Evidence-based blended and online learning: course design for university teachers

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Evidence-Based Blended and Online Learning

Course Design for University Teachers

Jan Nedermeijer

BRILL

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Course Design for University Teachers

By

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BRILL

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Acknowledgements

The courses and workshops that I designed and presented in different countries for PUM Netherlands senior experts after my retirement helped me look for an answer to the question of how we can combine technical design features, the various developments in course design, learning psychology, complex problem solving and creativity with the course design approach of Tony Earl. I thank the universities involved and the participants in Indonesia, Haiti, Ghana and Nepal. I thank the Indonesian co-trainers for following my courses and giving feedback. Of course, I thank PUM for allowing me to play my role as a course designer again. In addition, I would like to thank Caddy and Harriet Earl for permitting me to use the digital version of the book *Art and Craft Design* by their father, Tony Earl (1987). Parts of Tony Earl's book are included in my book to show his approach.

I have attempted to elaborate on and introduce the findings from new research on course design and use them for this book on evidence-based course design. While preparing my book, as a guest lecturer, I was able to use the facilities of ICLON (Leiden University, the Netherlands). I wish to thank the following persons for the time and effort they dedicated to commenting on the various versions of my book. Pierre van Eijl and Ans Ronduite helped me focus on my main question. Marie-Jose Verkroost has given me her professional opinion. Albert Visser gave his opinions based on his PUM experiences in his courses on blended learning. We organised a course in Ghana together; this resulted in a higher-quality course. Prof. Dr. Roeland van der Rijst commented on the need for course design. Henny Denessen, my wife, was the overall proofreader. She forced me to be clear and uncluttered.

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Introduction

Policy documents of universities and the ministries of education in many countries clearly show the intention of continuing to develop and implement the features of modern higher education (MHE), including the introduction of blended and online learning. Therefore, university staff in different places and situations are already working hard on educational innovations. This book is designed to support teachers involved in implementing these innovations. It seeks to assist state and private university teachers in redesigning their existing education into effective, efficient, valued, well-liked and feasible blended and online learning.

Instead of focusing on all teachers, I have chosen two groups: senior teachers with extensive teaching experience and interest in modernising university education and early-career teachers who have completed the University Teaching Qualification. The University Teaching Qualification (UTQ; in Dutch: BKO) is proof of pedagogic competence for teachers in academic education. My expectation is that these teachers will be willing and able to redesign their education optimally. Some may even act as advisors to colleagues who may be less interested in modernising education but still have to adapt their education step by step. These teacher advisers can use the design tools, pedagogical advice and examples of blended and online learning courses from the book, making this approach more attractive to a broader group of university teachers.

Much of the content of the book is based on my project work as an educational consultant and as a programme leader in IT implementation at six universities in the Netherlands. The immediate motivation to write this book was my experience as a senior expert for PUM Netherland senior experts in a dozen short training missions to universities in Indonesia, Haiti, Nepal (an online course) and Ghana.

The idea for the book arose because three ingredients of course design are usually worked out too superficially:

1. *Connecting concretely to the knowledge and experience of the teacher as a designer.* I have applied various design tools in my course and curriculum development projects. These tools have been upgraded using the latest literature and are presented in the book.

2. *Making better use of the evidence from educational research.* In my projects, there is a clear overlap between the design principles used. I have summarised these design principles and the available design options.

3. *Apply the literature on design when setting up a course design and development process.*

In his time, Tony Earl (1987) was an expert who was always focused
on the design of excellent education. His approach remains fundamental
to my thinking. Fortunately, the main features of his approach are still
valued. Beenham and Sharpe (2017) describe in their book, introduced
by Prof. D. Laurillard, the principles and practices of designing in higher
education and use them to rethink the pedagogy for a digital age. I have
combined the course design approaches in both books with the following:
– The latest course design models;
– The typical features of technical design models described in the
  books of Van Boeijen, Daalhuizen, Zijlstra and Van der Schoor (2021),
  the Snake model from Roozenkrans (2020) and the Vision in Design
  approach from Hekkert and Van Dijk (2011);
– The relevant design features found in design thinking, creativity and
  complex problem-solving.

My book's approach involves the consistent and integrated elaboration of the
three mentioned ingredients. This makes it much easier to translate the results
of educational research on applying IT in educational practice in higher
education.

The book's first part provides a general overview regarding the (re)design-
ing of university courses. This overview explains basic definitions of course
redesign and practical questions teacher designers should be aware of when
performing course design. Such practical issues involve face-to-face interac-
tions, online tools, course design elements and higher education pedagogics
involving IT. In this portion of the book, definitions regarding the diamond
diagram, the blueprint and route maps are provided to better inform educa-
tional professionals in higher education about the required techniques to be
employed during the online course (re)design.

In the second part of the book, practical examples of blended and online
learning by the author are explained and exemplified. This section describes
in detail the learning activities and materials of the Introduction course (with
the 6-step Design and Development process) and the Redesign Your Education
in a Blended Learning Course workshop (with the 9-stage Design and Develop-
ment process). This portion of the book focuses on hands-on experiences in
redesigning online courses. Therefore, examples of route maps, blueprints and
diamond diagrams developed by participants are shown.

The course design toolbox is presented to teacher designers in the third
portion of the book. The toolbox contains various pedagogical design tools,
which the teacher designers give additional evidence-based support when
(re)designing their courses.

Finally, in the fourth portion of the book, I discuss accountability in the (re)design of online courses. Specifically, this part includes discussions of technical design, design thinking, course development and instructional design, complex problem solving and creativity.

In addition to the book, the reader can obtain information via my website,[1] where additional and up-to-date information, a serious game about the characteristics of MHE and an e-course on blended and online learning are provided.

Note

1   bl.curriculumdesignhe.eu

PART 1

Blended Learning Course Design and Development

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Evidence-Based Process Course Design

Information technology (IT) offers many good possibilities in higher education (HE). However, combining regular face-to-face (F2F) education with IT is challenging to satisfy teachers and students. This book aims to support university teachers in redesigning their current (blended learning or online) courses. You may be forced to do this because of a new COVID-19 lockdown, or the educational manager or your institute requires these changes. More often, teachers themselves want to improve their teaching. Their task is to make the right combination of F2F teaching, the pedagogical options available through IT and self-study activities. The basic idea is that the teacher designer uses the powerful features of the three areas of teaching and learning activities (Figure 1). The expectation is that the quality of education will improve and certainly not decrease. The expected result of the redesigned courses is that the teacher designers will have a course to teach optimally. Students have a learning environment in which they can study successfully. The result should be that the students use the offered learning and practice materials. They attend (video) lectures, learn subject matters, actively participate in workgroups, conduct self-study and team assignments, achieve good test results and value the course.

Teachers should seriously follow a course design and development process (DD process) to achieve such a result. Integrating simple video lectures into the course or digitising all texts is insufficient for a successful blended and online learning course. Three ingredients are crucial in designing a successful blended and online learning course.

The first ingredient is how to match the design tasks and the experiences of teacher designers. The book is aimed at two groups of teachers. The first group
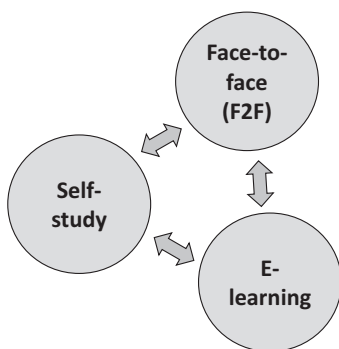
FIGURE 1
The three areas of teaching and learning activities

comprises senior teachers with much teaching experience and interest in modern HE. The second group includes early-career teachers who have completed the university teaching qualification and an introductory course in university pedagogical professionalisation. These professionals know about learning psychology, blended and online learning. The term 'teacher designer' includes both groups of teachers. The teacher designers are not professional instructional designers. The possible roles of a teacher designer can be found in the article of Wagenaar and Zwerver-Bergman (2020). The support given to the teacher designers should seriously consider their experience and knowledge. Too often, teacher designers are expected to use instructional design knowledge and skills with which they are not familiar.

The second ingredient is that teacher designers can use evidence from educational research. The literature on educational research gives teachers many evidence-based options that should be used in course design. However, university teachers rarely use these valuable research results (Chapter 22). One of the reasons is that the research results are not always explained and demonstrated in a format that motivates teachers to study and apply these evidence-based results in their selection of educational methods.

In this book, the evidence-based results concerning course design are explained and offered in more helpful tools. Evidence- or information-based results: Which formulation can you use? See Chapter 3. First, I have prepared tools explaining the possible IT options available for modern HE. Then, I select instructional science tools that you can use in the (re)design of your course. An overview of the design tools, course sequences, pedagogical models, DPs learning activities, materials and test options can be found in Part 3, Chapter 11. Finally, I prepared an overview of typical higher educational principles or activities in Chapter 16 that must be realised in your course to promote the desired learning activities to master the formulated learning objectives. How you use these tools depends on your pedagogical vision as a designer and the learning objectives of the course.

The third ingredient is to apply the literature on design when setting up your course design and development process (pDD process). In this book, I have tried to prepare a course design and development process that focuses strongly on the design features used in technical design, design thinking, problem-solving and creativity and the existing course design models. This has resulted in the basic course design and development process (Basic DD process). The expectation is that a stronger focus on design activities can create value and lead to better education.

