable network each member adds a specific value to discuss, design, and performance solving wicked problems.

Acknowledgements

Chapter 14

Formative testing in Creative Business.
The value and lessons from formative testing in a DBE education programme.

Marijke de Jager and Margreeth Themmen

Abstract

Testing to learn became the motto of the testing policy of the Creative Business programme at NHL Stenden in 2019. The programme wants to stimulate deep learning in its students by using self-direction and gaining more insight into their own learning. Since the introduction of DBE, the lessons and assignments at Creative Business have become more practice-oriented, challenging, and activating. How do you ensure that the testing fits in with this, and is therefore also challenging and activating, and at the same time leads to insight into the learning process of the student and helps to develop self-regulation?

With its method of testing in the first year, the programme has managed to create a testing and feedback culture aimed at growth, in which a large degree of self-direction in the student's own learning process is achieved by means of formative interim evaluations of knowledge and of the professional development of the student as a starting professional practitioner. In this chapter, in addition to theory on formative assessment, formative knowledge assessment and feedback as a powerful instrument to influence learning, it will be revealed how students have experienced the positive influence of this new way of assessment on organising their learning behaviour, the meaningful and deep learning, understanding and application of knowledge, and their own personal growth and development.

What influence does (formative) knowledge assessment have on the learning behaviour of students, what do we know?

As in primary and secondary education, we have also seen a test revolution in higher education in recent years. This revolution has arisen from the pursuit of a higher quality of testing, whereby tests are carried out more objectively with fewer tests. The revolution is also a consequence of the fact that various studies have shown that feedback, as part of formative testing, is a powerful instrument for learning (Hattie and Timperley, 2007; Vermunt and Sluijsmans, 2015).

In education, the emphasis has therefore shifted from 'evaluating learning' to 'evaluating to learn', i.e., collecting information about the learning process and learning outcomes of students. The information that is collected consists of feedback moments such as quizzes in class, feedback in the form of feedback from fellow students or experts, a test in class without grading etc., all of which falls under formative assessment. Formative testing thus refers to all activities carried out by lecturers and students to enhance learning and motivation. However, formative testing only exists when the information is used by students and lecturers for further learning resulting in, for example, improved learning performance, increased motivation, and better test designs (Vermunt and Sluijsmans, 2015). The student himself plays an important role in this. He or she is expected, based

on the results of the assessment and the feedback, to actively engage in follow-up activities in his or her own learning process. This assumes that the important condition of self-regulation is met.

Feedback because of formative testing ensures that the student improves his/her performance, but also that it contributes to the learning strategies of the student so that also in the longer term the student can improve his/her performance. In this way, the feedback is sustainable in the learning process of students. By giving sustainable feedback, students are stimulated to try to really understand the subject matter and to think about it critically. This is what former Open University PhD student Gerry Geitz stated in her dissertation 'Sustainable Feedback in Higher Education: Relation Between and Changeability of Self-Efficacy, Goal Orientation, and Learning Behaviour'. The student's process of processing feedback is called feedback literacy. (Carless and Boud, 2018.) This requires a student to go through four steps: appreciating the feedback, judging the feedback and their own work, regulating emotions, and acting.

Here it is important that students build up a repertoire of strategies for processing feedback and can be assisted in doing so.

The method of testing therefore has a great effect on student learning (Hattie and Timperly, 2007). by discussing with other students how to make the best use of the feedback

Another important development that has influenced or perhaps helped to initiate the test revolution is the attention paid by educationalists to deep versus superficial learning. Deep Learning (Fullan, 2017) or in-depth learning is an essential learning and development process according to Fullan to accelerate and improve the learning process, formative testing can provide insight into the degree of progress of learning. The degree of progress gives insight to both the student and the lecturer. It is important that students learn how to put knowledge together and how they can use it to solve problems in new situations. Deep learning is probably the best way to teach this, for example, about making connections, understanding, and really wanting to understand the text and thinking critically about it. Those who can do so are able to link new ideas to already known concepts and use them to solve problems in unfamiliar situations.

The educational vision Design-Based Education (DBE) of the NHL Stenden University of Applied Sciences is in line with this because the learning process of the student is about learning by trying and doing, learning through acquired learning experiences. Feedback, evaluation, reflection, and adjustment are a natural part of the phases of DBE. Working according to the principles of Design Thinking and the phases of DBE influences the didactics, the interaction between lecturer and students and students among themselves (NHL Stenden UAS, 2019).

DBE education challenges students to learn deeply, has a conscious intention to master and understand underlying principles.

Students who learn deeply, want to understand learning material, and seek active ways to process new knowledge, for example by thinking critically, asking themselves questions, and making connections between new knowledge and what they already know (and between different modules within a programme). This way of learning (Social Constructivism) generally leads to greater long-term effects; even after some time has passed, students can still place and apply the material, whereas with superficial learning

it is often forgotten after the test. This argues for a learning environment in which students are challenged to learn and stimulated to learn deeply (NHL Stenden, 2020). Feedback as an instrument is used synchronously and asynchronously from a didactic point of view to achieve deep learning.

Formative testing provides insight into growth

Formative testing thus provides information about the learning process (Black and William, 1998; Brookhart, 2007, Crooks, 1987) that gives instructors insight into students' growth and students can use to further their learning and thereby also motivate students to continue (Sluijsmans et al., 2013).

Changing the way testing is done can contribute to a culture where learning and development of future professionals is central, according to Sluijsmans, 2018. Based on all the interviews and chapters, she formulates five key messages for higher education to refine the dialogue about feedback culture on the learning and development function of assessment in higher education. In a feedback culture:

- There is a coherent and studyable curriculum of which assessment is a part
- Through continuous formative assessment, students are given every opportunity to complete their studies successfully in a cyclical learning process
- Students learn to take responsibility towards themselves and each other; they are involved, inquisitive and active partners in a feedback culture, lecturers take responsibility towards themselves and each other; lecturers work together as a professional learning community
- There is a shared vision and collective quality awareness; the programme also works on its own self-regulatory capacity.

These core messages have been adopted and are recognisable in the curriculum and in the assessment plan of the Creative Business programme (CB). These recognise that the curriculum and assessment is a continuous process to stimulate the students' desire to learn.

Feedback culture and the importance of involving students.

Part of DBE is involving students in the design of education (participatory design). This involves all stakeholders in the design of the learning environment (Konings, Seidel and Van Merriënboer, 2014). CB students are involved in various ways in designing the curriculum and evaluating it, for example by participating in team days, but also by holding periodic panel discussions and attending module coordinator meetings. The results of the panel discussions and the evaluations are shared with the CUCO (curriculum

committee), the teaching staff and the students so that transparent improvements can be made.
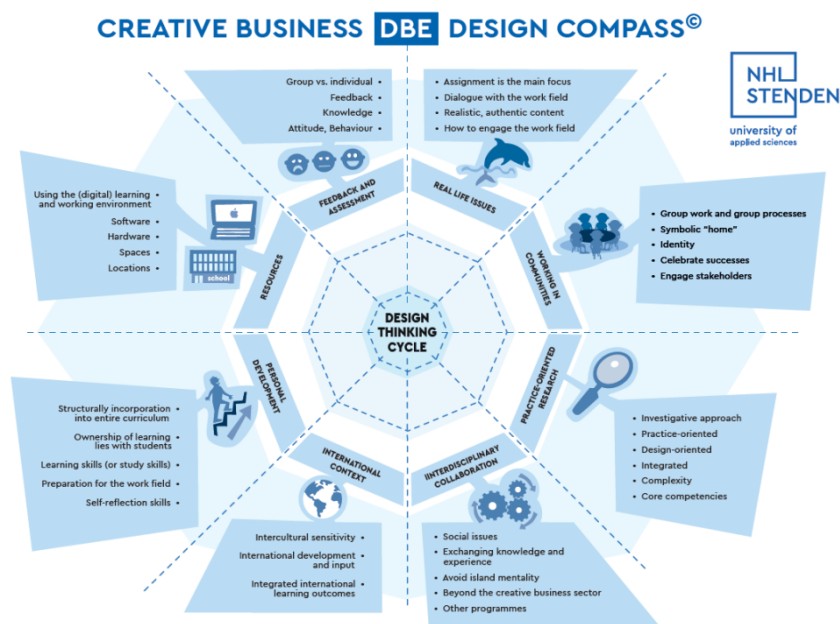

Figure 24. DBE Compass, Creative Business programme at NHL Stenden University of Applied Sciences.

Vision on assessment at Creative Business

The Creative Business programme wants to offer its students a 'powerful learning environment' in which learners are challenged to actively learn with a clear view on the functionality of the learning and the learned, situated in a concrete context and in which the authenticity of that context is as high as possible. These principles form the basis for the method of testing and assessment (Course document Creative Business 2019/2020).

With its system of testing and assessment, the study programme aims to stimulate students' learning and reflection on experiences and developments.

Therefore, Creative Business has the following vision on assessment: "Assessments at Creative Business should stimulate the learning that fits DBE: challenging, activating and distinctive and includes the interim evaluation of the progress of the learner in his process of becoming a starting professional".

From its vision on assessment and principles for the assessment policy, the programme has developed a guiding tool, following the DBE-compass.

The DBE Compass is the basis for the development of the curriculum. The test compass serves as a basis for the development of testing at Creative Business. At the heart of the

compass is the core of the desired test revolution at Creative Business; towards a feedback culture aimed at growth. A test revolution that does justice to the current demands made on starting professionals, fits in with the educational vision DBE and the desire to recalibrate testing in line with and sometimes in anticipation of national developments and insights in the domain of education and testing (Sluijsmans D. and Segers, M., 2018). By creating a feedback culture focused on growth, Creative Business educates students to become self-reflective and self-directed professionals who can learn for a lifetime.

With its system of testing and assessment, the study aims to stimulate students' learning and reflection on experiences and developments, with the goal of gaining insight into the learning process and obtaining self-regulation. The study programme enables students in their daily practice to regulate their own learning process and to learn actively by relying on sustainable feedback. The quality of the interaction between lecturer and student, the way feedback is given, and the frequency determine the effectiveness. The
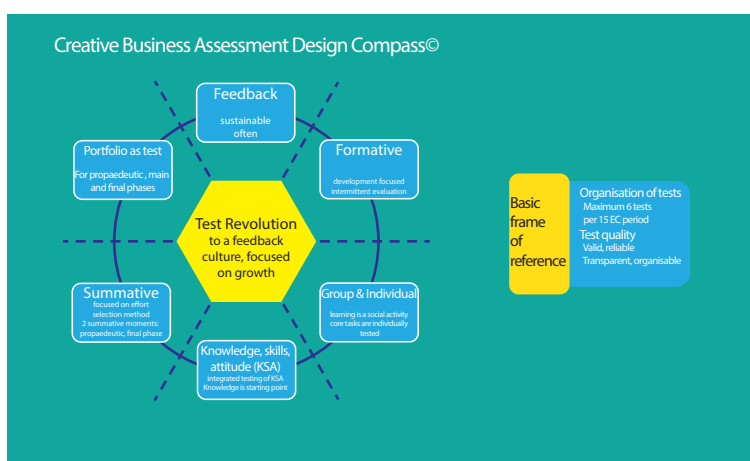
Figure 25. Assessment compass, Creative Business programme NHL Stenden University of Applied Sciences

active role of the student contributes to good dialogue and self-regulation and thus to the development of an agile professional who learns throughout life and demonstrates personal leadership.

The role of the portfolio in assessment

An important part of the formative assessment at Creative Business is the portfolio; the feedback is collected by the student in a portfolio, and this is reflected upon. The student uses the portfolio for reflection on personal and professional development and to prove that the student meets the core tasks for the Creative Business professional. This portfolio is filled and assessed annually. The burden of proof lies with the student. He/she will have to demonstrate/prove that he/she fulfils the core tasks, has developed him/herself and is ultimately professionally competent.

To be able to make a professional product, students need knowledge, which they will receive in the first year (book list, timetabled education, etc.) and which will be formatively tested (also in later years) by means of feedback in direct contact with the lecturers and peer students, but also by means of a digital test (or several) during the education unit. The content of the test is based on the Body Of Knowledge and Skills (BOKS) of the programme. The BAC of the education unit is determined based on the core tasks that are linked to that education unit. In this way, the student knows to what extent he has the correct knowledge to be able to make the professional product.

During the modules, a formative knowledge test is offered once (in week 5/6/7). This relates to the elementary knowledge base of the module contents, related to the learning outcomes of the module and (connected to this) to the BOKS linked to the various core tasks worked on during the module. Based on this, the student gains insight into the extent to which he masters the knowledge required to perform the central assignment, i.e., the professional product. The student can do the formative knowledge test several times a year (in each period in which the module is offered (for the module Creative Business 1 this is twice a year, the other modules are offered three times). This gives the student insight into the extent to which he has improved his knowledge level compared to the first test moment. At the end of year 1, another formative knowledge test takes place, this time covering the knowledge base of the entire propaedeutic phase. The student includes a reflection on his/her development regarding the components of the knowledge test in the portfolio.