The Basic DD process challenges teacher designers to indicate what they want and how they think they can achieve this in their course. The teacher

designers are forced by the course design and development process (DD process) to work systematically and creatively alternately. Teacher designers are helped by the systematic part of the DD process to identify the current strengths and weaknesses of the course, choose the subject matter and formulate the learning objectives. Teacher designers are encouraged by the creative part of the DD process to develop new and maybe unexpected ideas for their blended and online learning courses. Because of the different contexts in which the Basic DD process will be used, I propose that teachers create their unique personal design and development process (pDD process). The four main results of the pDD process are as follows:

– The teacher designer envisioned a systematic description of the learning process(es) through an ordered set of topics, learning activities and materials in the route map and the blueprint;
– A learning environment that supports the learning of students;
– The teacher designer decides on the quality criteria for the learning activities and materials of the final course design. I always start with five standard criteria that should be realised: effective, efficient, well-liked, valued and feasible (Table 1). During the pDD process, the quality criteria are elaborated to stimulate the thinking of the teachers in their selected direction. In the evaluation study of the new course, these quality criteria play a central role: Are the students satisfied? What should change? Examples of additional qualities are given in Chapter 6, Section 8.
– The planned learning activities and materials of the redesigned course are available to the students through the virtual learning environment (VLE). The IT infrastructure functions well and the teacher(s) and students can use various pedagogical methods, including IT software.

TABLE 1   Standard course qualities

Effective: The learning goals are achieved. The students had good results on the tests;
Valued: The learners found their learning time and activity worthwhile. The students participate in group activities, follow the lectures and study the subject matter properly;
Well-liked: The learning experience has been enjoyed and motivated the learner more;
Efficient: Optimal time and energy spent on the necessary learning activities;
Feasible: The students, the teachers and the organisation can deal successfully with the blended course. The teacher has the necessary teaching skills, the organisation arranges the education spaces properly and the students have the required learning skills.

SOURCE: EARL (1987, REPRINTED WITH PERMISSION)

The course design focuses on the learning process and environment, with an explicit and robust emphasis on the results from educational research. The Basic DD process follows the basic technical design cycle phases described in the (engineering) design guide of the Technical University Delft in the Netherlands. An exciting and valuable option is to visualise different design products. A new element systematically focuses on the quality criteria and requirements formulated by the teacher designer and faculty during the DD process. I formulated feasible course design tasks for the teachers instead of giving general and abstract assignments. The need to describe better pedagogical course models and best practices for teachers is stressed. In the book, there is a strong emphasis on the importance of professional teacher designers. Two examples of a personal DD process that I have used in different contexts are systematically worked out in the second part of this book.

1   Summary

The book consists of four parts. In the first part, you can read the introduction of the book in Chapter 1. In the book, I try to answer the questions that IT teachers and managers have asked me. You will find in Chapter 2 an overview of which questions are asked and where you can find an answer in this book. In Chapter 3, the meaning of evidence-based and evidence-informed design is explained.

An explanation of what is meant by blended learning, hybrid learning, online learning, massive online open courses (MOOCs) and small private online courses (SPOCs) is given in Chapter 4. Researchers and teachers have described many useful IT pedagogical options in the literature. These different useful IT pedagogical options are summarised in Chapter 5. Chapter 6 gives insight into the design perspective of course design and development. This perspective is elaborated with the help of the available design features from instructional design, technical design, complex problem-solving, design thinking and creativity. The design features are used to prepare a Basic course design and development process (Basic DD process). The Basic DD model is based on the 'basic design cycle for technical design' described in the Delft Design Guide used at the Technical University Delft in the Netherlands (Van Boeijen, Daalhuizen, Zijlstra, & Van der Schoor, 2021) and the design approaches of Roozekrans, 2020; Hekking & Van Dijk, 2011).

In Part 2, Chapter 7, I give an impression of what blended and online learning might look like and I offer some interesting examples. I describe two simplified Basic DD processes because (1) I needed a simpler version for the introduction

and workshop about blended learning in private universities in Indonesia, Ghana and Nepal. The 6-step DD process (Chapter 8) can be followed by all teachers who want to implement limited IT options in their courses. (2) The 9-stage DD process is for teacher designers who want to redesign their courses thoroughly (Chapter 9). I demonstrate a case study in Chapter 10 of how I redesigned and developed the Workshop Blended Learning following the Basic DD process to illustrate how you can apply the Basic DD process. The description of DD processes and the case study include several pedagogical design tools. An overview of the pedagogical design tools is provided in Chapter 11.

Part 3 contains several pedagogical design tools in which additional evidence-based support may be given to the teacher designers during the development of their courses. Possibilities of study sequence activities and course content, a list of typical learning activities in HE, some university pedagogical models for blended and online learning courses, an overview of the design principles (DPS) and instructional planning and building principles to be realised in modern HE are also provided.

Part 4 shows the studies of the typical design features and tasks used in the design processes in various fields. These analyses aim to find design features that have value to elaborate the design activities in course design. The references section includes the books, articles and especially the websites on which I have based my text on. If you want to know more about the contents of my book, I can recommend this literature.

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Reading Guide

Practical Questions and Advice in This Book

The teacher designer can find all kinds of advice in this book about the pedagogical design of a blended and online learning course. Several frequently asked questions about course design are listed below. For all questions, I give straightforward advice where you can find an answer. The relevance of the given advice for you, as a teacher designer, is directly related to your questions.

1 Do You Consider (Re)designing Your Course

1. You want a more detailed explanation of blended and online learning. Based on that, you want to decide whether to use IT and, if so, which options you prefer
In this book, you will find several resources to make the first choice of IT options you want to introduce in your course. Blended learning and online education are explained in Chapter 4. Some pedagogical options for using IT in HE are shown in Chapter 7. A detailed overview of the evidence-based IT options is given in Chapter 5. A summary is given in Figure 3. A matrix of education functions supported by IT versus ICTedu tools is shown in Figure 4. This matrix is a helpful tool for determining your thoughts regarding blended learning or online learning. Another possibility is that you study the E-course on the evidence-based use of IT in HE on Website Design Blended Learning and Online Education (Nedermeijer, 2021).

2. You want to include several concrete ideas in your current course. You do not expect that there will be significant changes required in the content and further pedagogics of your course
A convenient choice for you is to follow the 6-step DD process for course design. This process aims not to let you study the scientific evidence of applying IT but to support you in designing a course that satisfies you as the teacher and your students. You will find a description of desirable activities in the 6-step DD process and the expected results in Chapter 8. If you redesign an existing course, there is no need to make detailed instructional analyses or a lesson plan. A simple update is sufficient. The systematic approach ensures that you will give the IT options a proper place in your course.

Additionally, the 6-step process helps you identify which F2F activities should be modified or omitted. This will prevent your course from having an overloaded schedule. Finally, the DD process asks you to indicate which pre-conditions must be met to conduct the new course successfully. You will find ideas for testing in Chapter 17. A well-chosen design of the in-between and final tests strongly determines study success.

3. You want to implement other pedagogical changes besides implementing some IT options. For example, an increase in active learning assignments, more focus on the professional field, more group work and more flexibility and personalisation for the students

An appropriate choice is the 9-stage DD process. You expect your course structure to be adapted to IT options and supplemented with new pedagogics. In this case, more extensive pedagogical and substantive analyses are needed to redesign the course and develop new student assignments and other learning and testing materials. A detailed description of the 9-stage DD process is given in Chapter 9. An overview of IT options is shown in Chapters 5 and 7. Additional pedagogical support for your design process is provided in the third part of this book, more specifically in Chapter 11.

4. You want to design or overhaul a new course. You want to prepare your DD process using proper design insights

You can opt for the design activities in the Basic DD process described in Chapter 6 instead of the 6-step and 9-stage DD processes, simplified versions of the Basic DD process. The Basic Model course design is evidence-based. Design research was used in various research areas: technical design, instructional design, complex problem-solving and creativity. Additionally, the practical experience I (and others) gained in practical-oriented courses and curriculum development projects was used to build the basic model.

The Vision in Product Design is an exciting and helpful approach (see Chapter 18, Section 2.4). Using this approach, the designer tries to develop a vision of the relationship between the user and the product. Or, in educational terms, the relationship of the student and the teacher with the learning environment of the course.

Preparing a 'design brief or assignment' to summarise your work plan is advisable. The design brief is vital for you, your management and your colleagues. Do they agree with the design brief? Is your plan realistic? Do they have any suggestions? What do they see as possible effects on the other courses in the programme? After all, in most cases, the renewed course will have to fit

into an existing curriculum. The design brief is explained in Chapter 6, Section 6, design activity one.

2   You Have Specific Questions about Course Design

1. You like to gain more insight into the characteristics of modern HE. You expect to adopt some modern pedagogical ideas, but first, you want to understand modern HE (MHE)

MHE can be characterised in various ways. I decided to describe the MHE based on eight Design Principles (DPS) and some 55 pedagogical IT options. The DPS and the IT options for MHE are presented in Chapter 16. The DPS are used in Chapter 5 to describe the IT options in MHE. You are encouraged to choose some MHE teaching options in addition to the IT options you selected to implement in your course with the help of the serious Game MHE (Nedermeijer, 2020). The website Design Blended Learning and Online Education provides a comprehensive description of MHE with the eight design principles (Nedermeijer, 2023 search for Modern HE).

2. You like to gain more insights regarding available software and IT implementation in the educational HE programmes

Software development moves fast. Existing educational functions are combined or renewed in new software and new educational functions are developed, making it essential to follow software developments. There may be new IT options you can use in your course. Additionally, there are some websites where experts overview existing software and educational applications. The results and references can be found on my website.[1]

The HE institute should consider four questions (and answers) when implementing IT. The message from evaluation studies is that you should preserve the strengths of regular and blended learning and avoid re-using the recognised weaknesses of IT. Or, instead, combine the strengths of regular education and blended learning. The four main questions to be considered when you plan to implement IT in your education are: Is the support of the teachers available and well organised? Is management following and supporting the implementation process? Is the IT-technical environment work fully operational? Are the other characteristics of MHE considered? In Chapter 4, Section 5, the four questions are answered.

Overviews of relevant software for higher education can be found on the website of Hart (2023),

3. You are curious about the learning psychology background in HE. You prefer to obtain valuable recommendations on how to organise MHE

You will find an overview from Hattie and Donoghue (2016) with results from the learning psychology research in HE in Chapter 13. These researchers distinguished HE surface learning, deep learning and transfer of learning. Students should learn the knowledge and apply it in different work situations. Ideas such as competency-based learning projects and problem-based education can be linked to this approach. Other suggestions of learning psychology backgrounds can be found in Kirschner & Hendrick (2020), Luckin (2018), Neelen & Kirschner (2020), Picciano (2019) and in the websites 3-star learning experiences and lde-studentsuccess.com.

4. The support provided in this book follows an evidence-based approach. Are you curious about what evidence-based and evidence-informed approaches mean?

The meaning of the evidence-based approach or, as others call it, the evidence-informed approach is explained in Chapter 3. The IT options discussed in Chapters 5, 7 and 16 are based on scientific literature and the professional experiences of teachers and educators.

3   Summary

You can use the book for different purposes that I have experienced in my advice work. You can read parts of the book to obtain insights into blended and online learning concepts. If you are motivated to redesign your course, examples and design tools to support you are provided in this book. You can follow the 6-step DD process to implement IT options without profound changes in your course design. Or the 9-stage DD process, where you look for additional changes to modernise your courses. The Basic DD process is meant to support you if you desire to implement a new pedagogical vision combined with changes in the knowledge the students have to study. If you want to know what the various suggestions are based on, your answer is given in the fourth part of this book.

Note

1   bl.curriculumdesignhe.eu

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Evidence-Based or Evidence-Informed Course Design?

One of the ingredients of a successful course design and development process is to apply the evidence obtained in educational research. In practice, it appears that teachers rarely use this helpful evidence. Chapter 22 describes possible reasons Herckis gives why faculty hesitate to adopt evidence-based, innovative teaching methods.

Nevertheless, drawing up an evidence-based pedagogical concept in the systematic course and curriculum projects appeared possible. Research evidence and teachers' 'craftspersonship' should be combined in all design situations. These choices result in a clear and practical description of the evidence the course and curriculum committee will apply to the course or curriculum programme. In Appendix A, you can find an example of such a pedagogical concept.

The main topics discussed in this chapter are Evidence-Informed or Evidence-Based Learning, Basic Features of Evidence-Based Medicine Compared with Course Design, and Summary: Be Critical.

1 Evidence-Informed or Evidence-Based Learning

By focusing on educational research evidence in a course design and development process, I try to give the course design process an evidence-based character. Kirschner and Neelen (2021) stress 'the need to use the evidence available to us to make sure we move beyond opinions and intuition'. They compared the use of evidence in education with evidence-based medicine. As a result, they preferred to use an evidence-informed course design instead of an evidence-based design. As Kirschner and Neelen commented:

> We cannot usually deliver the same quality of evidence as clinical practice. In learning environments, we deal with many variables that interact and are hard to control.

Of course, this is true. However, there are two reasons why we better stick to using the concept of evidence-based course design. Suppose you read a

definition of evidence-based medicine. In that case, the resemblance with the situation of the teacher designer is remarkable (see Chapter 3, Section 2).

Sackett, Rosenberg, Gray, and Haynes (1996) explained that evidence-based medicine practice integrates individual clinical expertise with the best available external clinical evidence from systematic research. He continues:

> The practice of evidence-based medicine is a process of life-long, self-directed learning. Caring for our patients requires clinically important information about the diagnosis, prognosis, therapy and other clinical and healthcare issues.

In this process, you should:
– Convert this information needs into answerable questions;
– Track down the best evidence to answer them (whether from the clinical examination, the diagnostic laboratory from research evidence or other sources) with maximum efficiency;
– Critically appraise that evidence for its validity (closeness to the truth) and usefulness (clinical applicability);
– Integrate this appraisal with our clinical expertise and apply it in practice;
– Evaluate your performance.

2   Basic Features of Evidence-Based Medicine Compared with Course Design

On the student website s4be (2013), they explain the basic features of evidence-based medicine on one page. It is a growing network of students from around the world, from school age to university, who are interested in learning more about evidence-based health care. What can we, as designers, learn from general practitioners? To understand this, I reformulated below the main features of evidence-based medicine described in this article to clarify its significance for course design.

The simple definition of evidence-based from Sacket is the conscious, explicit and judicious use of the current best evidence in making decisions about teaching and learning. The current best evidence is simply the best there is. Of course, you have to be critical of old or out-of-date evidence. Be sure the evidence is still valid. And, of course, you have to keep up with developments in your field. How could this be done? The following qualities are required to obtain updated evidence:

– Conscientiousness: being careful with using evidence and zero in the diagnoses and therapy for the specific patient;
– Clear: being upfront, open, clear and transparent about your conclusions;
– Judicious: using good judgment and common sense.

Suppose you will take on this approach. You have to treat the evidence properly. Therefore: Be sure to find evidence from scientific studies relevant to learning and teaching in your course. For example, I applied the evidence found in my research colleagues' research activities at ICLON Leiden University Graduate School of Teaching, the Netherlands, in my advice in the course and curriculum design projects.

You will find helpful Design Principles (DPs) in various scientific articles or books. Chickering and Gamson (1987) formulated the first set of design principles for a course in higher education. A much later upgraded description is from Luckin (2020). A teacher designer can easily apply both sets of design principles. Therefore, my logical choice was to update and elaborate both sets of DP by summarising the pedagogical concepts formulated and used in the course and curriculum projects I was involved in. Ultimately, I chose to classify the available evidence and existing best practices according to the eight DPs for modern higher education (MHE) and 55 options for pedagogical activities. The central DP for my book is 'IT is a must' when choosing blended or online learning. In Chapters 5 and 7, possible evidence-based pedagogical options concerning the use of IT are presented systematically. The contents of the chapters have been incorporated into an E-course Evidence-based option to apply IT in Higher Education courses (Nedermeijer, 2021). Part 3 contains several other evidence-based pedagogical resources that the teacher designer can use in course design.

Crucial aspects of evidence-based work are to find and evaluate the information available, to assess its reliability and to decide if you can apply the results to your course. In Chapter 3, Section 3, 'Be critical', this aspect is elaborated in detail.

If evidence-based medicine is about using the best information to make decisions, how is it practised? This is about asking the right questions, using the best research evidence to answer those questions and returning to medical practice. Minimal high-quality information is available when a patient has a rare or unusual condition. To do the best for the patient, you may need to rely on a good understanding of anatomy, physiology and pathology and work out what is best from the first principles. Or, you rely on the experience of older and wiser colleagues.

Sometimes, hundreds of clinical studies involve hundreds or even thousands of patients with similar results. This makes advising the patient about

the benefits of treatment relatively easy. However, what if the results of different studies are conflicting? Or, what if the studies did not look at the sort of patients you are treating?

The importance of using available evidence and other information is the same for our work in educational design. Teacher designers should focus more strongly on an evidence-based approach in HE. If you do so, you can expect that the HE quality will increase and educational committees will address 'sticky problems' more effectively. Examples of sticky problems include the growing complaints about online education, the selection in the first year, the quality of academic writing, the design of serious games and 3D animations, the application of artificial intelligence, etc.

Is evidence-based medicine time-consuming and complicated? No, it does not need to be. Many evidence-based resources are where much of the work is done for you.

Also, educational researchers must develop resources or tools based on research evidence that teacher designers can use in their design work. Crucial is for teacher designers to learn how to combine research results and their own experiences, just like general practitioners. One of the insights of Merrienboer (2023) has formulated in his Farwell lecture is:

> We need empirically supported theories that help us understand teaching and learning processes and make sound design decisions that optimise learning in simulated or real environments.
>
> And: As a result, there are no instructional methods that do or do not work; that is to say: everything works somewhere, nothing works everywhere. Research should be aimed at increasing our knowledge.

3   Summary: Be Critical

An important point of attention with evidence-based research is that you must be sure that the formulated evidence can promote the desired learning effect. In their book, Kirschner and Neelen (2020) elaborate on how to judge a given evidence for correctness. They also point to existing learning myths. This information is fascinating and valuable.

Suppose you do not include a DP in your design. In that case, the chances are that you have not made an optimal education programme. For example, in the first MOOCs, the cooperation between students and teachers was fragile and collaboration was ineffective in many 'remote emergency' online university learning programmes. In both cases, education did not run smoothly.

In the early days of project education, group work was often emphasised. It soon became apparent that students did not study all the relevant knowledge and it was necessary to review and elaborate on the acquired knowledge with the teacher in F2F meetings. This is the step from theory with a lowercase t to theory with a capital T.

Many evidence-based options have been researched by researchers or evaluated by teachers. All options mentioned in this book have been applied somewhere in a course. I consider these severe options evidence that offers teachers all kinds of ideas. Teacher designers should make these options fit into their design process. Whether the selected option works in your course requires thinking critically and evaluating it later. There are no guarantees of success and there are also no reasonable standard solutions in design.

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Blended and Online Learning

Evaluation studies on the use of IT in HE clearly show that IT-based study activities are equivalent to regular study activities. However, it should be emphasised that both forms of education have specific added values. For example, think of F2F lectures in which teachers explain a subject motivated and transparently to their students. They can observe directly whether the students understand it. In regularly planned F2F lectures, first-year students are given a framework for planning their time. Other examples of added value are personal contacts in working groups and individual conversations, which stimulate students and teachers.