The student uses the results of all tests to demonstrate in his/her annual reflection for Personal and Professional Development (PPD) that he/she has developed sufficiently regarding all learning outcomes (in addition to further documentation based on professional products, etc.). In addition, during PPD coaching sessions, attention will be paid to the importance of keeping knowledge up to date. With the results of the formative year test, the student can show that previously acquired knowledge has not been lost. The result of this test is not decisive for obtaining a positive Binding Study Advice (BSA), but the reflection on the results, as well as the reflection on the formative knowledge tests that are offered during the modules, are considered in the concluding Criterion Based Interview (CGI) in which the year reflection is discussed.

Knowledge is never assessed purely summatively in CB; the application of knowledge is of course tested in the professional products. The starting point is therefore that testing is done to learn, both formally and summatively. The effects of this method of assessing knowledge on learning behaviour will have to be properly evaluated during the first year and are shown below.

The test format is not determined in advance; it can be multiple choice, but short answer tests, insight questions, open book questions can also be considered. There is room to experiment within the modules with more playful ways of testing (Kahoot, Assessment As Learning (AAL), etc). Preferably, use will also be made of digital knowledge testing (Blackboard, FeedBackFruits, etc.). The form of testing will have to be examined for each core task/subject, but it is desirable to introduce a line in this. The expert teams should also determine in advance what the 'elementary' knowledge base for the foundation year is per core task.

Creative Business makes as much use as possible of "assessments for learning". The formative knowledge tests described above are a good example of this. Students use the results of these tests to reflect on their acquired knowledge. The summative moments (assessing the professional products) are also used in such a way that they contribute to the learning process of the student. In their portfolio, students reflect on the assessment of the professional products and set learning goals to further develop their knowledge and skills in that specific area.

Since 2019, Feedback Fruits supports students in gaining insight into improvements in their own work and therefore in their assessment. It is important to start this in the first year of study because students are still open to new methods and a maximum cumulative
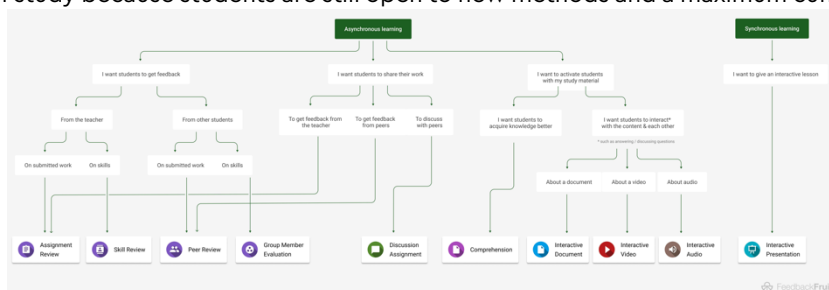

Figure 26. Decision Tree of FeedbackFruits

effect can be achieved. Another important effect is that it helps develop students' self-regulation skills (Sluijsmans et al., 2013; Taras, 2001; William, 2011).

Figure 26 shows schematically how feedback can support education. A brief explanation follows below.

Students can give feedback to each other on their contribution/skills or receive feedback from the instructors on their submitted work or contribution to the process. The feedback given is online and can be viewed and included in the student's portfolio at any time. The student and his/her mentor discuss the feedback in study progress meetings. The student's active role contributes to good dialogue and self-regulation and thus to the development of an agile professional who learns throughout life and demonstrates personal leadership. Goal setting, self-monitoring, self-reflection, and feedback belong together. Sustainable feedback (actively asking peers and lecturers for feedback on your work) is used to promote active learning by students (Carless, 2013).

The importance of involving students in the assessment cycle

There are three reasons why involving students in the assessment cycle by using formative activities is useful. (Vermunt and Sluijsmans, 2015). The first reason is that it increases the learning value for the student by offering tools to organise the way of feedback. Hattie and Timperley (2007) indicate that effective feedback answers three questions:

1.   What is the student working towards? What are the goals and associated assessment criteria and standards? When answering this question, there is feed-up.

2.   Where is the student now? What progress has been made regarding the assessment criteria and standards? Answering this question involves feedback.
3.   How will the student get to the desired situation? What approach is needed to grow and achieve the desired learning objectives and outcomes? Answering this question is referred to as feed-forward.

The above questions are used within the study programme when giving feedback. Lecturers also indicate that giving good feedback is intensive and takes a lot of time.

A second and a third reason for actively involving the student in the assessment cycle is that it possibly increases the self-regulating ability of the student and can have an important learning value for the lecturer.

What do students think and what do they learn from this assessment?
Creative Business started with DBE education in 2018. In that first year, together with students, each module was evaluated to find out how students experience the programme and the modules and what suggestions they have for improvement.

Method of evaluation
All students are invited to fill in a digital evaluation and in addition, per cohort, one representative from each group is invited for a panel discussion. So, every year there are 4 panel discussions with almost the same student composition. In 2018/2019, two groups of 4-7 students per module were interviewed, one group from the national stream and one group from the international stream.

In the panel discussions, much attention was paid to the new ways of testing and what influence this has on students' learning.

Based on the theory described about formative knowledge assessment, feedback as a powerful instrument to influence learning and deep learning, questions were formulated on three themes:

a.   Learning from the assessment: questions are addressed such as did the students experience the assessment as instructive, how did they prepare for the formative knowledge assessment, what did the outcome mean to them and what (learning) actions did they undertake.
b.   Learning behaviour: to what extent does the assessment help to organise the learning behaviour of the students? Topics that are discussed here include: How did you organise your own learning behaviour this module (e.g., setting goals, planning activities, monitoring, evaluating, reflecting, etc.) Did you do that and how? What goes well and what can be improved?
c.   Meaningful and profound learning: to what extent were students able to understand, integrate and apply the knowledge? Do students experience personal and professional growth and development?

The choice was made for qualitative research to learn from the students' experiences and impressions, what problems they encountered, what experiences and insights were gained and what does this mean for the programme and for the lecturers.

In the panel discussions that will be held after each module, the above questions will be addressed to investigate, based on the experience, opinions, and explanations of

students, whether the way of testing and giving feedback contributes to the intended learning process of students and what the programme can improve in this respect.

Conclusions from the interviews and recommendations for the programme

After conducting the panel discussions, the interview reports were collated, labelled, and analysed by the researchers. The interviews were recorded, and first relevant fragments were ordered, resulting in an order per sub-aspect (learning from assessment, learning behaviour and deep learning). For each sub-aspect, the students' comments were then put together and coded according to central concepts. The analysis of the qualitative data from the interviews provided the researchers with important insights that can be included as recommendations in the CSF programme, both in the context of implementing the principle of DBE and in the context of testing.

The results are described below per section and in chronological order. Conclusions and recommendations are then described in the final section.

Learning from assessment
First semester academic year 2018/2019

The value of good feedback.

When asked if and how students learned from the first DBE module at CB, students initially zoomed in on the learning value of making the reports. In this module, the final product consisted of an individual product and a group assignment.

Several students experience that they study better by working on products in which they receive regular feedback on the product. They receive the feedback from fellow students (peers) and lecturers. They indicate that the form in which they receive feedback is very important. Substantive feedback that allows them to increase and test their knowledge and not just feedback about the wrong font. The value of correct feedback is therefore very important.

A student indicates that making a report leaves more lasting impression on her than learning for a test once. When I have made the test, I forget everything again but now I remember everything I used for the report.". Other students agree with this but also indicate that prototyping was nice to get feedback but then they would like substantive feedback.

The value of making test questions together

A knowledge test takes place halfway through each module. It is done in the form of a Kahoot (online quiz) with all classes in 1 room for which students must make their own questions. This is instructive according to the students, but it would have been even more instructive if this had taken place in a smaller setting where the lecturer could have given direct feedback. They also give the following tip: make the questions in groups. The quality of the questions would then be better, according to the students. The lecturer can then add a few questions about subjects that have not been discussed. One student says he experienced it as a kind of competition and that he learned from it, but that not everyone reflected on it and acted. According to the students, this is because of the term Kahoot, which they see as a 'game'.

In the international group, a student states: "this way of testing takes away a lot of pressure, you can see how good your knowledge is without having the pressure of a grade right behind you".

Another comment is: "halfway through the module you have a good understanding of what you should know and that gives you a better feeling". Kahoot and example questions help to know what you still have to learn for the final assignment".

"By doing a report I feel like I actually invest in the topic and I have to make an effort to learn and to understand because I have to explain it to another person and when I/m doing a test it is just like getting it all and then putting it on the paper and then it's gone; so with the reports and the assignments I feel like I'm learning better because I'm partly responsible for the other people's grades as well so I want to do a good job. Therefor I like the combination test and assignment, you know where you stand and that's a huge plus for me".

Second semester 2018/2019 Year 1

The value of formative interim knowledge tests

In the second semester, the formative knowledge tests were taken digitally, some in groups but the tests can also be taken independently by the student at any time. This also applies to the cumulative test that students must do in preparation for their end-of-year interview (Criterion Focused Interview) in which they must present their learning trajectories about personal and professional development based on their portfolio. Students found the answers and explanations of the test questions on Blackboard: 'helpful and clear' and 'your own responsibility to ask the lecturer if you don't understand'.

Several students indicate that they find the formative knowledge testing in between useful: 'good to test your knowledge in between and it forces you to go deeper into the subject matter'.

However, it is important that immediate and preferably joint feedback is given in a group session. Students find the form of the Kahoot suitable for this purpose, but they do recommend scheduling the session, discussing the answers, and continuing to emphasise the purpose of the formative knowledge test.

Recommendations that students give to ensure the test is taken seriously by everyone are, for example: have the questions made by lecturers (professionalism), schedule the test (instead of doing it digitally and online at your own time) and clearly explain the purpose of the test to students.

About learning from the feedback concerning the module Professional Products, the students indicate that they would like to receive 'points of improvement' in a few sentences or bullet points from the lecturer to include in the PPD portfolio (study career programme).

It also happened that during the lessons not much feedback was given, which made the student think that everything was okay and then the final grade turned out to be insufficient.

Learning behaviour
First semester 2018/2019 Year 1

The value of 'learning to learn' in DBE

Although DBE is new for the students, they indicate that you learn a lot from doing independent research and testing. Here and there, the assessment of the final product/group assignment is problematic: those who are not experienced want a quality final product while you are still developing yourself. It is also indicated that sometimes throwing yourself in at the deep end gives the feeling of "having thrown away two weeks". Ringing the bell earlier with the tutor is not the first thing students think of at this stage and moreover there are coaches who give answers like: "yeah, good question, might be, what do you think yourself, something to think about, interesting, keep that in mind, etc"... That did not really help.

"I won't say we didn't learn anything, but it was hard in the beginning".

"We don't know what to ask for!

"No theory in some modules was not good, then the things we did was our learning process and that was also graded".

Students in all groups indicate that they would like to have more lectures, knowledge, and guidance in the beginning to be able to work on the assignment in the workshops afterwards. Working in groups and having discussions and reflections during the process is what they like.

Students indicate that they learn more from applying knowledge in practice than from knowledge alone: "working on the project is more fun than studying for an exam and it is also more stimulating".

The value of peer feedback

In the Content module, a peer feedback session was scheduled to share knowledge, insights, and questions. Students find this a great way of sharing each other's work and learning from each other.

The Production module also works with peer review (for the first time with FeedbackFruits), which one finds of great added value. "Through the presentation, the group receives feedback and then you think, oh yes, I completely overlooked that and so on". The support of the PPD (study career path) in your own learning behaviour was a little difficult at first ("what is actually a learning goal?") but after a few weeks it is experienced as very useful and supportive. Students do find it important that the coaches constantly emphasise and explain the relationship with PPD. What also helps are the conversations with the mentor, especially when the mentor "makes the learning goals concrete, also for daily life and is a bit behind it".

> *"I like it here and it's really a miracle at school. I notice that, apart from school, I also use what I have learned here in my work and in other places and that I am now suddenly very eager to learn. I haven't had that for a long time and now I'm looking forward to*

learning more and I notice that from other people around me as well and that has a very motivating effect."

"I was a bit of a lazy school-goer, a bit below my level so I don't have to do so much, and I'll get through it; here I'm challenged, I enjoy doing more, for example I'll get a book about marketing and then I'll read it because I enjoy doing it. Next year we'll continue with marketing, I think that's great!"
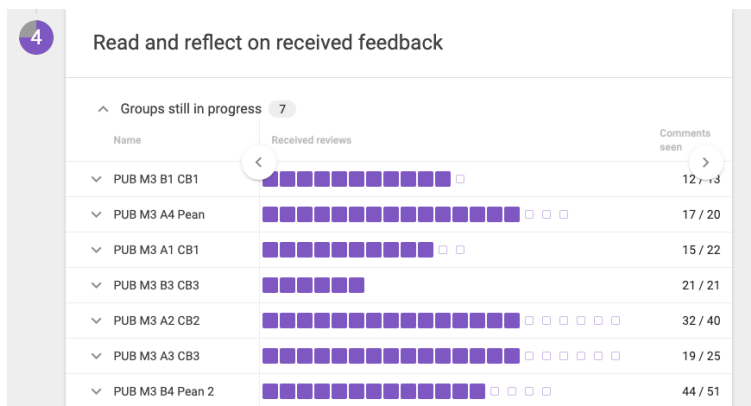
Figure 27. Example of giving and receiving feedback in Blackboard.
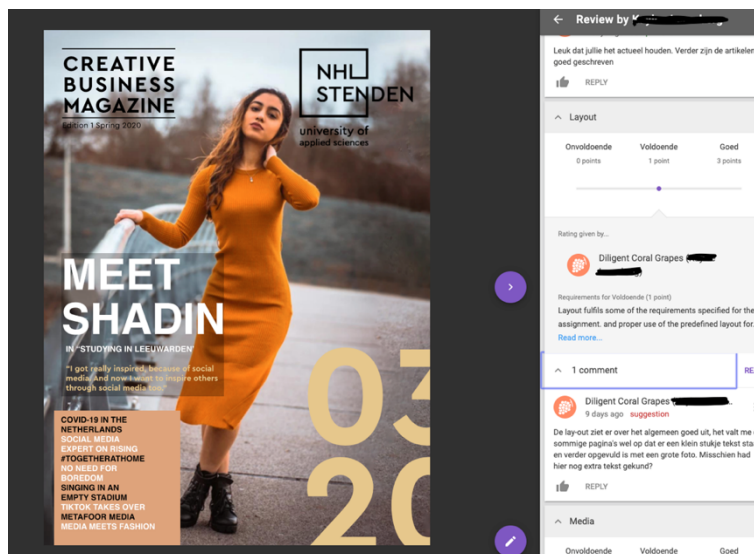
Figure 28. Example of feedback on professional product via Blackboard: Receiving feedback.

Second semester 2018/2019 Year 1

The value of gaining insight into the achievement of study goals

In the interviews after the second semester, the observations were like those in the first semester when it came to learning behaviour.

The students indicate that lecturers should constantly emphasise why things are important and that you are studying for yourself. Explain the goal and say that the

lecturers are there to help. Also, that after a test/assessment, you can decide for yourself whether you want to study a certain topic in more depth or study it again. "Feedback must be stimulating to go further with the assignment".

Some think that there are still many students who would like to get a grade, also for knowledge tests.

They find the End-of-Year-Talk a good way to end the first year, you can really show that you know your own learning behaviour and learning paths and have grown. It helps you to become aware of your learning goals.

"My learning behaviour has grown, first it was unclear and chaotic, now I know what I need to do.

Meaningful and profound learning
First semester 2018/2019, year 1

The value of being able to link knowledge to practice.

When asked if students have understood and can apply and/or integrate the knowledge from the module, students respond with certain examples that demonstrate this. As examples they mention the knowledge and the application of certain models they have learned, but also personal aspects such as cooperation and how to act in certain situations. Working in a studio is an added value to be able to discuss the knowledge they have acquired. Still, there is a lot that they experienced as vague and unclear in the beginning and only became clear later. They did not like that process.

"I gained confidence, learned practice but not a lot of knowledge.

Second semester 2018/2019 Year 1

Combining the value of knowledge lectures with practical components.

The second semester leaves a more positive impression, students indicate that they have learned a lot in terms of both content and application and that the knowledge is 'useful'. In this interview, students indicate that the combination of workshops, lectures and workshops has contributed to the understanding and application of the knowledge. They indicate the ideal sequence of starting with a knowledge lecture, followed by a workshop about a more in-depth component.

> *"Working with a real client is the number one priority when it comes to meaningful learning."*
>
> *"The theory fits into practice by doing the assignment and the questions in the knowledge test were connected."*
>
> *"Theory, practising and getting great feedback (in marketing) felt comfortable."*
>
> *"DBE helps you to grow, to be independent but can't do it without good feedback."*

> *"DBE helped me to grow, especially with my learning behaviour;*
> *DBE helped to focus and to get prepared for later and to learn*
> *because the effort has to come from me."*

A suggestion by students to promote deep learning and learning behaviour is to have two end-of-period conversations. For example, at the end of period 4 with an emphasis on professional and personal development.

And after that, students can take the cumulative formative knowledge test, e.g., at the beginning of the new school year and reflect on it in a conversation with the mentor at the beginning of the new year, as a kind of 'refreshment' of what has passed in the first year, what has stuck and what that means for the effort, focus and actions in the second study year.

Conclusions

The students who were interviewed indicated several times that they experienced the panel discussions as meaningful and that they felt heard, certainly because they see that they make a valuable contribution to the improvement of the study programme. In each panel discussion, they look back on the previous conversation and what happened with their input.

The active involvement of students in the design and evaluation of the programme increases involvement, is the experience at CB.

The results of the interviews support the plea of Vermunt and Sluysmans (2015) to also involve students more in the assessment cycle to increase the learning effect, the transparency, and the responsibility of the student. CB students implicitly indicate that they want to receive feed-up, feedback and feed-forward. The theory of knowledge-development or epistemic feedback that Paul Kirschner mentions is a valuable addition to this. The lecturer encourages the student to think further and more deeply. He/she asks questions, inspires, confronts, and acknowledges the student so that he/she can gain insight and adjust the learning process.

This also influences the learning behaviour and self-regulating ability of students, one of the most essential skills in the field of long-term learning.

Then comes 'feedback literacy', the ability to receive, interpret, and use feedback to learn from. Students who are feedback literate make proactive suggestions to keep the feedback dialogue going. They ask for clarification or clarify their own point of view in a constructive way, which keeps them talking about their own performance and the feedback they have received.

Understanding and paying attention to student perceptions helps to put learning from tests into practice and to continuously improve. Testing is not separate from education but is an integral part of it. It does not (only) serve to assess students but is an important tool in learning. Formative testing gives the student insight into how well and at what level a student has mastered the material.

Based on the interviews and the theory, the following findings can be made regarding the question of what influence formative (knowledge) assessment has on the learning behaviour of first year CB students:

- Formative testing contributes to learning from tests when this takes place in a session in which immediate feedback can be given.
- Formative testing contributes to learning behaviour when the lecturer applies feed-up, feedback and feedforward consistently and qualitatively.
- Formative testing contributes to meaningful learning and deep learning when educational practice is balanced: real clients, lectures, workshops, interim (peer) reviews, and monitoring the growth and insight of students through PPD and portfolio.

The findings from the interviews give rise to the following reflections and recommendations/challenges for CB

- Learning from tests: formative knowledge tests could be seen as a serious teaching activity, especially when these tests/teaching activities are developed in consultation with students. Discussing the results and showing the importance of the test can be valuable for the relation with the professional product and the learning outcome.
- Learning behaviour: going through the full formative cycle of feedup, feedback and feedforward for all tests is important for students. ; CB describes this in its vision, but this part could perhaps be provided, this also applies to the quality of the feedback and actively asking the student for feedback. Working with FeedbackFruits, which was introduced in the academic year 2019/2020, offers opportunities for this. Students will receive feedback on their work several times, this feedback will also remain visible online (via Feedback Fruits (Figure 24 and Figure 25)) and the student will thus have insight into his/her growth.
- Meaningful and deep learning: creating a challenging learning environment in every lesson can stimulate students to learn deeply and meaningfully using the DBE principles such as real-life wicked problems, co-creation, iterations. In-depth knowledge from experts can also help.
- The CB programme can become more and more of a professional learning community, with students and lecturers being actively and consistently involved in the development and evaluation of the curriculum and testing.

Chapter 15

Applied research using design-based education in a technical context.

Klaas Dijkstra

Abstract

What is the best project management method for a dynamic context in which applied research, technology and education come together? It is difficult to find a single method that is usable in all situations. There seem to be two main approaches: iterative and linear. The main question that is asked in this chapter is: how can several of these methods be integrated in a meaningful way for this dynamic context? Where do the methods overlap and how are they different? We propose an integrated approach to design-based education in which proven iterative concepts like Agile and Design Thinking are integrated with traditional linear concepts like waterfall model and scientific writing.

This leads to an operational form of design-based education in which during a research project the focus of Scrum sprints is gradually shifted from one design thinking phase to the next (while keeping the iterative nature of design thinking). Several prototypes lead to a final product which is presented at the symposium on computer vision and data science.

During the minor computer vision and data science, students from several studies, researchers, and professors (of applied sciences) have worked in multi-disciplinary teams with this design-based education approach. The first results are positive, and this approach seems to work well for applied research projects in the high-tech field of computer vision and data science.

Introduction

For decades, the ICT sector relied on meticulous planning of projects. Software was developed linearly in several phases: analyse, design, develop, implement, and test. This is known as the waterfall model. The competencies associated with each phase have formed the basis of the domain competencies of HBO engineering (Bacheloropleidingen Engineering, 2016). Usually the final phase (testing) needed to be cut short because of time and budget limitations. This has often resulted in spending more recourses to test a product on premise. Additionally, progress is barely visible for customers because results only start to get tangible during the development phase.

Nowadays engineering projects use Agile concepts (Agile software development, 2019). The idea is simple and elegant: The original phases of the waterfall approach are still traversed, only, with Agile, in a shorter time and in multiple iterations. This means that the development phase starts much earlier and is iterated multiple times. One of the advantages is that prototypes can already be shown to the customer in the initial stages of the project. Early testing of the prototypes leads to new insights and updated designs are created in the next iteration. A formal and popular Agile method is Scrum (The home of Scrum, 2019), which has been adopted as a standard tool for Agile project management by many companies. Although Scrum is not linear it still assumes the

plannability of actions and is well suited for software development projects. When it comes to research projects the Scrum framework is sometimes too rigid. In research projects a single insight can sometimes disrupt all subsequent steps in an iteration.

In many other fields it is well understood that an Agile approach gives more flexibility and freedom in projects. This resulted in an even more general concept, coined Design Thinking (DT) by Stanford University (Plattner, 2010). DT defines several phases Empathise, Ideate, Prototype, Test and Evaluate. In some flavours the Communicate phase is also defined. In DT these phases are traversed iteratively, each time improving the prototype. DT puts explicit focus on empathizing with the stakeholders and creating fresh ideas. Therefore, DT allows more room for creative problem solving which makes DT, in principle, an excellent tool for doing research.

Research starts with research questions and in technical applied research these questions are designed to give insight in a solution for a technical problem. In an iterative way, answers to these questions are sought by means of prototyping and experimentation. In that sense both fundamental research and applied research are of a scientific nature. Concise and effective communication of research results becomes increasingly important in any dynamic environment. A well-established method of communicating scientific research is by research papers, posters, and oral presentations. Depending on the field, the structure of these documents usually follows the IMRaD (Introduction, Materials, and Methods and Discussion and Conclusion) layout (Wu, 2011). We make a distinction between a scientific paper and a technical paper, where the latter is most suitable for technical applied research because it describes the technical perspective instead of a purely scientific perspective. Both papers however follow the same critical thought process associated with modern professionals.

The project management paradigms and the way that research is documented using the IMRaD format are all closely related. For example: The "materials and methods" section of a technical paper can be the result of the ideate phases in the DT cycle. Similarly, the test phases of both software development and DT aim towards the same goal.

We propose an integrated approach of Scrum, Waterfall, Design Thinking and IMRaD into one operational form that is specifically designed for applied research in a technical context. This integrated approach has been tested and evaluated by over 40, both national and international, students from several technical disciplines. We ran four iterations of our approach during 2 academic years within the minor Computer Vision and Data Science.

Research questions

The methods discussed are not directly applicable in a dynamic environment where technology, applied research, and education are combined. In this part the limitations of the various approaches are addressed and summarised in the form of research questions. At the end of this chapter, the research questions will be reflected upon. Gauging by the popularity of these well-established paradigms it can be concluded that they work well in a multitude of practical situations. However, the first obvious question is: how can these paradigms be adopted in a meaningful way in this dynamic setting? We call this, "the integrated approach" throughout this chapter.

From the introduction one might get the impression that iterations are everything. While iterative frameworks might, theoretically, be an elegant approach that graduated students can use throughout their professional careers, there are practical limitations. At some point the student needs to finish to be able to go to the next milestone. Also, in

practice, curricula are often structured in predefined phases in terms of semesters and academic years. This raises the question, is everything iterative? If not, how can iterations be integrated with more traditional phases? Related to this is the question whether the waterfall method is obsolete?

What all approaches have in common is that they are elegant and simple. This is a prerequisite for a method to be widely adopted. Especially in an educational environment where students can decide for themselves if a method works for them. So, what is a simple yet effective method to communicate a project management method to students? A challenge which is specific for a high-tech field like computer vision and data science is that it is, technologically, extremely challenging. Therefore, it is important to ask the question: how can the development of technical skills be optimised for a student within an iterative framework?

Design-Based Education @ Computer Vision and Data Science

NHL Stenden adopted the educational concept: Design-Based Education (DBE) and related to that, Design-Based Research (DBR). In the following description the focus is mainly on Design thinking, which is only part of the more comprehensive DBE concept. DBE (and DBR) focus on five aspects: Multi-disciplinary collaboration, international and intercultural aspects, personal growth, sustainable education, and design thinking.