The main topics discussed in the chapter are Why Consider Using IT in HE? What Do I Mean by Blended Learning? What Do I Mean By Online Courses? Another More Complex Format of Online Education Is Hybrid Education, Preparation for the IT, Activating Online Education in Open Universities in Some Countries, Online Education Offered through MOOCS or SPOCS and Open Educational Resources (OER) That You Can Use When Designing Your Course.

1 Why Consider Using IT in HE?

IT pedagogical options can provide additional value to enhance the quality of blended learning in online courses. For example, IT options can help deepen insight into crucial and complex topics with consecutive assignments. The assignments can be described as more realistic with multimedia. In the VLE and other software, the teacher can give standard feedback to the students. Teachers can provide the students with the necessary VLE support when unavailable. The teachers can also consider preparing different explanations for students to increase their entry-level. Teachers can use various online and offline options to teach articles, multimedia and offer assignments. They have with the VLE the possibility to update learning materials when necessary. Students may be encouraged to work independently. Teachers may support students in doing their homework outside the classroom because of COVID-19, other sicknesses, terrible weather conditions, pedagogical reasons, etc. Also, IT can give students more control and responsibility regarding their study activities.

Teachers themselves can benefit from using IT, enriching their courses with the help of IT-pedagogical possibilities. Teachers can easily exchange learning materials with colleagues and professionals and re-use their learning materials and student assignments in other courses. A systematic and detailed overview of possible IT uses in higher education is provided in Chapter 5.

Another reason for using IT is that students should be prepared for a future in which ITedu tools are used everywhere. Currently, almost all professionals work with digital hardware and software. Therefore, not using IT is no longer an option; many students even expect IT in education. Consequently, they must learn to use ITedu tools, professional software and hardware efficiently and effectively during their studies and assess the quality of the information.

However, there are some essential prerequisites. The design and development of a good blended learning course require extra time from the teacher. The IT infrastructure should work correctly and the support of pedagogical and pedagogical teachers is also needed. Often, you cannot continue with it if you forget a specific, simple step while using the software, which the IT experts may explain in three minutes. But the ÌT-expert is often unavailable during the day and evening. So you may have to wait one full day before being advised by the IT expert before continuing your coursework. This might be an important reason why teachers are not motivated to use IT. IT support for teachers is crucial for effective course design.

2   What Do I Mean by Blended Learning?

Blended learning combines e-learning, face-to-face education and self-study (see Chapter 1, Figure 1). Of course, there are many other definitions of blended learning. I like to stress in my definition the importance of the teacher designer in making a pedagogically-based blend of these three essential areas of teaching-learning activities. In all three areas, IT can be applied. One generally speaks of blended learning when it supports 20–80% of the study time. You can speak of online education if IT supports more than 80% of the study time.

There are many successful blended learning designs. In Chapter 5, an overview of possible IT options is given. Blended learning is flexible and can be applied in different pedagogical approaches (e.g. module-based, project-based, case-based, problem-based education, in curricula with lectures, working groups and regular tests). The main task in the (re)design of a blended learning course is to find the appropriate learning process(es). The plural learning process forms are chosen because students study differently. The teacher designer

1. Task-oriented learning (active learning).

2. Issues and problems from the professional field are central.

3. Focus explicitly on knowledge.

4. Realise the necessary qualities of a nominal program.

5. Consider seriously collaborative learning and learning from fellow students.

6. Testing and feedback are the motor of students' learning.

7. IT is a must!

8. Possibilities for personal development.

FIGURE 2   Eight pedagogical DPs in MHE. (The DPs are described in Chapter 16)

selects the necessary pedagogical formats and carefully assesses whether the chosen formats are feasible. A helpful tool is the set of eight pedagogical design principles of MHE, as shown in Figure 2. These principles will play a role in the design of most courses in higher education. Sometimes an essential and central role and sometimes a subordinate role. If you 'forget' a design principle, it often turns out that the course does not meet the five quality requirements of effective, efficient, valued, well-liked and feasible from Chapter 1, Table 1.

3   What Do I Mean by Online Courses?

IT-supported study time varies between 80% and 100% for online education teaching, learning materials and activities. The software programmes used in online education are VLE, such as Moodle, Blackboard, Brightspace, Google Classroom, etc. The students find their learning materials and activities in the VLE: course descriptions, digital text files, PowerPoint, e-learning courses, eBooks, professional websites, tests, assignments, hyperlinks to the learning programmes, games, simulations etc. You can also combine that software with an e-mail programme, a file-sharing system like OneDrive or Dropbox and video calling software like Skype, Teams, Zoom, WhatsApp etc. Course materials and activities are available in detail at the start of the course. Of course,

teachers can still make small changes just before or during the course, but its main elements should generally be available from its beginning.

Logically, supporting self-study receives the most attention in online education. More and more, IT is used to stimulate students to study together. The small amount of time for F2F activities should be designed carefully to be effective. The teachers can use the approximate 20% of study time available for F2F teaching activities for synchronous lectures, e-mail, individual F2F advice or chat, providing feedback on the submitted results of individual or group assignments, assistance in practical activities and small-group teaching. Teachers can encourage students to finish assignments through VLE. Online education is applied in open university programmes, MOOCS and SPOCS.

3.1 *What Can You Do during a Strict and Less Strict Lockdown Period?*

During lockdown periods, the universities were forced to change regular education to online education. During the strict lockdown periods, contact between teachers and students was only possible through internet. The term emergency remote teaching was used for this kind of education. The consequences of the emergency remote online approach are that students and teachers miss the F2F activities, social contact and discussion in small groups, practical activities and individual advice. Digital lectures were possible, but many teachers and students complained that online lectures were boring, exhausting and inefficient. Not having eye contact played an important role. As a result, many students and teachers were dissatisfied and perceived IT negatively. They stopped with IT options, also IT options from which students and teachers can benefit in modern higher education.

3.2 *Have the Teachers and Management Made a Good Decision?*

Educause organised an evaluation study to determine why the students were pessimistic about online education in the first year of the lockdown period. (Brooks & Gierdowski, 2021; Kelly, 2021). The results are shown in Tables 2 and 3. From these overviews, it is possible to conclude that most problems could be solved during the less strict Covid – period with the possibility of meeting in small groups with well-prepared teachers and a well-organised IT system.

This book gives many suggestions for solving the issues mentioned in Table 2. Educause made three recommendations for institutions to improve teaching and learning both now and in the post-pandemic future: (1) Invest in hybrid organised education, (2) connect faculty members with instructional designers and instructional technologists and (3) place the students at the centre of teaching. The full report, 'Student Experiences with Technology in

TABLE 2   15 mistakes teachers have made in online teaching during the pandemic

15 mistakes

1.   The use of unofficial platforms and too many external applications or sites;
2.   A lack of instruction, guidance, and support for activities such as break-out rooms, discussion boards and collaborative assignments;
3.   Unsatisfactory administration, proctoring, collection of exams and other assessments;
4.   Not anticipating technology limitations when teaching certain subjects, accommodating disabilities or meeting the learning needs of all students;
5.   Use of long lectures with massive slide decks;
6.   Lack of instructor engagement, communication with students and feedback on assigned work;
7.   Lack of technological support and refusal to accept tech issues as excuses for late work or absences;
8.   Assignments with minimal scaffolding or connections to learning outcomes;
9.   Underdeveloped class plans and agendas;
10.   Attempts to replicate F2F experiences in online learning environments;
11.   Instituting camera-on policies;
12.   Imposing strict deadlines with severe penalties for late work;
13.   Failing to maintain the pages within the learning management system for an online course;
14.   Refusing to accommodate or belittling students with disabilities; and
15.   Lack of clarity in the processes and procedures for completing and submitting assignments.

SOURCE: KELLY (2021)

the Pandemic', is available on the Website Design blended and online learning (Nedermeijer, 2023) and the Educause website (Brooks & Gierdowski, 2021; Kelly, 2021).

   When the government ordered a less strict lockdown period, the described characteristics of online education could help realise an adequate functioning of F2F education in small workgroups of 4–12 students with and without teacher and personal contacts. The size of the groups depended on government regulations. There were many places where student groups could meet in lockdown with or without a teacher. Educational establishments could be found in educational institutes, other public buildings, restaurants, student houses, etc. Consequently, some teachers tried to arrange moments where students met

with each other and the teacher in small groups during the less strict lockdown period. These one or two meetings lasted for two hours every week.

This opportunity to meet each other was very welcome and was excellent for the well-being of the students. Furthermore, it allowed the teacher to function similarly to a typical university teacher.

4 Another More Complex Format of Online Education Is Hybrid Education

Hybrid education means that part of the students follows the lessons at home and the other part follows F2F education in a classroom at the university or another brick building. During the pandemic, the students had to keep 1.5 meters distance in the classroom. Another name of hybrid education during the pandemic was 'Emergency Remote Teaching'.

Many combinations of F2F, E-learning and self-study activities are created to design courses in the hybrid education format. Hybrid learning can be seen as one of the possible blended learning formats. Spencer (2020) and Hagemeijer and Dolfing (2022) show various models for hybrid learning.

– Students follow at home and in the classroom synchronously the same lesson. The two groups frequently interact with each other. This option is very effective in stimulating non-traditional or at-risk students.
– Students alternate their study days between being at home and being in the classroom. Most of the learning is asynchronous, with a few opportunities for video conferencing.
– Sometimes, the rotation model is implemented. Students rotate between different stations on a fixed schedule.
– Students work in small (project) groups. The different groups have regular contact with each other and the teacher through video-conferencing.
– An essential activity in organizing hybrid education is preparing good functioning IT equipment and a well-designed classroom setting.