Before discussing the integrated approach used in the minor Computer Vision and Data Science, the context is briefly explained. Knowledge Centre Computer Vision and Data Science (KCCVDS) consists of two professorships: Computer Vision and Data Science, each with their own professor (of applied sciences) and a group of researchers. Students, companies, and research staff collaborate on demand-driven applied research projects in a fully equipped lab. By forming teams with students, researchers, and professors a master-apprentice style of learning is naturally achieved. Computer vision and data science are both enabling technologies which can be used in any of the nine "topsectoren" (priority focus areas) defined by RVO (RVO, 2019).

KCCVDS is mainly driven by enabling technologies. This makes all projects of a technological nature in a well-defined niche, and it gives students an opportunity to work in a high-tech environment with experts from the field. The broadness stems from the applications where the computer vision and data science can be used. Because of this, customers usually already have a clear idea of what they want to achieve using the technology. The main challenge within a project is to solve the problem using state-of-the-art computer vision and data science techniques.

This technological drive of KCCVDS is important for the integrated approach. For example, the empathise phase of design thinking is less prominent because the customer already formulates a question with a strong bias towards the preferred technology (i.e., wants to use computer vision and data science). This also means that an ideate phase is always focused on technical solutions within the computer vision and data science domain. This field is vast, fast, and ever evolving, which makes focus on these specific technologies important.

Design-Based Education in the Minor

Multi-disciplinary collaboration, international and intercultural aspects are achieved by forming project groups of students from diverse disciplines and origins. Students from the various disciplines do applied research and contribute, each from their own unique technical background. However, a certain level of competence in programming and math is needed because of the software-technical nature of the projects. Both research staff

and students continuously learn new technologies and gain understanding on how to use them by doing applied research. This facilitates personal growth and sustainable education.

Figure 29 shows the integrated approach used in the Computer Vision and Data Science minor. The integrated approach uses three different concepts in tandem: Design Thinking, Scrum, and communicating research. The integrated DBE approach is explained in this section.

Scrum for applied research

In typical Scrum, a sprint consists of predefined actions (in the form of cards) chosen from a repository of actions (the backlog) and ends with a software prototype that is demonstrated to the stakeholders by the development team.

A semester roughly consists of five months which is equal to the length of a minor or internship. Each month consists of a Scrum sprint. At the end of each sprint the students produce two products: The technical prototype and part of their technical paper. For convenience, a sprint ends at midnight AoE (Anywhere on Earth) on the first of the month. The intermediate products are demonstrated to the project team and other stakeholders at the end of each sprint. The prototype and technical paper are passed through a feedback round with at least two supervisors. In this way the students are challenged to produce working prototypes, continuously and as early as possible.

In this sense the minor follows the typical Scrum design. However, in an applied research setting, predefining all cards for a whole month can become limiting. For example, a new insight can completely change the course of a sprint, which makes long sprints difficult to plan. Therefore, short sprints of one week are initiated, each Monday, during a recurring progress meeting that is held with all project members (students, supervisors, and researchers).

The weekly meetings usually have the following structure: The actions or cards for the previous week are discussed. Ideally all actions have been done by the team and, if this not the case, an action is either redefined more realistically, given a higher priority, or is removed. A backlog is kept for all new actions. This backlog is continuously maintained by students throughout the project. The final part of the meeting is to move actions from the backlog into the sprint and assign a person to each action. This determines the workload for the week.

Scrum defines daily meetings at the start of each day. In a dynamic research environment this is difficult to achieve. The weekly recurring meetings are regarded as substitute for the stand-up meetings in our integrated approach.

Design Thinking and Scrum for applied research

In a typical DT cycle: empathise, define, and ideate phases lead to prototypes that can be tested and evaluated before starting the next cycle. To successfully use DT for applied research in a high-tech field, the definition of certain phases is broadened and slightly restructured, while keeping the core concepts of design thinking.

In Figure 29**Error! Reference source not found.** each DT phase is defined within a sprint. This determines on which DT phase the focus of the sprint lies. Throughout the semester, the focus changes each month from empathise and define to ideate and test to evaluate. This does not mean that the phases of the DT are not progressed multiple times. In
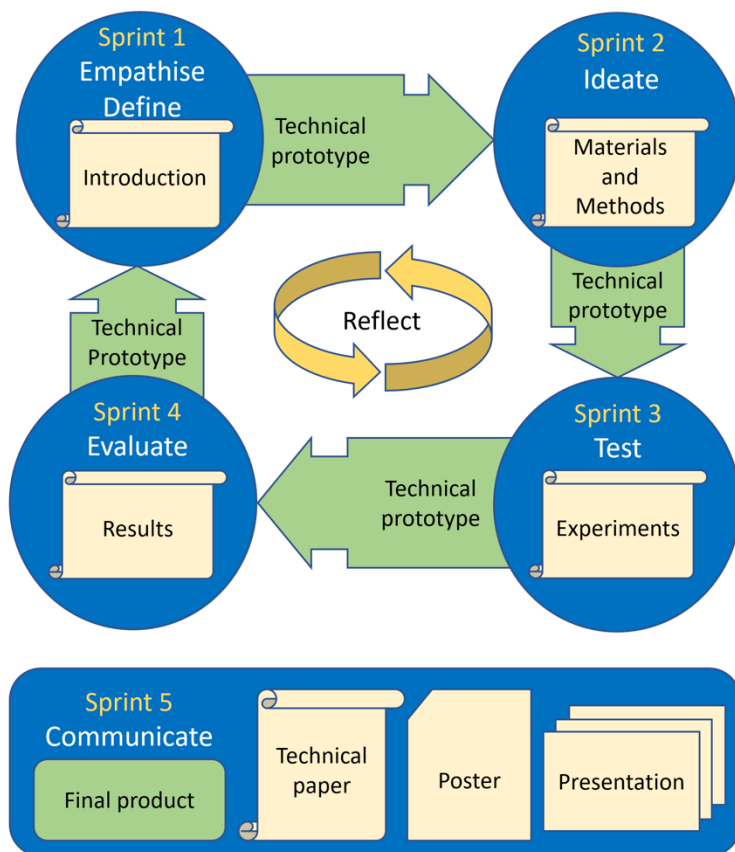
Figure 29. Our proposed integrated DBE approach. During five Scrum sprints the focus is shifted from one design thinking phase to the next. During a sprint several design thinking iterations can be traversed. Each sprint results in a demonstrable technical prototype and a section of the technical paper. The final communicate sprint is disconnected from the iterative part and leads to a presentation by the students on the symposium on computer vision and data science. This completes the applied-research project

practice when a student is testing (sprint 3) a new insight can trigger a new ideate phase. The idea is that, during weekly meetings, constant reflection on the work refines the prototypes.

Compared to the original DT method, there is a difference: Prototyping. Developing software is complex and abstract, which means that ideas are generated by writing small pieces of software to avoid highly impractical ideas. Similarly, it is difficult to define the problem without first getting an idea of how the software performs on a related problem, which is done, again, by writing small pieces of code. Generally, programming cannot be learned using pure research, it needs practice. This means that prototyping is the main tool to progress through the phases. This automatically means that technical prototypes

are the output of each sprint. A technical prototype can be anything that runs and is related to the field and the problem statement.

The end of the minor is defined by the communicate phase. During this phase other DT phases cannot be triggered, and the main goal is to finish everything and prepare for the bi-annual symposium on Computer Vision and Data Science, where the findings will be presented. This phase results in the final technical product, the technical paper, the poster, and the presentation. These products are used for the final holistic assessment of the students and are of paramount importance for the next group of students to be able to continue the work during the next iteration.

Activities within each phase
Empathise and Define
In the empathise and define phases the student needs to capture the context and exact nature of the project. In technical projects the main challenge is not only to understanding the question of the customer, but also understand the technology in which the question of the customer is framed. Therefore, during the empathise phase, it is important for the student to empathise with both the technology and the stakeholders. The first two weeks start with a full-time course on computer vision and data science to get acquainted with the technical possibilities of these fields. This course is always evolving, and new content is added continuously to follow the fast pace of the field.

After the course, a project is assigned to a student based on their own preference, discipline, and skills. The student starts by defining the context, problem statement, research questions, and other work related to the technological challenge. This is written down in formal and concise language in the Introduction section of the technical paper. This determines the scope of the project. The technical prototype can be, for example, running the final product of an earlier project group or a first running prototype of the newly learned algorithms.

Ideate
In the Ideate phase most software is developed. During this phase, the student tries different technical approaches and performs small tests to determine the fitness of these approaches. The goal is to identify promising new techniques for solving the problem. During the ideate phase, a deeper understanding of the technology with respect to the research questions is achieved. Additionally, the student collects and maintains datasets with image data that are annotated by domain experts. These sets can either be made on premise, in the lab or, in most cases, the dataset is already created by the customer or by earlier project groups.

This sprint, where the focus lies on the ideate phase, is ended by a demonstration of several small prototypes that show promising directions for answering the research questions. Additionally, the Materials and Methods section of the technical paper is delivered which describes the details of the algorithms and the details of the dataset. This will produce most of the ingredients needed for answering the research questions. At the end of the sprint, the students are also asked to pitch a scientific paper they found relevant for their project. This helps the students to learn to interpret this kind of literature and helps in writing their technical paper.

Test
During this sprint the focus is on the test phase. Typically, there are many ideas, rough estimates, and expectations of the performance of those ideas based on small tests. At

this moment, focus is needed to validate results and for that, formal experiments need to be designed. The goal of an experiment in this context is to test an idea on a previously collected large dataset. During this phase careful thought is given on what experimental results can contribute to answering the research questions. It is important that before the actual experiments are executed (these can run for days) the software itself is bug free, as bugs might interfere with the results and can ultimately lead to false conclusions. Therefore, during this phase, also unit tests and integrations tests of the software itself should be performed.

At the end of the sprint the written experiments section of the technical paper is produced. This puts focus on the results of the whole project. What will the message of the technical paper be? How will the experiments logically answer the research questions and how does this provide insight in the solution for the posed problem? During this phase it is not uncommon to readjust research questions and sharpen goals and to trigger a new iteration through the define and ideate phases.

Evaluate

During this sprint the focus is on the evaluation of everything that has been produced during the project. By running experiments insight is gained into the research questions and the original problem. Experiments should mostly be automated but will still require monitoring and adjustment. Quantitative and qualitative data are collected and noted in the results section of the technical paper. Typically, the experiments and the results sections of the paper are merged into one section called Results. Finally, a comprehensive discussion of the results is provided, and the discussion and conclusion section of the paper is produced. The conclusions should reflect on the research questions.

This leads to a final technical product that has been tested and validated by software tests and formal experiments. The output of this sprint is also the first draft of the technical paper.

Communicate

The communicate phase is intentionally disconnected from all other phases. It is often tempting to do one final experiment or add one final idea but, during this phase, the focus is on wrapping up the project. This is the phase where the iterative approach is temporarily abandoned. In the communicate phase several steps are taken to prepare for the bi-annual symposium where all stakeholders are invited, and the students have an opportunity to present their work.

The final draft of the student is passed through one more feedback round with the supervisors. The resulting technical paper is shared with an external reviewer. This causes a fresh look into the technical paper and because the reviewers are usually the supervisors from other groups this facilitates quality control. For uniformity a template for the paper has been provided to the student. It is important that this paper is concisely written and contains minimal grammar and spelling errors so the external reviewers can focus feedback on the content of the paper rather than the form.

After the technical paper has been revised using the feedback of the external reviewers the student creates a poster and a presentation. During this wrap-up phase the final software product is cleaned-up and stored in such a way that students of subsequent project groups can continue the work. During the symposium each student group will present their work in an oral presentation. Poster sessions are held so participants can

ask additional questions directly to the students. The final grading is performed in a holistic manner and is discussed during a calibration session with all supervisors.

First experiences

The integrated DBE approach has been implemented and feedback has been collected starting from the first semester of 2018 onward. During these semesters more than 40 national and international students performed a project at the KCCVDS. These students came from a broad range of technical studies, among which were Electrical Engineering, Mechanical Engineering, Mathematical Engineering, Chemical Technology, and several other programmes throughout the Netherlands and abroad.

The aspects that are discussed here are mostly observed informally during many meetings and discussions with students and members of the research group. Additionally, bi-annual evaluations are taken by asking students to answer open questions. We ask for three positive and negative aspects that students might have encountered. This formal and informal evaluation has given a first indication that our approach was received positively, and in the future, we plan to analyse the feedback in more detail and to also collect additional feedback from subsequent student groups.

Because of the careful balance between structure and freedom the students have a clear understanding of what is expected (Student evaluations, 2018), but also indicate they have enough freedom to decide their own path. An increase in quality of the written work has been observed that lead to the nomination for the Leeuwarden Courant Awards (Riesebos, Gordon and Kloosterman, 2019).

Our integrated DBE approach is printed onto an A0 poster that is on display in the lab. The poster details the activities within each Scrum sprint and shows the deliverables. The idea is that this keeps the project top-of-mind for students, supervisors, and researchers alike. During regular technical project meetings, we noticed that the students use the poster to plan their work. A positive result from this is that the project team can put less focus on the process and can more freely explore the technological solutions for the posed problem.

We observed three threads that run though the whole process. The first thread is the documentation of research results. The technical paper is gradually produced by the student throughout the semester. The positive effect that is observed is two-fold: first the student receives feedback very early in the process and secondly the supervisor is better able to manage the quality of the final technical paper. This is particularly important if the paper serves as part of the documentation to the customer.

The second thread is the knowledge level of the student. It is observed that the technical skills of a student develop in a high pace during the empathise, define, and the ideate sprints. After these sprints the student are better able to structure their work during the test and validation sprints and can present a well-structured solution during the communication sprint on the symposium.

The final thread is the technical solution which is also gradually developed. During the first sprints a rough prototype exists with many ideas incorporated. The test and validate sprints demand a more focused end-result and it has been observed that this usually results is a high-quality final prototype.

Discussion and Conclusion

In this chapter an integrated approach for applying DBE in a technical applied research context has been presented. The approach is discussed from three perspectives, namely design thinking, Scrum, and applied research. These first experiences have been promising as gauged by the positive reactions.

Managing the balance between the freedom of the learning process of the student and working towards a final solution that answers the research questions and produce a solution for the problem is important. Our integrated DBE approach facilitates both: it starts by focusing on knowledge gathering and generating ideas and then gradually shifts focus towards testing and validating. The entire process is finalised by the communication sprint which is intentionally disconnected from the rest of the cycle.

Prototyping is an important phase when doing applied research in a high-tech field like computer vision and data science. Therefore, each sprint focusses on a specific phase of the design thinking cycle and after each sprint a demonstrable prototype is produced. A significant difference with canonical design thinking is that a prototype is produced after each phase, not only after the ideate phase. The rationale behind this is that the easiest way to empathise, define, and ideate is to start by understanding the technology in which the problem is framed, and this is best done by developing small prototypes/pieces of code. This can even be regarded as shorter iterations of the design thinking cycle during a sprint.

Finally, we reflect on the research questions. The question *"How can these paradigms [Design thinking, Waterfall, Scrum, and scientific writing] be combined in a meaningful way in this dynamic setting [Applied research and education]?"* is answered by observing positive effects of applying our DBE approach in practice during real-life applied research projects.

The questions *"Is everything iterative? If not, how can iterations be integrated with more traditional phases? Related to this is the question whether the waterfall method is really useless?"* has a two-fold answer: in our integrated approach the focus on sequential sprints gives a global waterfall-like feel which is clearly not iterative. In that sense waterfall is certainly useful. However, by defining each sprint to only represent *the focus on a certain design thinking phase,* makes the entire process clearly iterative and leaves ample room for fresh ideas and design-based education and research.

The question *"What is a simple yet effective method to communicate a project management method to students?"* is answered by the form we chose to present the integrated DBE approach. Our DBE poster functions as a single point of entry to information for students. This chapter serves as a more comprehensive description of our integrated DBE approach.

The question *"How can the development of technical skills be optimised for a student within an iterative framework?"* is answered by starting with a pressure-cooker style course on the technical subjects and by practicing with small examples. In subsequent iterations, further development of student skills is achieved by on-the-job training on real-life applied research projects. It is also important to let professional researchers do research together with students so that a master-apprentice style of learning is achieved.

Chapter 16

Photo Voice to support the learning organisation.

The patient's voice expressed using images

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Abstract
Photo Voice is a means of researching and reflecting on a concrete, existing situation in an organisation. In this way it fits within the methodology of DBE and DBR. Photo Voice supports learning moments of professionals and managers. But it also contributes to research. It is now a recognised form of qualitative research that provides information about new designs or reflects on designs that have been made and/or need improvement.

An organisation that wants to do research and develop new things in the context of the perceived quality by the target group itself. For example, Photo Voice can be used in education, healthcare, or judicial institutions. Stakeholders, customers, patients, employees, or others collect visual material by means of photography. A selection is made, discussed, and some of it printed and exhibited. Subsequently, one or more dialogues are held based on the images. For example, with the researchers who want to improve things and work on a new design. It is also useful for aid workers, teachers, or judicial officials who want to improve the quality of care and want to innovate.

The advantage of this method is that it creates a space for open and free association, also for those who have less language skills. It is used during the evaluation moments, where learning effects or research-based data are collected. An example is given in this chapter of clients in addiction care who return images and words to the organisation in their own authentic way. Images that stimulate reflection, improvement, and further research. This has given Photo Voice a permanent place in the Leadership and Change Management research group and strengthens the DBE and DBR approach.

Introduction
The time has passed when the board of a public or healthcare organisation determines the course of the organisation based on their vision and convictions. The process of determining the course, the intended quality and structure of the organisation is increasingly a form of co-creation with several stakeholders, including patients. Instead of setting the course, managers, the leaders in an organisation, are increasingly becoming the supporters of learning and development processes. This requires different, innovative methodologies.

In this article we will introduce a new form of learning and reflection based on the methodology of Photo Voice. Photovoice is a participatory action research method that supports groups and individuals in expressing their experience of their lives and

environment. By means of photography, people can image their world. This is a method that suits well with patients of at Addiction Care Noord Nederland (VNN). It works often even better than the classic surveys, questionnaires, and interviews.

At design-based research it is essential to reflect and evaluate each phase of development to arrive at a new of better product. Photo Voice is a method that is helpful for management, employees, students, and the target group. In this case patients at VNN, who needs addiction care. The uniqueness of photo voice is that it does not focus on the rational, linguistic but on the intuitively expressive. Precisely this aspect of working with Photo Voice is very suitable for joint reflection and evaluation in a certain phase of design-based research. The unique thing about this is the dialogue between management professionals, the target group and possibly other stakeholders that can take place. This methodology not only fits well with the environment and the different background and level of the patients, but also supports the dialogue with employees and management.

Learning organisations

Public organisations in the Netherlands are often described by the principle of the learning organisation (Chang and Lee, 2007; Senge, 2006). This means that these organisations not only want to continuously improve their products or services, but also learn from the way they have organised themselves and the way they work. By this, these organisations mean that they not only want to continuously improve their products or services, but also the way in which they have organised themselves and the way they work (Senge, 2014). The principles of design-based learning (DBL) and design-based research (DBR) are increasingly being applied for this purpose. The NHL Stenden University of Applied Sciences is right to have embraced these methods.

In organisations methods of learning and research is often linked to a quality management system, which includes, for example, the analysis of complaints and incident reports and customer satisfaction surveys. Quality management systems are often used to improve products in healthcare organisations. A quality management system is mainly rational. Consultations about improvements are highly targeted, bureaucratic, and structured. It is often far removed from the target group itself, the patients at VNN. There is little space for an open dialogue, based on feelings and images, with a conversation being based on intuition. While quality of work and the treatment in the health care itself are often about perception and not just rational explanations.

Addiction care North Netherlands (VNN), which supports the principles of the learning organisation (Meerjarenbeleid VNN, 2015), was dissatisfied with the results of the above-described rational methods and interventions. The collection and analysis of data of complaints, incidents, and surveys that patients and their relatives can fill out, led to a level of abstraction, that was too far away from practice. Much emphasis was placed on describing and developing protocols and procedures. As a result, professionals have become more distanced from the concept of quality of care. The concept of quality had become something that had to be done by the quality officer, the external auditor, the health insurer, the Healthcare and Youth Inspectorate (IGJ) or another external party. It was experienced as means of control, with checklists, protocols, and procedures. It led to a process of alienation, in which there seems to be less attention for the most important purpose in healthcare: the continuous improvement of patient care. A lot of (paper)work was done, with the best intentions to learn from mistakes and feedback, but it only yielded very limited information to actual improvement.

Change in thinking

At VNN, we have taken a step towards a new phase in quality thinking. We are trying to reconnect with the purpose and meaning of healthcare: caring for our patients and the autonomy of our professionals. In this innovative way of working, we have introduced the concept of dialogue with patients, employees, and management. Thinking about quality of care, what is needed to achieve this, and which changes may be necessary. In this learning process, we constantly come across new things that may enrich the care provided to our patients. This new phase also includes new starting points and methodologies.

Addiction care in the north of the Netherlands is based on the principle (VNN's long-term policy, 2015-2020) that, in addition to science and professionalism, expertise by experience is also an important source of information for achieving improvement. In addition, the organisation has chosen to steer as little as possible top down, but to allow important decisions such as the development of an annual plan or other policymaking to be made in dialogue with the parties concerned, including patients. Based on this vision and with the question of how the process of collaborative learning in the organisation could be better supported, we searched for a suitable method. A method that starts with the client and his or her own experience and connects both the experience of the client, as well as the professionals and management. A method that contributes to a learning organisation, working on new a better design of organisation and methods of treatment.

Photovoice in progress

Among other many methods, VNN has chosen for the Photo Voice method. This method has now been used successfully within VNN for several years. Photovoice is a qualitative, participatory, action-oriented research method that can be used for various target groups (Wang, 1999). Photovoice is an intervention that makes use of photos and the narratives of the users. The photos themselves are a source of information, but they also support the user in forming a story about their life or a specific theme.

In principle, Photo Voice has three goals (Wang and Burris, 1997):

1.   The recording of strengths, but also the possible worries surrounding a theme. Images are made and collected for this purpose.
2.   Entering a dialogue about the themes based on the photographs taken.
3.   Reaching policymakers with the results of the dialogue based on the photographs and narratives.

The process of Photo Voice within VNN: experienced quality of care

When starting a Photo Voice session, we take the experienced quality of care provided by patients in addiction care as a starting point. It is important to know how the individual patients experience care, what is going well and what can possibly be improved. This issue is then presented to a group of patients. This group of patients is equipped with a camera or will take pictures with their mobile phone. These photos, the visual material, will be discussed with each other and selected based on the power of interpretation and meaning that is given to the photographs. The patients then present the images to the staff, practitioners, and management. They share their thoughts and feelings that arise from the selected image(s). Patients, employees, and management discuss these thoughts and feelings with each other.

Photo Voice in practice: an example

Photovoice has now been used several times within VNN, with various groups of patients. Inspiring projects in which patients are challenged to give their voice through

Figure 30. Dirt and memories on the street. Photo by Rutger, client VNN.

photographs. Photovoice, for example, has been used in FACT care. FACT care supports people who often have problems in almost all areas of life, such as housing, finance, work, relationships, and health, often combined with psychiatric and/or addiction problems. There is also often care offered without the clear consent of the person ('meddling' care). A FACT team supports each client to rebuild a meaningful and stable life with the disorder. This often happens close to the client: at home, in the shelter, in the clinic, but sometimes also on the street. The support is tailored to the client's needs as much as possible.

Within this setting, Photovoice was tried out. The participants came from Groningen and had a long history with the FACT team there. At the beginning they were asked to write a sentence that related to themselves and their lives. This sentence could be used as a guideline for the photographs. The assignment was deliberately used so vaguely and unclearly to prevent it from becoming an assignment with possibly 'standard' answers. The participants took their lives, as a starting point. It was about equality and dialogue. The aim was not to 'help' the other person or to offer 'a meaningful or pleasant activity', but to give a voice to the client. The relationship during the Photovoice assignment was different from a counselling relationship, which is more characterised by interdependence and inequality of power. It also appeared that there was now more room for the not rational aspects of the quality experience, such as images, emotions, and intuition.

There was a strong commitment and enthusiasm among the participants. This enthusiasm did not automatically translate into presence; the supervisor of the photovoice process

was constantly in contact with the participants. The participants were visited at home,

Figure 31. Alarm! That was shaking me. Photo by Coenraad, client VNN.

picked up at home or the photos were selected at their homes. During this contact, sometimes characterised by drug use or panic attacks, the photos were discussed and what they meant to the participants.

It was nice to see that between the first photo and the final exhibition, the language and the relationship between the supervisors and patients changed. From dialogue and as a fellow inhabitant of the world with an interest in the other and in what is going on around us and in our lives.

Once the photos were ready, a photo exhibition was organised. A nice conclusion to a process in which the participants were proud of their photos and at the same time were vulnerable. This was followed by a dialogue with professionals of VNN, employees of the Municipality of Groningen, social workers, probation workers and employees of the mental health service. The photo exhibition was the main topic and formed the starting point for the discussion. The meeting yielded various points of view; the form of the dialogue and the exhibition triggered a conversation that gave more insight into each other's interests and motives. One conclusion was that 'Addiction care may not only be about the use of drugs'. An employee of the municipality of Groningen was touched by the impact of his decisions, which became visible through the photographs and the conversation. One of the photographers did not say very much but said that the form had allowed her to speak anyway.