In his Blog, Spencer (2020) explains:

> Each of these models for a curriculum works well in certain situations and poorly in others. As teachers, we can think strategically about designing learning processes to optimise the benefits of its models. As schools, we can think creatively about when and how to use these models. We avoid some of the pitfalls of the spork-based (= spoon + fork) approach to learning. Even so, there will be mistakes. Learning is dynamic and complicated

hybrid learning adds another layer of complexity. However, we can help students thrive in every learning environment by being intentional.

Admiraal, Guo, and Van der Rijst (2022) and Hagemeijer and Dolfing (2022) have studied the teachers' and students' experiences during the pandemic. Some results of these evaluation studies are:
– Successful hybrid education requires more than translating an existing course design into an online environment.
– Online students feel like they are bystanders.
– Interaction between F2F students and students online is limited.
– Interaction between teachers and students is limited, also which as F2F students. Teachers choose plenary instruction.
– Teachers and students are satisfied because some learning is supported compared to no education.
– Importance of autonomous motivation, as needed in all teaching approaches.
– Given the laborious nature of managing hybrid classes and courses, their use should be restricted to situations where conventional, onsite options are unavailable.

5   Preparation for IT

Goes and Klink (2021), Breimer (2021) and Brooks and Gierdowski (2021) expect IT will obtain a second chance after the post-lockdown period and teachers should get the opportunity to rethink IT in their courses. In evaluation studies about online education, crucial weak and strong aspects are described. The message from these researchers is to preserve the strengths of regular and blended learning and avoid the recognised weaknesses in the application of IT in the HE, as described in Tables 2 and 3.

Four questions must be considered when you plan to implement IT in your education: Is the support of the teachers available and well organised? Is management following and supporting the implementation process? Is the IT-technical environment work fully operational? Are the other characteristics of MHE considered?

Question 1: Is the support of the teachers available and well organised?
Start implementing the ITedu tools in your course in small steps. Start with relatively simple IT options. Organise small pilots to experience and test IT possibilities. Next, organise a pilot project for a part of your completely redesigned course with a small group of motivated students. Evaluate, discuss the results with your colleagues and adapt your design.

Educause (Brooks & Gierdowski, 2021) evaluated the online education experiences of students and teachers in different countries. I used these evaluation results (Table 3) to create a checklist (Chapter 6, Section 11, Figure 14). This tool evaluates whether a curriculum program's blended or online learning courses will succeed.

Introducing IT in an educational institute should be executed step by step. Effective communication and knowledge exchange among management, students, teachers, supporting IT staff and educational experts must be considered seriously. The faculty and faculty members should support each other's design activities, exchanging ideas and experiences. Short meetings (e.g. lunch meetings), where you and your colleagues can share information among the management and the IT staff about the experiences with the ITedu tools, the educational materials prepared for and used by the teachers, the students and the IT staff. Many faculties have organised a task force or project group to discuss problems, solutions, questions and new desires using blended learning.

Possible teacher professionalisation activities are short courses, lunch meetings, websites, support from IT staff, education experts or student assistance. These individuals can help the teachers with small and more complex problems when designing, developing, applying and evaluating a redesigned blended learning course F2F via VLE, e-mail or WhatsApp. There are good reasons to consider involving students to support teachers. Younger people often have more experience using IT. They are flexible in their time, have insights into the world of students and learn many things necessary for their careers. Still, teachers will probably ask for advice from their colleagues first. Teachers and IT technicians should work together to optimise the IT technical environments because the pedagogical possibilities and costs of ITedu tools develop over time.

A (university) website about blended learning and other IT applications allows teachers to show each other their educational ideas, products, and other relevant supporting texts.

The information materials and experiences from the first projects can be used to support the next group of teachers more effectively.

During the implementation period, the teachers and IT technicians may discover new opportunities for using IT in education. All problems in using the IT technical environment must be resolved without delay. These experiences should be presented on the university website.

Question 2: Is management following and supporting the implementation process?
The management and staff members formulate their expectations and follow the consequences of implementing IT for the organisation of the university, the faculties and the supporting departments. Results like student engagement, the ability to attract more students and study success are expected to increase.

TABLE 3   Pedagogical elements relevant to blended and online learning based on an
              Educause project (Brooks & Gierdowski, 2021 and Kelly, 2021)

Pedagogical functions applications mentioned in the Educause report

1.	General	– Consider the characteristics of modern higher education: active learning, focusing on students learning, feedback, group work, IT use, etc. – Coherence among IT, self-study and F2F is crucial.
2.	Give information and explanations	– The availability of (asynchronous) video lessons with the explanations of teachers and the search option is appreciated. – Short video lectures with search options are preferable. – An overview of the course content and activities is necessary to support the learning of students. – The use of learning materials from the internet is advised.
3.	Support self-study and classroom study	– Demonstration of clear assignments and procedures is valued. Be careful with too strict deadlines
4.	Prepare for further education	– The availability of projects and special assignments are valued.
5.	Opportunity for collaborative learning	– Reach out to classmates. – Working together in small groups is valued. – Motivational and social activities have a positive effect. – Communication with student parents can be crucial.
6.	Tests and feedback	– Adequate use of test examples and teachers' feedback. – Unclear test procedures and criteria are a problem.
7.	Sufficient internet connection	– Students and teachers need good internet access. – Students cannot always finish assignments on time. Teachers should consider this issue.
8.	Sufficient quality of laptops and the like	– Not all students may be able to use software/laptop. – Students cannot finish assignments (on time). Teachers should consider this issue.
9.	Support teachers in using IT	– Practical and timely technical support by IT personnel. – Teachers should support each other (team teaching). – Use the prescribed steps to design short video lectures.

(cont.)

TABLE 3   Pedagogical elements relevant to blended and online learning based on an
             Educause project (Brooks & Gierdowski, 2021 and Kelly, 2021) *(cont.)*

Pedagogical functions applications mentioned in the Educause report

10.	Support the pedagogical skills of teachers	– Additional training/instruction is essential. – Team teaching: exchange of ideas. – There is a need for new pedagogical models.
11.	Support students in using IT	– Students and teachers value the possibility of lending laptops. – Help with technical problems, use a list of frequently asked questions (FAQ) or a (virtual) helpdesk.
12.	Support students using new learning activities/ materials	– There should not be too many different software programs. – Clear instructions on studying new IT activities are valued. – A standard layout of the learning material is necessary.
13.	Support students by teachers	– The accessibility of teachers for questions is crucial. – The FAQ option saves the teacher a lot of time. – Sufficient attention to the disabilities of students is essential.

Increased satisfaction regarding the professional field is expected with better preparation of the students. The importance of using IT should be prominent in the policy documents of the university and the documents for accreditation. This process means that teachers and IT staff know they are working on an essential task for the university. The necessary diverse activities and financial consequences should be carefully planned during implementation.

It is often challenging to convince teachers to use IT in their courses. Therefore, they have to be ensured that using IT positively affects their teaching processes and courses. Also, it should be clear to them that the university and the management support the idea of introducing IT and support them wherever necessary during the implementation process. For example, the management (rector and vice-rector, heads of program or staff members) assigns the beginning of various pilot experiments and other activities during the implementation process.

Often, management decides to start a task force or a project group that will follow the developments in the various pilots. Such a task force maintains

contact with the management about the progress of the pilot projects and hardware and software development. The members of this task force should be a manager, two or three teachers, two IT staff and an educational expert. Sometimes, the educational institute may decide that besides the IT staff, there is a need for an educational expert with experience in blended learning. The task force maintains close contact with the teachers and the IT staff.

Using IT means permanent innovation. Hardware and software develop rapidly and the application of IT will intensify during implementation. The teachers and IT staff should follow new developments and look for possibilities to implement them wherever possible and relevant. Opportunities for innovation should be discussed in the task force several times during the year. Teachers should be stimulated to be clear about their needs, questions and problems using IT in education. IT staff should also be transparent about what is possible and about the costs of finding an answer to the needs, questions and problems. Software should be adapted to the needs of teachers. If the task force agrees about the usefulness of a particular innovation, they propose it to management.

The teachers and the IT staff involved in this educational change process should be given explicit support from the management. The possibilities of the management to support the implementation process comprise providing extra time or money to those involved. Additionally, it is advisable to give credit to the teachers and the IT staff active in the pilot projects (in meetings and on the website). The active teachers in the pilot experiments can be seen as ambassadors of IT in education. Therefore, management must support them.

Question 3: Is the IT technical environment fully operational?
The success of IT implementation in education also depends on the quality of the IT technical environment (e.g. hardware, software and IT-supporting staff). The educational institutions must ensure that all students and teachers have access to a computer and internet in the institute, at home or both. Also, it should be possible for both groups to work with necessary IT learning materials, such as VLE, PowerPoint, complex images, video lectures, games, simulations, etc. The internal or wireless networks and the internet connection should work properly, which is the responsibility of the IT group. The IT staff should be qualified to implement and maintain the hardware and software. Implementing IT will be strongly disturbed when teachers and students experience failures of one or more elements of the IT system.

The necessary capacity and speed of the IT technical environment depend on the type of software, the digital learning materials and the number of users. If the number of students and teachers using ITedu tools increases, the IT

technical environment will need more capacity and speed. Management has to decide whether the capacity and speed of the IT technical environment will be improved. The IT group should be able to organise or realise the necessary improvements. Another development that must be considered is that the institute may decide that besides using IT in education, the administration and the research groups will also use IT. This scenario will have consequences for the IT technical environment.

The university may start implementing IT without an IT technical environment, with insufficient capacity to enable students and teachers to use video programmes, games, YouTube, simulations, pictures, etc. In this case, a possible solution is to download the software and files on a local server, to which the students and teachers should be given entrance to access the software and files.