After the dialogue, the outcome was shared with the team of professionals and the manager. They adopted several recommendations, such as, more focus on the person behind the addiction. Parts of the organisation and methods were improved. For example, the planning of treatment activities and home visits, the basic attitude of the care workers had to become more people-oriented and less methodical (rational) and more room for customisation. Instead of the client having to follow the treatment program, the staff members had to follow the client more. This meant a new, different design of the care organisation and improvements in the supply, the treatment of the patient. An exhibition was also set up at the location so that more employees and other

teams could become acquainted with the images and results. The effect was that other departments also wanted to organise a Photo Voice session, to enter into dialogue with each other and to learn from it.

Subsequently, the exhibition was moved externally to the Oranjebuurt in Groningen, part of the Tegenlicht Meetup. A nationwide podium for art and dialogue. At this meet up the exhibition triggered a conversation about stigma in the neighbourhood. This shifted the dialogue and learning from each other to a social context. It made the subject of addiction part of the discussion with visitors through the expert by experience and therefore contributes to the normalisation and de-stigmatisation of the subject. During the Photo Voice process a report is made of each step. This makes this method also suitable for students. Students can support, observe, and take care of a report that results in improvements in the organisations or the implementation and products.

Learning and research in health care and education: parallel processes?
Just as in the health care sector, the (higher) education sector is constantly looking for new methods and new forms of learning. It is important that (higher) education students

Are ready for and able to keep up with a rapidly changing world. Innovative power and flexibility are expected working in the professional field. In addition, students, as future professionals, must be able to respond quickly to the demands of the work field. Partly for this reason, NHL-Stenden has introduced a new educational model called 'Design-Based Education' (Puente, Van Eijck and Jochems, 2013).

According to the founders of Design-Based Learning (DBL) (Feng and Hannafin, 2017), Design-Based Learning replaces the classical education in which the instructor is the expert. In this new method, the instructor is primarily a coach, the facilitator who supports a process of divergence, an open, creative, and sometimes even chaotic process that moves towards solutions through convergence. DBL is about learning by trying and doing. Feedback, evaluation, reflection, and adjustment are important parts of DBL. It is therefore closely linked to the cycle of quality that is used within the education sector, of which these four steps are a part. Here we also see the parallel process with care, which has this same cycle of quality, with plan, do, check, and act.

Photo Voice DBL and DBR
The interesting thing is that the cycle that DBL and DBR runs through is almost equal to the DBL cycle. You start on an open one, ask the way. It works based on trying and making mistakes towards a final product. The route to that is dialogue, reflection, and evaluation. Each time the open, creative space is searched for. A space that is not only filled rationally, but also with emotions and space demands for intuitive and the conversation about meaning.

Photo Voice is not only suitable for organisations to improve their quality, students who participate, but also for researchers. And especially researchers who want to do research among vulnerable people who have a less rational attitude and will for example have difficulty completing a questionnaire. Also, researchers who are interested in the more emotional, meaningful, intuitive side of the quality of care. Because people can provide more data than just rational explanations or scores. Improving to better designs, services or products in healthcare is often about the experience, experience and meaning one can give to them. This means that you start in an open way, there is an uncertainty. You don't know the outcome yet, maybe only the direction. But even that is not yet fixed in DBL and DBR.

After all, the DBL and DBR process also starts with an open question and therefore a certain degree of uncertainty. Images and thoughts within the group about the issue are gradually emerging. Photovoice could then be used to make these images literally concrete and to interpret the thoughts. Then a certain degree of pattern recognition and order is created, and the design is given more direction and focus. As in the practical example from Photovoice, you can experiment together to eventually arrive at a design or an answer to a question. The following figure illustrates this process.

We would therefore argue that Photo Voice should not only be used as a method of reflection, evaluation, learning and research in healthcare. It could also get a place within the DBL of DBR methodology where possible and appropriate. It has been and is being tested on a small scale in secondary and higher education (Oden, 2013).

The embedding of Photo Voice within the DBL or DBR therefore contributes to improving the quality of care. Not only patients, but also managers and professionals are involved
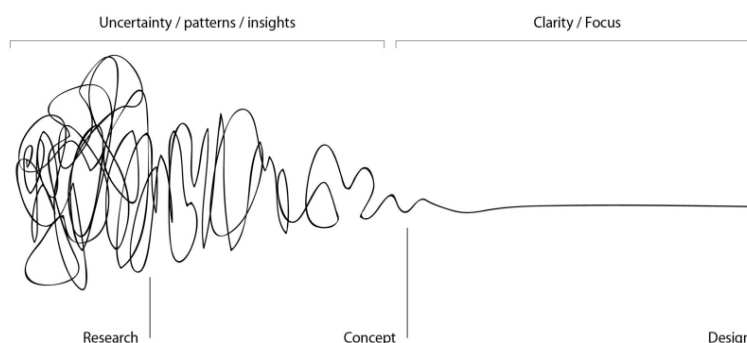

Figure 32. How the process of divergence and convergence progresses towards a clear final design, or solution direction for a problem or problem. Source: https://www.nro.nl/wp-content/uploads/2018/04/NRO-onderzoeksverslag-Platoolab-FINAL-v2.pdf.

in this approach. Photo Voice in combination with DBL and DBR can contribute to the learning organisation that can strengthen the quality of organizing and execution. It also contributes to learning to reflect and evaluate students and provides rich, qualitative data for researchers. It also contributes to learning to reflect and evaluate students and provides rich, qualitative data for researchers. It is for these reasons that members of the research group at NHL Stenden University of Applied Sciences, Leadership and Change Management, gratefully use Photo Voice.

Section 5 Reflections and conclusions

Chapter 17

Epilogue: Stepping into DBE

Migchiel van Diggelen

Stepping into DBE tells the story of NHL Stenden University of Applied Sciences, which has implemented Design Based Education throughout the university. The initiators of this book together with all the authors have succeeded in presenting a beautiful colour palette of DBE experiences. For me, this colour palette speaks of the innovative nature of Design Based Education. The book helps to put the new educational concept DBE of NHL Stenden UAS in the spotlights and to give a stage to all those enthusiastic and committed pioneers who have done their best to give DBE hands and feet. The book reads like a search for what DBE is, can be, and how this can be realised. In my experience, this is a search that teachers also experience in their daily practice. That is precisely why I found the book valuable and striking. But I would also like to say straight away that I think it is a very valuable search that offers NHL Stenden UAS with a beautiful educational concept with a lot of potential.

The quote of Geitz and colleagues (2021) from chapter 16 sums up the story nicely for me:

> "Stepping into DBE has meant, for the authors in this volume, developing education from a vision of education and an educational concept derived from it. The contributions by the authors have shown that this vision has guided the actual implementation of the educational concept and that the instructor has a crucial role in this. It is important that there is coherence and that all components are inseparable, also referred to as constructive alignment. From the roots, a tree grows in all its diversity and colour."

The quote identifies some ingredients for powerful education and for successful implementation of DBE, namely: a vision, constructive alignment, and the crucial role of the teacher. These ingredients are an important starting point to strengthen the further development of DBE. The implementation of DBE may rightfully be called a large-scale educational innovation. It is not easy to make large-scale educational innovations successful. Linking research to educational innovations is an important precondition for sustainable implementation of DBE.

In this epilogue, I outline some potential directions for research into DBE. I build on the content of the book and my first experiences as Professor of Design Based Education at NHL Stenden UAS. The research directions are linked to two related objectives: 1. enriching the conceptual embedding of DBE and applying the concepts in dedicated research to strengthen the implementation of DBE, and 2) contributing to the further development of DBE. For the sake of completeness, I would like to indicate that, in line with Design Thinking, the outlined research directions are mainly ideas and frames that need to be explored, tested, made concrete and that reflection both within and across frames is required. Before addressing the two aforementioned goals, and presenting possible directions for research, I briefly discuss the vision and rationale for DBE.

Vision or rationale

The DBE concept is a curriculum-wide plan for learning (Van den Akker, et al., 2003). This means that a well thought-out and coherent concept must be developed for the whole institute. Typically, a curriculum starts from a clear vision that provides the curriculum with a rationale (Van den Akker et al., 2003; Visscher-Voerman, 2018). In my view, the DBE concept has a clear, rational, and strong vision anchored in contemporary learning theories (Geitz and De Geus, 2019). Parts of this vision are clearly described by Geitz et al. (2021) in Chapter-1. In addition, DBE as an educational concept seems to be future proof because of its firm embedding in societal trends as becomes clear while reading the book (e.g., Benhadda and Loosekoot, 2021; Blom and Struik, 2021; Coelen, 2021; Geitz et al., 2021; Joore et al., 2021). I will mention a few trends that have already been mentioned/discussed elsewhere in this contribution, namely:

- Greater interweaving of professional and school contexts in which work, and learning take place, greater interweaving of formal and informal forms of learning
- Increased complexity of situations that demand innovative solutions that transcend a discipline
- Increased relevance of taking responsibility for the well-being of the individual and the collective
- Increased relevance of self-direction and taking responsibility for lifelong development, and finally
- Recognition of designing as a generic and relevant 21st century skill.

In my opinion, the last trend is hardly, if at all, emphasised and highlighted within DBE. This is a bit odd because you have a nice double loop here. It is something that DBE educates for, but it is also something that DBE has in itself. It provides NHL Stenden UAS with a unique profile. To my knowledge, NHL Stenden UAS is the first institute (focused on all domains) to implement design-based learning institute-wide and across all domains. DBE has the potential to provide graduates with a distinctive, recognisable, and future proof profile fitting the demands of industry and the 21st-century. To further realise this potential, the introduction of new theoretical concepts to enrich the rationale and conceptual embedding of DBE may be helpful.

Ambition 1: Enriching and strengthening the theoretical foundation of DBE

As mentioned, the educational concept of DBE has a clear rationale and strong vision embedded in contemporary learning theories. DBE therefore has a strong conceptual embedding. At the same time, it is questionable whether the learning theories can provide a conceptual basis for all aspects of DBE, whether the formulated learning principles are sufficient for getting a grip on and understanding all learning processes at play and whether they provide sufficient guidance for optimal design, coaching, and assessment of student learning (environments) in DBE education. Geitz and De Geus (2019) name several principles that underpin DBE. I would suggest adding a principle for design-based learning. In this design-based learning, I feel, lies a very important distinguishing component of the educational concept and a crucial link to the ambition of NHL Stenden UAS. The ambition is to support and/or challenge students to become enterprising, resourceful professionals who are self-aware and who have learned to look beyond the boundaries of the field and national borders (NHL Stenden, 2019). To realise this ambition, it is necessary to understand learning processes involved in learning to design and the associated didactics. Introducing new concepts can help to capture, interpret, and investigate the implicit learning and guiding processes that take place within DBE. The knowledge generated from this, together with new knowledge, can then focus the attention of educational professionals on these implicit learning and guidance

processes and thus become the subject of educational design, guidance and assessment and be used to optimise these activities. There are several options to underscore a principle for design-based learning.

Option 1. Design-based learning: the introduction of abduction

A first option for strengthening the theoretical foundation of DBE is related to the specificity of design and my assumption that classical (instructional) theories do not sufficiently capture the uniqueness of design and design-based learning. Most instructional theories are based on the distinction between inductive and deductive teaching or combinations of both (Van Merrienboer and Kirschner, 2017). In short, and somewhat black and white, inductive education is about abstracting rules and knowledge from examples and experiences and deductive education is about offering clear and more generic frameworks that students must translate into specific situations. Both forms of teaching are based on their own style of reasoning: inductive and deductive reasoning. Both inductive and deductive teaching, and hybrid forms in between, can be found in DBE. Blom and Struik (2021) also conclude in Chapter-4 that implicit choices of professorships for a design strategy go back to epistemological principles about going inductive or deductive. But, informed by insights from the design disciplines, my assumption is that inductive and deductive reasoning and inductive and deductive teaching and mixtures do not capture the uniqueness of DBE. Against this background, I would like to introduce the term abduction (Dorst, 2011).

Abduction is a term that was introduced in the design disciplines in the 1970s (Luckman, 1967; March, 1976). In educational theory, however, this term has not yet gained a great deal of fame and a firm foothold. The term abduction is often used in the design disciplines in the context of the concept of Design Thinking and is essentially about how designers deal with the many uncertainties and unknowns that they face during an open design process. WHAT the product of a design should be is unknown and HOW the design process should be organised is also unknown. The desired situation is unknown and so is the road towards it. Moreover, all kinds of stakeholders have their own images and expectations about a design. In this context, designers use abduction. Abduction can be seen as a form of reasoning that is applied when there are multiple explanations for design problems. From these explanations you choose the one with the most value for practice (Stompff, 2020). The introduction of the concept of abduction thus provides a new style of reasoning alongside existing styles of induction and deduction to build instructional theory upon. Theory that may inform the further implementation of DBE. Research can help to gain insight into how this reasoning style is implemented in the context of design and can therefore help to shed new light on learning to design. Exploring 'abduction' within design education, may help gaining an understanding of the processes involved and translate this understanding into implications for designing, coaching, and assessing learning (environments) within DBE from an educational perspective.

Option 2. Designing in the creative and design disciplines: introducing the studio-model

A second option to strengthen the theoretical basis of DBE relates to knowledge that is present within the creative and design disciplines about designing and design didactics. In the classical design disciplines there is, for example, more reference to the work of Schön (1983). The author is widely cited in literature that writes about the so-called studio model (e.g., Lahti et al., 2016; Sawyer, 2018). Sawyer (2018) concretised the studio model through interviews and observations with teachers from the arts and design sciences. According to Sawyer (2018), the primary goal of the studio model is to develop the capacity of students to successfully achieve creative output on an ongoing basis. This

goal is realised in a community of practice where creativity is seen as a process and way of working in which ideas, themes and concepts develop in dialogue with stakeholders and especially prototypes. In this studio model, students are also taught discipline-specific learning outcomes. But these specific learning outcomes are in the service of the creative process and are assumed to be most effective when placed within a process of continuous creative process. Important elements of such a model are learning to experiment and learning to see failure as inherent to the creative process. The studio model confirms findings of Reedijk et al. (2021) who write in their chapter about the faith factor and creative confidence. Also, the model coincides with what Blom and Struik (2021) describe in their chapter as the creative leap. The studio model may provide direction for research to gain insight in this creative leap and derive implications for teachers on how to support students in dealing with this creative leap. Moreover, the studio model seems to align well with the mission of NHLStenden UAS (NHL Stenden, 2019). The plea here is certainly not to adopt the aforementioned model unchanged. In line with the line of reasoning and findings of Blom and Struik (2021) in their chapter on situationally developed design processes my suggestion would be to explore the extent to which the model is recognised and useful in sectors where creativity occupies a less prominent place.

Within the context of DBE, the studio model can be supportive in providing education in studios with a conceptual embedding and vision. More in general, given the richness of manifestations of Ateliers within DBE, it seems useful to develop a model for Ateliers. Gomez-Puente et al. (2013) have developed a model for design education based on a review study. This model includes project characteristics, design elements, the role of the teacher and student, and assessment. From the perspective of curriculum theory, however, the model offers too little support for further development of education. For this reason, the model of Gomez-Puente et al. (2013) was combined with a curriculum model by Van den Akker (1999), the spider web model and the DBE model (as described in Geitz and de Geus, 2019).Figure 33 shows the Atelier model (from an educational perspective). The framework provides a set of important elements for instructional situations in Ateliers. Elements that could be the subject of further research.
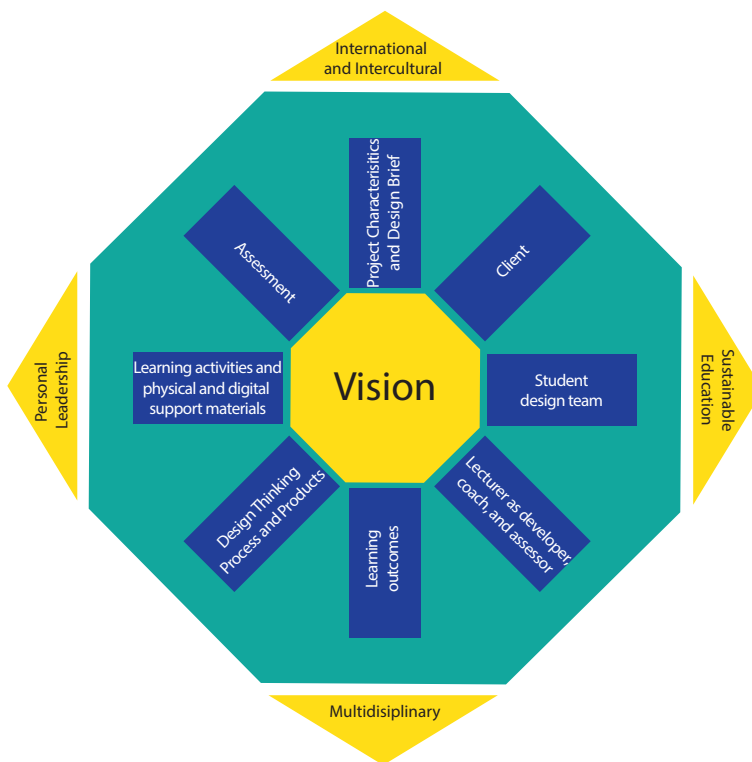
Figure 33. A model of an atelier. Development based on Geitz and de Geus, (2019), Gomez-Puente et al. (2013), and Van den Akker (1999).

The model presented in Figure 33 can be seen as a first prototype. Further iterations are needed. The model, for example, does not yet adequately represent the world of work. For this purpose, I suggest using the concept of hybrid learning environments.

Option 3. Designing in hybrid learning environments
Introducing the concept of Hybrid Learning environments for strengthening the implementation of DBE with new theoretical concepts fits well with a conclusion of Benhadda and Losekoot (2021) in chapter 7. These authors state (p. 41):

> *"What DBE provides the opportunity for is to bring more of the industry to the classroom earlier on. The flexibility of using real-life projects and challenges in the classroom and gaining feedback from practitioners provides a priceless feedback loop not just to staff but also to students."*

This quote elegantly phrases the added value of DBE in terms of the industry/world of work perspective.

The model of hybrid learning environments offers useful starting points for further theorisation of the learning environment. The idea is that a review of the relationship between school and work in DBE is necessary for educating agile professionals and

citizens who can continue to learn throughout their lives. This assumes the development of an integrated, applicable, and up-to-date knowledge base in which students integrate different types of knowledge acquired in different contexts (Schaap et al., 2011). The development of an integrated knowledge base requires different kinds of learning environments that blur the transition from school to professional practice and narrow the gap (Baartman and De Bruijn, 2011). These learning environments go beyond combining school (experiences) and work (experiences). It is about consciously and coherently designing learning environments that can naturally intertwine both environments: hybrid learning environments. Hybrid learning environments make the professional process central to student learning.

The model by Zitter and Hoeve (2012, see) is often used to characterise hybrid learning environments. The model has two dimensions. The first dimension deals with two extreme forms of learning: acquisition and participation. Acquisition involves the acquisition of explicit knowledge (theory). Participation is about being immersed and participating in a learning community, the future professional practice. The second dimension is situated between two extreme contexts of learning: constructed or realistic circumstances. In constructed circumstances, the professional setting is absent. Realistic circumstances are about work-integrated learning.

Combining these two dimensions results in four quadrants of a hybrid learning environment (Zitter and Hoeve, 2012):

- Quadrant 1 (top left): Constructed Acquisition. In this quadrant, knowledge and skills are woven together independently of the professional process. This may involve an expert session or lecture.
- Quadrant 2 (top right): Realistic Acquisition. This quadrant deals with situations in which the acquisition of practical knowledge is central and is either made explicit or developed. Learning from experience and through reflection plays a major role here. An example is carrying out a design project in a workshop.
- Quadrant 3 (bottom left): Constructed participation: In this quadrant, learning takes place from learning situations with a strong authentic component. An example is a simulation.
- Quadrant 4 (bottom right): Realistic participation. This quadrant is about learning by doing. In fact, learning as working. This may involve a design project at a company or an internship.

The idea is that the optimal development of learning environments requires the optimal intertwining of all four quadrants. Although the model is not specifically reserved for DBE, it can be helpful to recognise that different settings within DBE can be valuable if they are appropriately designed and coordinated. The latter raises important questions. What does each setting require from DBE? How do you optimally organise the coordination between different settings within DBE? It may be interesting to explore what DBE looks like in each of the four quadrants. Maybe ateliers within DBE can also be categorised according to the dimensions? What does DBE require from each setting?
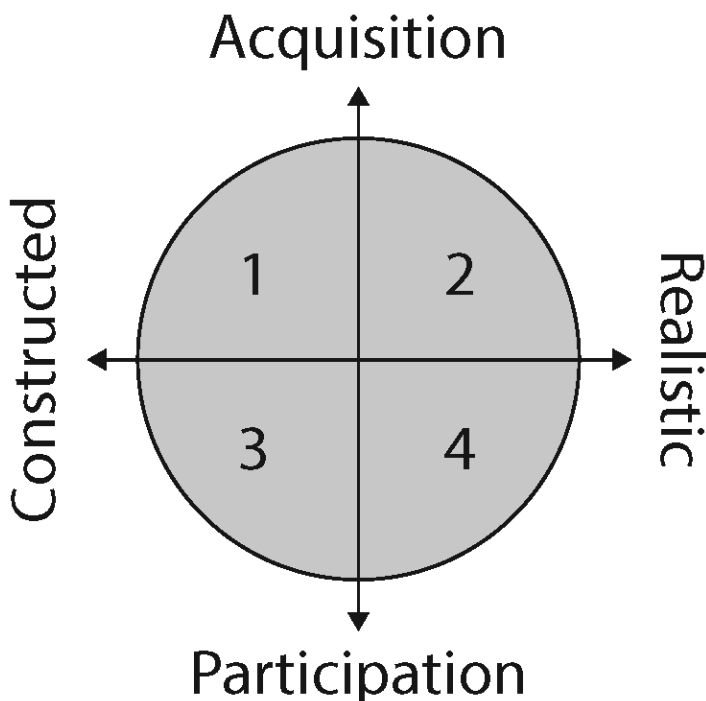

Figure 34. Model of hybrid learning environments (adapted from: Zitter and Hoeve, 2012).

In addition to strengthening the theoretical foundation of DBE, research can also directly focus on the further development of DBE practice without touching upon new concepts.

Ambition 2: Further development of DBE

Initiate dialogue between the vision of DBE and the views of lecturers

In the introduction of this book, Coelen et al. (2021) mention that designing education in a trialogical process with students, staff and the work field leads to learning for all stakeholders as a key message of the book. In Chapter 4, Assen and Otting (2021) emphasise the importance of realizing a shared vision and stress the importance of (inquisitive)dialogue, collective action, and reflection. Phrased in my own words, Assen and Otting (2021) conclude that more (inquisitive) dialogue between teachers, and collective learning is needed to establish a shared vision and to further the implementation of DBE. The conclusion of Assen and Otting (2021) is in line with what is generally stated in educational innovation literature. For educational innovations to succeed, it is important that, in addition to developing specific knowledge and implementing skills, the views of lecturers are also considered (Thurlings and Van Diggelen, 2021; Trigwell et al., 1994; Verloop et al., 2001). Teachers' views on Design Based Education (DBE) form an important basis for the implementation of the formulated principles of DBE. A large proportion of educational innovations are not successful because instructors continue to cling to or return to old routines (Verloop et al., 2001). Awareness of the influence of instructors' views on educational practice and educational innovation is relatively recent, and various studies show that to bring about changes in educational practice, instructors' views must be taken as the starting point (Birman et al., 2000; Hawley and Valli, 1999). In my opinion, this also applies to the further development of DBE. This does not mean that teachers' views should be the standard of educational development, but they should, in my opinion, be the starting point for successful development through interventions and innovations (Brand-Gruwel et al., 2019; Verloop et al., 2001). In the context of DBE implementation, the foregoing could mean that insight needs to be gained into teachers' views on the important facets of DBE and guidance within it. This brings us to the role of the teacher.

The role of the teacher

The teacher is crucial when it comes to the quality of education (Hattie, 2009; 2013). When it comes to the quality of DBE, the coach is crucial. However, Benhadda and Losekoot (2021) found that teachers do not know what is expected of them. I have made similar observations. Many teachers of NHLStenden UAS seem to struggle with their coaching role and to experience difficulties in realizing powerful coaching. This bears a strong resemblance to what is known about coaching student learning from literature.

(Assen, 2018; Van Diggelen et al., 2013; Van Diggelen et al., 2020). We know from research that many instructors from various sectors find it difficult to switch from more teacher-oriented to student-oriented roles (e.g., Assen, 2018; Van Diggelen, et al., 2013) and to realise powerful coaching (Assen, 2018; Ketelaar et al., 2013; Van Diggelen et al., 2013). Coaching is a complex skill. Teachers generally find it difficult to start a conversation, to give the student the space and responsibility and not to take over too quickly (Van Diggelen et al. 2020). Dealing with uncertainty is a crucial skill for a coach and it is precisely this that many teachers find difficult and uncomfortable. This fuels the tendency to fall into sending. The openness and uncertainty inherent in learning in design-based learning reinforces the above (Van Diggelen et al. 2021). So, it is understandable that many teachers involved in DBE struggle with their role as coach and feel the need for more support.