A significant problem is the power supply. If there is a short power break, the students and teachers must continue using their laptops with full batteries via a wireless connection. If frequent power brakes are longer, installing a generator with enough capacity to maintain the power will be necessary. The problem related to power breaks is that students and teachers may lose work. Consequently, users may have to redo part of their work after the power is restored. This problem can be solved using an Uninterruptible Power Supply (UPS). This hardware device provides a backup power source in case of a power outage (blackout), brownout, or surge in power.

Many universities have a particular IT classroom where students can work individually or in small groups. The teacher and the students can use a PowerPoint presentation in this room. The IT group handles installing and maintaining the space and equipment.

Question 4: Are the other characteristics of MHE considered?
Blended learning is an essential element of MHE. It enables the teacher to use current disciplinary topics and modern didactics, such as active learning, giving and receiving feedback and learning professional competencies. Teachers need basic technical skill training of around 100 hours (60 hours of contact education, 40 hours of self-study).

The team of teachers of a programme must discuss specific topics. How could you teach? How can you implement problem-solving, entrepreneurship and other general and specific competencies? How could you introduce the results of the relevant research literature?

In a university, personal development and social contacts between students and teachers are essential elements that should be given proper attention. Possible topics to be discussed are creating personal development, offering extra activities for excellent and motivated students, supporting a good start of the

study, offering electives for students and helping students with academic and personal problems. IT provides various options to realise these activities.

6   Activating Online Education in Open Universities in Some Countries

Open universities offer high-quality education for those who cannot (or do not want to) study at another university. There are no prior education requirements for a bachelor's education geared towards studying part-time. The education model stands for personal and activating online education flexibly for students. Besides the course books and the VLE, there is a small campus in several cities where the students can follow workgroups, practical activities and individual support.

7   Online Education Offered through MOOCS or SPOCS

MOOC means massive online open courses. A MOOC is available to everyone interested in it. There are (often) no cost or application requirements; you only need a username and password. The MOOC founders regarded 'open' as using study materials without copyright restrictions.

A MOOC is meant to be a massive course. Thus, sometimes 5,000–100,000 students might attend a MOOC. The duration of a MOOC is usually between 4 and 12 weeks. MOOCS cover many disciplines and subjects in different languages. They are excellent sources of free, high-quality information concerning many different topics. The learning activities and materials are available online and the students are responsible for their (self-)study. However, sometimes the learning materials are under copyright; if this is the case, they cannot be used in your course without the author's permission. In Table 4, some typical pedagogical activities used in MOOCS are presented.

Students opt for MOOCS because they are (mostly) free of charge and they can study exciting subjects taught by highly qualified teachers in their own time and place. MOOCS are used as part of lifelong learning. Students who attend MOOCS generally have no other possibility of entering HE.

Many MOOC students are teachers who like to study a specific topic or are interested in pedagogical approaches and learning materials. Another option is for teachers to use a MOOC in their education. You need to introduce certain content or cases necessary for the local (professional) situation to increase the quality of a given MOOC.

TABLE 4   Applied pedagogics for MOOCS

---

1.   The MOOC is given in VLEs: Moodle, Blackboard, Brightspace or a VLE designed by large MOOC firms, such as Coursera, edX, etc.;
2.   Study planning: The course begins whenever the student wants to finish some assignments for a specific date;
3.   Credit options: A diploma/certificate is given after the participants complete all assignments. There are informal and formal test options (organised with the help of cameras and proctors or organised at a university);
4.   Video lectures (6–10 min), tutor programmes or synchronous webinars;
5.   Discussion forum;
6.   Assignments using course contents, case studies or research work;
7.   Quizzes, peer grading exercises and exams;
8.   Documents, blogs, wiki, glossary and references to URLs are available;
9.   Because of the importance of having personal contacts in some MOOCS, the participants are asked to start a small group and meet at a well-chosen place that the participants can reach without any problems or come to the university to meet a teacher and fellow students.

SPOCS are small private online courses for a limited group of participants (30–60 students). For example, students work with the teacher/researcher on a research assignment. In contrast to a MOOC, a SPOC are not necessarily free. SPOCS provide more discussion and personal attention opportunities because they are more exclusive.

More information about MOOCs can be found in the Website Design blended and online learning (Nedermeijer, 2023).

8   Open Educational Resources (OER)

SURF is the IT organisation for university, professional and vocational education in the Netherlands (SURF, 2023a). The Dutch universities, colleges of higher education, university medical centres, secondary vocational educational institutions and research institutions work together in SURF to develop ground-breaking IT innovations. More than 100 institutions from five sectors are members of the SURF cooperative.

SURF stimulates open educational resources. SURF uses the following definition of digital learning materials:

Creative work used for educational purposes, such as texts, images, sound or video, available digitally. These are materials that lecturers studies. Teachers can informally exchange learning materials with their colleagues or share them via a storage system or repository. Building together a storage system and filling it with learning materials is stimulated and supported by SURF. You can find more information about open education resources on SURF (2023b).

Other sources of learning materials are available from the Open Education Consortium, Open Educational Resources and Merlot. Additionally, colleagues in the network of teachers may serve as sources.

Teachers mentioned different reasons to introduce OER in the (re)design and development process of their courses, such as: Improving quality through community feedback, making existing learning materials accessible to everyone, collaborating to build collections, using them as a source of inspiration for your lessons and using as a time-saving tool in developing your course.

9   Summary

Many aspects of using IT in HE have been described in this chapter. The main types of IT courses are blended learning, online learning, hybrid education, MOOCS and SPOCS. The pedagogical elements relevant to the different course types are shown in Table 3. The elements are the same, but the application in a specific course often differs. An excellent one-hour lecture might be pretty dull on a laptop screen. An overview of IT options for HE is given in Chapter 5. The principle is that the F2F, the self-study process and the IT learning activities are balanced. These methods should support each other in realising a better learning process. The teacher should design and develop the correct teaching and learning activities and materials.

Evaluation studies have shown that IT options are not always applied correctly, resulting in negative opinions about IT by students and teachers. Sometimes the software and hardware did not function as expected. Sometimes, the course design was not correct. Table 2 overviews 15 mistakes often made in blended and online education. These problems can be solved by adapting the organisation, improving the support for the teachers and the students and creating a perfect internet connection for teachers and students. In Chapter 4, Section 5, you can find the four crucial questions to be answered when implementing IT to realise a good functioning infrastructure (e.g. hardware, software and support personnel).

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Evidence-Based IT Options in Education

An overview of evidence-based pedagogical options to apply IT in your education is provided in this chapter. These options have been researched and appear successful in many situations. The research scientist has sound reasons to believe these IT options might also be effective in other educational situations. A second reason the IT option is considered evidence-based is the successful application and evaluation of an IT option by an experienced teacher. Still, there is no 100% guarantee that the IT options mentioned in this Chapter will function successfully in a new situation under different circumstances.

In my training activities, I use two overviews of IT options. Figure 3 summarises all IT options, which are ordered following the six educational functions used in Chapter 16. It helps the participants to choose IT options from the many possibilities. In the second overview, the IT options are combined in Figure 4 with 20 ITedu-tools. It gives an insight into which soft- or hardware can be used to implement a particular IT option.[1]

Suppose you want to learn more about blended and online learning. In that case, you can do so through websites, such as the websites like 3-star learning experiences (Kirschner & Neelen,2023), lde-studiesuccess (LDE, 2023), the Rubens te-learning (Rubens, 2023, in Dutch), SURF (2023) or Design Blended and online learning (Nedermeijer, 2023) and books from Neelen and Kirschner (2020), Luckin (2018), Kirschner and Hendrick (2020), Last en Jongen (2021), Last (2022), Picciano (2019), Stein and Graham (2020) and Bates (2015).

There are many IT options. From a practical point of view, I have arranged the IT options into six groups of evidence-based pedagogical IT options. Give Information and Explanation: Explicitly Focus on Knowledge, Support Self-Study and Classroom Study (Stimulate Active Learning), Strengthen the Preparation of Students for the Professional Field, Incentivise Communication between Students and between Students and Teacher(s). Apply Tests and feedback: Testing Is the Motor of Learning.

1 Give Information and Explanation: Explicitly Focus on Knowledge

Knowledge comprises facts from the discipline and procedural knowledge (analytical and systematic problem-solving strategies, etc.). Students obtain

	1. Give information or explanations	☐	2.3. Offer (extra) study questions, assignments, cases, serious games and simulations, including feedback
☐	1.1. Present learning materials through the VLE	☐	2.4. Use available online pedagogical tools
☐	1.2. Facilitate the use of ebooks, virtual articles and syllabus	☐	2.5. Offer remedial teaching
☐	1.3. Make video lectures and tutor videos	☐	2.6 Sent results assignments through VLE to the teachers, fellow students or both
☐	1.4. Use hyperlinks	☐	2.7. Apply fixed deadlines for assignments/tests
☐	1.5. Connect with (professional) websites and software	☐	2.8. Discuss students' results in the classroom
☐	1.6. Offer additional virtual explanations and electives	☐	2.9. React as a teacher through the forum, a short video film, an online lesson or a F2F lesson
☐	1.7. Wrap your course around an open-source course	☐	2.10. Discuss with the students the necessary study skills
☐	1.8. Make use of an online virtual classroom	☐	2.11. …
☐	1.9. Present case studies, videos, simulations, animations and serious games	☐	2.12. …
☐	1.10. Use pictures and schemes	☐	**3. Strengthen the preparation in the working field**
☐	1.11. Present a glossary	☐	3.1. Introduce students to professional occupations with videos, professional websites, pictures, case studies and projects
☐	1.12. Present study guide and the faculty and teacher messages in VLE	☐	3.2. Give assignments with authentic problems
☐	1.13. Use 3D software	☐	3.3. Use the option for peer feedback
☐	1.14. …	☐	3.4. Organise project work, other group work and internships focus on the profession
☐	1.15. …	☐	3.5. Follow student's competencies with a portfolio
☐	**2. Support self-study and study in the classroom**	☐	3.6. Prepare students for internships
☐	2.1. Present the assignments through the VLE	☐	3.7. …
☐	2.2. Present the assignments of increasingly difficulty	☐	3.8. …

FIGURE 3 Summary of possible pedagogical options for using IT in HE. Cross the options you like to implement in your course. Limit yourself to 5–7 options. Often, more choices mean that the course changes cannot be easily handled

☐	**4. Stimulate communication between students and between students and the teacher(s)**	☐	5.5. Give additional assignment(s) after the test results
☐	4.1. Present students' course information	☐	5.6. Involve students' evaluation of student paper
☐	4.2. Organise teachers' availability through e-mail, consulting hours, and FAQ option	☐	5.7. Ask students to develop test questions
☐	4.3. Formulate clear procedures for e-mail handling	☐	5.8. Give feedback based on a student study result
☐	4.4. Support small or project groups with software	☐	5.9. Check for plagiarism in the work of the student
☐	4.5. Organise a buddy system, involve (student) moderators or stimulate student cooperation	☐	5.10. Follow students' progress with a portfolio
☐	4.6. Organise a discussion forum, a virtual classroom or E-coaching to support the students	☐	5.11. Stimulate social (virtual) contacts before and after a lecture or workgroup
☐	4.7. Enable submitting the group work results or individual self-study with peer assessment	☐	5.12. …
☐	4.8. Stimulate F2F and digital student contacts (social software, chat function, …)	☐	5.13. …
☐	4.9. …	☐	6**. Evaluate a course**
☐	**5. Test and give feedback**	☐	6.1. Evaluate your course with the VLE questionnaire
☐	5.1. Give the students the option to do self-tests	☐	6.2. Follow and analyse the students' study results with the VLE test function
☐	5.2. Give feedback f2f in the classroom or through the VLE about the self-study	☐	6.3. Use learning analytics
☐	5.3. Discuss results and give additional explanation	☐	6.4. …
☐	5.4. Use students' assignments with peer feedback with rubrics as evaluation criteria	☐	6.5. …

FIGURE 3   Summary of possible pedagogical options for using IT in HE. Cross the options you like to implement in your course. Limit yourself to 5–7 options. Often, more choices mean that the course changes cannot be easily handled (*cont.*)

Possible Educational functions which are supported by ICT versus the ICTedu-tools X = application is used for the function o = function is often used with the help of a particular app or plugin	E-book	E-mail	PowerPoint	B LOG, video blog (VLOG)	Website	Podcast or Audiorecording	Clickers	Video clips and tutorials	Video record lecture	MOOC	VLE: Virtual Learning Environment and plugins	Wiki	Animation	Software and hardware used in the discipline	Simulation	Game	Social networks	Portfolio	Cloud	Test, feedback software
1. Give information or explanations																				
1.1 Present learning materials in the VLE	X									X	X									
1.2 Facilitate use of Ebooks, virtual articles, syllabus	X		X	X	X					X	X	o		X					X	
1.3 Make video lectures /tutor	X	o		X	X	X		X	X	X	X	X	X		o	o	o		X	
1.4 Use hyperlinks	X		o	X	X	o		o	o								o	X	X	o
1.5 Connect with (professional) website/ software	X	X		X	X	o		X	o	X	X		X	X	X					
1.6 Offer additional virtual explanations and electives	X	X	X	X	X	X		X	X	X	X	X	X	X	o	o			X	
1.7 Wrap your course around an open-source course	o	o		X	X	X	o	o	o	o	X									
1.8 Make use of an online classroom	X	X	o	X	X				X	X	X	X		X					X	
1.9 Present case studies, videos, simulations, animations, games, etc.		X	X	X	X					X	X			X	X	X	o		O	
1.10 Use pictures and schemes		o	o	X	X					o	X	X		X	o	o	X		O	
1.11 Present a glossary	X	X									X	X		o						
1.12 Present study guide, faculty/ teacher messages	X	X			X			o		X	X									
1.13 Use 3D software													X		X	X				
1.14																				

(*cont.*)

Possible Educational functions which are supported by ICT versus the ICTedu-tools

X = application is used for the function
o = function is often used with the help of a particular app or plugin

Function	E-book	E-mail	PowerPoint	BLOG, video blog (VLOG)	Website	Podcast or Audiorecording	Clickers	Video clips and tutorials	Video record lecture	MOOC	VLE: Virtual Learning Environment and plugins	Wiki	Animation	Software and hardware used in the discipline	Simulation	Game	Social networks	Portfolio	Cloud	Test, feedback software
2. Support self-study and study in the classroom																				
2.1 Present the assignments with VLE.	X								X	X										X
2.2 Present the assignments of increasing difficulty		o		o				X	X	X	X									
2.3 Offer (extra) study questions, assignments, cases, serious games and simulations, including feedback			o	X	o	o		X	o	X	X			X	X			X		
2.4 Use online pedagogical tools	X	o	o	o	o		X			X	X	X		X	X	X		o		X
2.5 Offer remedial teaching		X	o	o	o					X	X			X	X	o	X	X		
2.6 Sent results assignment results through VLE to the teacher or fellow students or both		X		o	o						X		X	X	X	X		X		
2.7 Apply fixed deadlines for assignments/tests										o	X		X	X	X	o				X
2.8 Discuss students' results in F2F										o	X				X	X				X
2.9 React as a teacher in a forum, a video etc.										X	X									X
2.10 Discuss with students the necessary study skills										o	X						X			
2.11																				
3. Strengthen the preparation for the working field																				
3.1 Introduce students to professional occupations with videos, professional websites, pictures, presentations by experts, case studies, projects and assignments			o	X	X			X	X	X	X	X	X	X	X					

Possible Educational functions which are supported by ICT versus the ICTedu-tools

X = application is used for the function
o = function is often used with the help of a particular app or plugin

Function	E-book	E-mail	PowerPoint	B LOG, video blog (VLOG)	Website	Podcast or Audiorecording	Clickers	Video clips and tutorials	Video record lecture	MOOC	VLE: Virtual Learning Environment and plugins	Wiki	Animation	Software and hardware used in the discipline	Simulation	Game	Social networks	Portfolio	Cloud	Test, feedback software
3.2 Give assignments with authentic problems		X	X	X	X			X		X	X	X		X	X	X				
3.3 Use the option of peer feedback																				X
3.4 Organise project work, other group work and internships focusing on the profession							X			X	X						X			
3.5 Follow students with a portfolio																		X		
3.6 Prepare students for internships	X		X	X				X								o				
3.7																				
4. Communicate between students and between students and the teacher(s)																				
4.1 Present students' course information.		X	X	o	o					o	X				X				X	
4.2 Organise teachers' availability through e-mail, consulting hours and FAQ option										o	X					o	X			
4.3 Formulate clear procedures for e-mail handling.	X			o	o					o	X									
4.4 Support small or project groups with software				o	o					X	X					X	X		X	X
4.5 Organise a buddy system, involve (student) moderators, etc.				o						X	X				X	X	X			
4.6 Organise a discussion forum, a virtual classroom or E-coaching										X	X			X		X	X			

(*cont.*)

Possible Educational functions which are supported by ICT versus the ICTedu-tools. X = application is used for the function. o = function is often used with the help of a particular app or plugin	E-book	E-mail	PowerPoint	B LOG, video blog (VLOG)	Website	Podcast or Audiorecording	Clickers	Video clips and tutorials	Video record lecture	MOOC	VLE: Virtual Learning Environment and plugins	Wiki	Animation	Software and hardware used in the discipline	Simulation	Game	Social networks	Portfolio	Cloud	Test, feedback software
4.7 Enable submitting the group work results or individual self-study with peer assessment.				o						X	X			X			X			
4.8 Stimulate F2F and digital student contacts			o	o	o					X	X			X			X			
4.9 ...																				
5. Test and give feedback																				
5.1 Give the students self-tests											X							X		X
5.2 Give feedback F2F in the classroom or through the VLE about the self-study			o				X			X	X			X				X		X
5.3 Discuss results and extra explanations								X			X			X				X		X
5.4 Use students' assignments with peer feedback											X							X		X
5.5 Give additional assignment(s)										o	X									X
5.6 Involve students' evaluation of student paper				X	X					X	X									X
5.7 Ask students to prepare test questions								X		X	X									X
5.8 Give feedback on student study results										o	X			X						X
5.9 Check plagiarism															X	X				X
5.10 Follow students' progress portfolios.																X		X		X

(cont.)

Possible Educational functions which are supported by ICT versus the ICTedu-tools X = application is used for the function o = function is often used with the help of a particular app or plugin	E-book	E-mail	PowerPoint	B LOG, video blog (VLOG)	Website	Podcast or Audiorecording	Clickers	Video clips and tutorials	Video record lecture	MOOC	VLE: Virtual Learning Environment and plugins	Wiki	Animation	Software and hardware used in the discipline	Simulation	Game	Social networks	Portfolio	Cloud	Test, feedback software
5.11 Stimulate social (virtual) contacts before and after a lecture or workgroup											X						X			
6. Evaluate a course																				
6.1 Evaluate your course with the VLE questionnaire				o	o					X	X									X
6.2 Follow and analyse the students' study results with the VLE test-results-help-function										o	X									X
6.3 Use learning analytics										X	X									
6.4 …																				

FIGURE 4　Matrix educational functions versus ICTedu-tools

knowledge through active learning methods. Such methods include active lectures, self-study assignments, problem-based assignments, projects, internships, case studies, group discussions or the internet. Students must be familiar with the context of a lecture or assignment. They learn to relate their newly acquired theoretical insights to the theories from textbooks and professional literature. The teacher stimulates this deepening of knowledge in F2F lessons. By carefully selecting problems and cases, students can build a body of knowledge necessary in the (future) professional field and learn how to apply it in practical, relevant situations. Hattie and Donohue (2016) explain more of this approach in Chapter 12.