One way of helping teachers to develop their coaching skills is professionalization (Van Diggelen, 2013). The question then, however, is what the content of professionalisation

should be and how professionalisation can be organised. The book offers nice examples of how professionalization can be arranged. Giessen et al. (2021) wrote a chapter about designing an interdisciplinary minor and demonstrate how elements of Design-Based Research and Education can help when developing a new course and fostering a new collaboration between research groups. The authors use a 'practice what you preach' approach. This can be very useful. Especially with respect to designing learning environments but also with respect to, for example, designing (series of) coaching sessions. In addition to practice what you preach, Assen and Otting (2021) emphasise the importance of collective learning via inquisitive dialogue, shared vision forming, collective action, and collective evaluation and reflection. Both examples adhere to what literature states as characteristics of effective professional development. The practice what you preach principle present in the work of Giessen et al. (2021) reflects the characteristic of practice-orientedness (Supovitz and Turner, 2000) and being connected to issues teachers are confronted with in their daily practice. In doing so, it assures that the characteristic of foreseeing in teachers needs and learning preferences is also met (Day, 1999). The work of Assen and Otting (2021) reflects the characteristic of collaborative learning emphasizing the need for interaction and exchange with colleagues (Wilson and Berne, 1999) and characteristic of meaning making through reflection (Smith and Gillespie, 2007). An important characteristic that has not been (explicitly) dealt with is offering repeated and longitudinal support (Smith and Gillespie, 2007). So, the book Stepping into DBE provides useful examples of professional development approaches that adhere to many characteristics of effective professional development.

Next to how professional development should be designed it needs to be decided what the content of professional development approaches should be. Also, it should be established whether the content can be practice-driven based on the expertise and wisdom of the teachers and/or internal trainers or that a more theory-driven approach is needed. Oftentimes, a theory-driven approach is opted for when expertise is not available within the community and needs to be found externally (Vermeulen, 2016). To this end, I believe it is important to make more explicit what knowledge (and skills) teachers need to realise powerful coaching in design-based education. For this purpose, a conceptual model can be helpful.

In line with the T-PACK model (Koehler and Mishra, 2009), we could speak of the D-PACK model. As becomes apparent from Figure-28 the D-Pack model consists of the elements of pedagogical knowledge (PK), content knowledge (CK) and design knowledge (DK).
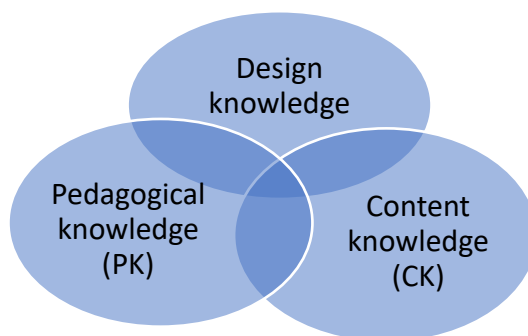

Figure 35. D-Pack model (based on T-Pack model, Koehler and Mishra, 2009).

Content Knowledge (CK) includes the central facts, concepts, theories, and procedures of a particular subject area, but also knowledge of how the subject area is expanding. Pedagogical Knowledge (PK) includes the way in which pupils learn, their (mis)conceptions, use of teaching aids, evaluation of learning, class management, lesson preparation and implementation. Design knowledge (DK) is about knowledge of design. This entails knowledge of, for example, design and/or research processes, strategies, tools, and techniques to be used in the design (research) process, design (research) models to structure the design process and motives for decision making. The starting point for such a model would then be that separate knowledge of subject content, pedagogy and design is not enough. Instead, the trick is to develop an understanding of the relationship between these components and that adequate coaching is then about adequately balancing these components. Research could then focus on making the contents of the cells more concrete and especially on mapping out the overlapping areas. These contents could then be addressed in Professionalisation.

In conclusion

There are two purposes for research on DBE addressed in this epilogue. Firstly, to introduce new concepts to strengthen the rationale and conceptual embedding of DBE and use these concepts to perform research. Secondly, to further develop DBE by, for example, making the role of the teachers informed by research concrete and use it as a basis for professionalization. Obviously, more objectives can be distinguished. For example, research can focus on monitoring the efficiency and effectiveness of DBE. Addressing such an objective would contribute to setting the next steps into DBE. Next steps that can only be taken by building on the great work of all those colleagues at NHL

Stenden UAS involved in the implementation of DBE. It remains to be said that, though, Rome was not built in a day. Related educational concepts such as Problem-Based Learning have established educational and research traditions but took years to develop. DBE is new, distinctive and, in my view, deserves such traditions. It would be great if a start can be made with developing these traditions at NHL Stenden UAS.

Chapter 18

Conclusions

Anouk Donker, Hanneke Assen, Gerry Geitz, and Robert Coelen

The merger of two universities of applied sciences, NHL and Stenden, ushered in an inspiring and challenging period for lecturers and students. Both universities of applied sciences had a rich history in Competence-Based Education as well as Problem-Based Learning. The merger was the moment to re-evaluate and further develop the education. The new university (NHL Stenden University of Applied Sciences) developed a novel educational concept, in which the best of both antecedental education approaches was transformed into Design-Based Education. This novel educational concept places both the student and the professional field at the centre. The complex issues in the field and society at large mostly require a multidisciplinary and design-oriented approach. The learning environments of all study programmes have recently been redesigned to fit this new concept.

The design and development of a new educational concept, in which the trialogue between students, lecturers, and the professional field plays an important role, has proven to be quite challenging and demands a lot of energy. The process of designing a new innovative educational concept, on a university-wide scale, is a wonderful opportunity but also comes with challenges. Especially when you keep in mind that educational delivery had to continue. An additional and significant challenge was the COVID-19 pandemic that forced closure of our buildings. The consequent necessary transition to online education took much additional time and effort from the lecturers. The transition immediately raised issues regarding the still fledgling educational concept of DBE. All in all, we found ourselves in a unique situation in recent years. A situation in which all those involved were asked to participate and embrace a new educational concept.

All stakeholders were asked to think carefully about what we want to achieve with DBE and with which learning outcomes, educational forms, tests, processes this could be achieved. Meanwhile, all programmes have started with this process. From the stories in the various chapters, we can conclude that programmes, students, instructors, and professionals in the field have tackled this task with great energy. It becomes clear that to design innovative education, it is important that the underlying vision and the corresponding learning principles are clear to everyone. Educational design and didactic choices must obviously be in line with the vision on education, also called constructive alignment. Last (2015) aptly describes and illustrates this using the example of a tree: "Think of the whole of an educational design as a tree, with the educational philosophy based on learning theories as the roots, growing into a solid vision as the trunk, from which the learning and design principles branch out, and finally the leaves stand for the didactic techniques. But if one only looks at the leaves, the fundamental levels of education are skipped." Stepping into DBE provides an inspiring insight into the steps taken by various programmes and research groups during this process. How, sometimes by trial and error, new curricula have been developed and research methods applied. The contributions of the authors are diverse, and all parts of the development process are illuminated from a different focus, e.g., the metaphor of the tree. In other words, the

chapters cover all relevant aspects that are important when developing and implementing a new educational concept, from root to leaf.

The vision of education and the associated educational theories are clearly described in Chapter 1 by Geitz and colleagues. The roots of the tree, the foundations of DBE and the ingredients needed to make the tree grow are discussed in detail in this chapter. What is intended by DBE education is the starting point in this contribution. The authors also show that education and learning environments have multiple layers. In the metaphor of the tree, this means that ultimately it is always about the entire tree and not, for example, about the leaves. Coelen (Chapter 2) looks at how DBE might prepare those that leave the tree for a world of work. Joore et al. (Chapter 8) emphasise that an educational philosophy affects many levels. A transformation requires a holistic approach. For example, for a good implementation of DBE, among other things, changes to the building are needed, organisational processes need to be adapted, but changes are also needed at the policy level. The authors recommend using the Multilevel Design Model for Education. Dijkstra's contribution (Chapter 14) starts by positioning DBE in a technical education context and thus offers insights into how the educational concept of DBE can be effectively linked to the specific characteristics of the technical work field and the approaches used there. Dijkstra shows that iterative and linear work can be complementary and do not exclude each other. The uniqueness of the design is well illustrated in this contribution; the foundation, the roots are the same, the appearance can vary.

At lecturer level, Assen and Otting (Chapter 3) show that collective lecturer learning is a condition for designing and implementing the DBE educational concept. They observe that lecturers have enthusiastically started designing and developing DBE but that in the study programmes studied, a shared vision of DBE is not yet entirely clear to everyone. Lecturers miss the dialogue about the vision, and this is reflected in the didactic choices that are made. Van Ree (Chapter 6) and Van der Giessen et al. (Chapter 5) on the other hand, show that collective learning does take place in other ways. They emphasise that by going through the steps of DBE themselves and using DBR, lecturers learn collectively. It turns out to be a valuable way of developing a shared vision. Just like Benhadda and Losekoot (Chapter 7), they speak of the teach as you preach principle. Benhadda and Losekoot add an international level to this, the influence of culture on the development of DBE. Reedijk et al. (Chapter 12) emphasise that the instructor is "the key" to the success or failure of DBE. It appears that if lecturers go through the steps of design thinking during curriculum development, they are better able to facilitate the students during the DBE learning process. Not only the design process, but also the new role of the lecturer in this curriculum and the effects on students are described in the first experiences with DBE. From the vision on DBE, the trunk and branches of DBE are designed in a systematic way.

Torensma and Boonstra (Chapter 9) focus on the (crucial) role of the lecturer. They start from the educational concept of DBE as an open system in which learning takes place and then, based on Illeris's (2016) model of learning dimensions and social capital theory, look at the three mediating roles of the instructors in DBE. Attention will also be paid to the interaction, the dialogue, between all those involved in the learning process: the instructor, the student, and 'stakeholders', i.e., society or, more specifically, the professional field for which students are being educated. Based on case studies within the CMD study programme and the X-Honours programme, it is made concrete what these interactions could look like. The most important conclusion is that the instructor should be able to fulfil all three roles to make DBE a success. Van der Meer (Chapter 10) describes the experiences of lecturers who were involved in the design process of their course. The focus is on their experiences, emotions and meaning of the transition to DBE;

the focus is on the undercurrent of the change process. Using a metaphor, a story of a journey is told. A journey of lecturers in development towards their new role, with all the challenges and lessons they encounter along the way. This story shows that the foundations of DBE, the roots, nurture the lecturers.

The importance of students developing the skill of dialogue as early career practitioners is central to Rietveld and Waalkens' contribution (Chapter 13). The authors share their lessons learned regarding the role of lecturers in stimulating self-regulation and interdisciplinary cooperation among students in a DBE environment. The authors describe that students find mutual communication crucial for success. For example, students indicated that communication with fellow students was essential to the success of their project. The development of their communication skills appeared to be necessary, because being able to have a dialogue and show empathy helps to discover the needs and expectations of the stakeholders. In their contribution, De Jager and Themmen (Chapter 14) make it clear that it is necessary to have constructive alignment within the DBE curriculum. They describe how you can ensure that the assessment is in line with the objectives that you want to achieve. With its method of testing in the first year, the study programme has managed to create a testing and feedback culture aimed at growth, in which a large degree of self-direction in the student's own learning process is achieved by means of formative interim evaluations of knowledge and of the professional development of the student as a starting professional practitioner. This shows that, in the metaphor of the tree, the branches and the leaves of the tree must be in line with the trunk and the roots.

Günther and colleagues (Chapter 11) describe how researchers, together with students from teacher training colleges, conduct research into multilingualism in education (i.e., the field). Involving the students in the research and working on authentic questions from the educational practice ensures a rich and varied learning outcome for all involved; students learn to conduct research, schools learn about multilingualism, and the researchers about shaping this process through a methodology appropriate to DBE. Anthonio et al. (Chapter 16) also make the importance of using methodologies clear in their contribution. They describe the qualitative research method Photo Voice and the way in which this method can give a powerful impulse to the process steps as they are taken within DBE. The use of visualisations and dialogues about them, creatively associating, has the potential to enrich the DBE process. Analogous to the tree, we see in these contributions a translation from vision to implementation in learning or in this case research principles, and the use of different tools.

For the authors of this volume, "Stepping into DBE" has meant developing education from a vision of education and an educational concept derived from that vision. The authors' contributions have shown that this vision has guided the actual implementation of the educational concept and that the instructor has a crucial role in this. It is important that there is coherence and that all components are inseparable, also referred to as constructive alignment. From the roots, a tree grows in all its diversity and colour.

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Stepping into Design-Based Education

This book provides insight into an ambitious project to re-invent the educational method practiced at our institution. The predecessors used different approaches to the delivery of education. One of them used Competency-Based Education, whilst the other practiced Problem-Based Learning. The choice to combine the advantages of both methods, as well as to develop an entirely new concept that provided a better response to the fast and ever-increasing pace of changes in the workplace, was made by both institutions together. This approach was called Design-Based Education (DBE).

Given the significant changes required of stakeholders to facilitate learning according to the new DBE approach, it is important to take stock of what these changes mean in terms of teaching and learning and to ascertain from early steps how everybody can stay, or step, on board. The ultimate litmus test for this new method is of course how our graduates perform.

DBE has its origins in Design Thinking and blends this with problem-based and competence-based learning as practiced at the predecessor institutes of NHL Stenden UAS. The aim of the multi-layered DBE concept is to create sustainable education with an environment where effective, efficient, and ambitious learning processes are stimulated that challenge our students to develop their talents and create unique profiles. The concept of DBE not only stimulates our students to learn, but also empowers our lecturers and the associated professional field to combine with them in a trialogic learning process creating social value, the development of metacognitive skills, and multidisciplinary collaboration and knowledge.