Some concepts in a domain are complex and require a more extended study period to be understood. These concepts are named threshold concepts.

> A threshold concept can be akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, interpreting, or viewing something without which the learner cannot progress in understanding a particular topic. (Hudson, 2020)

Such concepts must be studied in several courses. The teachers should agree mutually on how they will teach such a concept. The complexity of the learning activities in the assignments has to be carefully considered. The learning tasks in the assignment should not be too complex or too easy for the students. Well-designed pedagogical systems prevent cognitive overload by students. If necessary, you can decrease some irrelevant content and optimise content relevant to learning (van Merriënboer & Kirschner, 2013). In Tables 20 and 21, you will find suggestions for preparing assignments.

1. Options to apply IT in giving information and explanation
1.1 Present learning materials through VLE: video lectures, digital texts, syllabi, articles, digital explanations and other course materials. Copyright is often no problem in HE;
1.2 Facilitate students using the internet, eBooks, virtual articles and extra background information;
1.3 Make the presentations/lectures of the teachers or guest lecturers available on video. Students should be helped to find the relevant parts in the presentations easily;
1.4 Use hyperlinks to additional resources on the internet;

1.5   Connect with websites (professional) software and libraries;
1.6   Offer additional explanations to explain complicated topics or present electives;
1.7   Wrap your course around a course available on the internet (MOOCS and OERS);
1.8   Use an online virtual classroom, like Zoom, Teams or the BigBlueButton (Moodle);
1.9   Provide case studies, videos, simulations, animations and games with regular and additional information;
1.10   Use pictures and schemes (for example, built up step by step);
1.11   Provide a glossary with defined concepts;
1.12   Explore information on the internet with various search options;
1.13   Use 3D programmes with a virtual and augmented reality spectacle.

2   Support Self-Study and Classroom Study (Stimulate Active Learning)

Learning is an active process, as will be explained in Chapter 13. Students study actively in the classroom, either in groups or by self-study, to master learning objectives instead of passively listening. This approach enables complex learning. The students learn to apply their knowledge in classroom assignments or through self-study. The assignments focus on learning tasks relevant to the learning objectives. The students will obtain feedback after finishing the assignments. The complexity and size of the assignments will increase during the study years, motivating students to study these assignments. IT options to support the self-study of students are shown in the textbox. The expectations of teachers concerning the learning of students are transparently described in the course program in the VLE. The learning objectives of a course should be logically related to other courses and learning tracks in academic curricula.

Teachers, tutors or both support the self-study of the students. The students should increase their capacity to study independently during their studies. The design task of teachers is to find meaningful learning activities that stimulate students to study independently. A suggestion in this respect is stimulating the students to study regularly instead of waiting until before the test. The simple principle behind this suggestion is that if students devote more time to studying, their results will improve. Often this is called the time-on-task principle. As a teacher, it is more stimulating if the students study the subject matter during the course. As a result, the substantive level of your lessons can often

increase. A significant result can be that the test results improve, provided that the course program and the test questions are aimed at the formulated goals.

---

2. Options for using IT to support self-study and classroom study

2.1   Present the assignments through the VLE. The teacher can easily include all relevant information for the case studies in the VLE: pictures, Excel sheets, videos, written text and URLs. If there is no time for extra exercises in the classroom, the VLE allows additional assignments with feedback that should be used in self-study. Sometimes small groups of students are organised to discuss their results;

2.2   Increase the difficulty or complexity of your exercises or tests in the VLE. The complexity and difficulty of learning activities should increase when using a sequence of assignments: the last assignment should be identical to the final test questions;

2.3   Offer (additional) study questions, assignments, case studies, games, simulations and exercises. Provide feedback with the correct solutions and short explanations;

2.4   Use online pedagogical tools (e.g. discussion forum, glossary, etc.) in your classroom and self-study;

2.5   Deliver the assignment results through the VLE to the teacher/students;

2.6   Offer remedial teaching to help students acquire the entry-level of your course;

2.7   Apply fixed deadlines for delivering an assignment to the teacher or fellow students;

2.8   Discuss the results in the classroom. The teacher, tutor and fellow students can give feedback. Or provide standard answers through multiple choice questions or short answer questions;

2.9   React to the results of students through the forum, a short video film or an online lesson. The teacher should bring the know-how of students to a higher theoretical level;

2.10   Discuss the learning track with the students to develop their study skills. Supporting tools like checklists, formats, logbooks, timesheets and step plans are available for the students.

---

3   Strengthen the Preparation of Students for the Professional Field

Correlate learning with the professional or academic field to make learning more relevant and engaging. Students can develop professional competencies, attitudes and relevant knowledge necessary to succeed in their careers.

The focus will be on complex learning. Students learn to use the subject matter with real work scenarios (authentic learning). This will decrease the gap between theory and practice in the professional/academic field. The transfer of knowledge is challenging and requires significant practice in different scenarios. Students prepare themselves for lifelong learning during their studies (see the article by Hattie in Chapter 13).

The university staff chooses competencies in cooperation with the professional and academic fields. Theory, skills, professional attitudes and 21st-century competencies are integrated into the learning activities. Students are encouraged to build a repertoire of solved professional cases crucial to problem-based learning. Students should be involved in innovative projects and study relevant developments in the discipline. Nedermeijer and Pilot (2000) explain how to design and develop professional education focussed on professional competencies.

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3. Options to apply IT to strengthen preparation for the professional field

3.1   Introduce students to professional occupations through videos, professional websites, pictures, presentations by experts, case studies, projects and other assignments;

3.2   Give assignments using authentic problems and issues from the professional field. Use real cases (from simple to complex, from easy to complicated theoretical content, from 0.5 hours to five weeks). Cases represent the typical activities, situations and problems from the professional field of the students;

3.3   Give assignments to the students in which they have to give feedback to other students (peer feedback). Use rubrics as evaluation criteria. An important aspect is that you have to teach the students how to evaluate their colleagues. The teacher will organise some special assignments for this activity, providing test examples;

3.4   Organise project work, other group work and internships to exercise relevant professional problems, issues and software. Provide support to the students with the available software;

3.5   Follow the development of the competencies of the students during their educational careers with the help of a portfolio. These competencies and their assessment criteria must be compared with the professional field;

3.6   Prepare the students at the university if they have to finish a test before entering an internship or other practical activities. Often, students are allowed to start an internship only if they have mastered the competencies of their field to a certain level. Offer additional modules and tests to support the preparation of students.

4   **Incentivise the Communication between Students and between Students and Teacher(s)**

Social bonding is crucial to keeping students committed, active and on track. Students learn from each other by verbalising and exchanging their knowledge, insights and approaches. Peer learning is often applied in blended learning and MOOCS. Collaborative learning effectively allows students to learn from their fellow students. Students must learn 21st-century competencies to collaborate with other professionals and clients. Tutors (e.g. teachers, volunteers and senior students) support and guide the self-study and group assignments. Ideally, tutors are available for support at specified hours.

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4. Options to apply IT to incentivise communication between students and between students and teacher(s)

4.1   Provide information to students about your course through the VLE or e-mail. Present the study guide, notifications and ad hoc changes in the programme and activities through a VLE. Present short videos and virtual reality programmes where senior students show and explain how to study at their university/faculty. By doing this, new students will obtain a first idea of what they can expect from the course;

4.2   Organise the teachers' availability through e-mail, consulting hours and informal meetings before and after a lecture/workgroup. Use the possibility of a FAQ section. Often, standard answers are sufficient;

4.3   Formulate clear procedures for e-mail handling. Set up rules for class e-mails: response time, use of decent language, standard layout, attachment format, indicating when the students can expect a reaction from the teacher, keeping a copy of the vital correspondence of separate courses under separate mail addresses;

4.4   Support small or project groups (in your classroom) with the VLE or other available software or plugins;

4.5   Organise a buddy system, involve (student) moderators or stimulate cooperation between students living in their neighbourhood to motivate them to study regularly;

4.6   Organise a discussion forum, a virtual classroom or E-coaching (video, chat or exchange of documents) to support the students during their studying periods outside the classroom or campus;

4.7   Enable the submission of group work results or individual self-study for informal assessment by the teacher or through peer assessment;

4.8   Stimulate F2F and online student contact before and after online sessions: e-mail, digital lessons, chat function and other software.

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5   Apply Tests and Provide Feedback: Testing Is the Motor of Learning

Through testing, the faculty can determine whether the students have the desired/expected level of competency. The study behaviour of students is strongly influenced by the content and format of the tests (constructive alignment) and the various feedback formats provided by their teachers. Students will be more motivated if they are informed about their study progress and receive regular feedback answering two questions: How did I do it? Am I doing it correctly and for the right purposes? Arrange for proper feedback on the performance of the students during the course.

Spreading exams over time is more effective because there is less 'competition' for the learning time of students when preparing for the different tests. The same applies to the test results when subsequent courses have already started.

Consider preparing a summative and diagnostic test to organise the various tests in the programme. It is good to schedule a test plan for your summative and formative tests that fits the learning objectives and methods. An extra element is to consider measuring the qualities of the summative tests, for example, by the VLE.

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5. Options to apply IT to test and provide feedback

5.1   Provide students the option to do self-tests with the same difficulty and format as the final test. Performing a test is a better learning activity than reading a book twice or thrice. Students can do a progress test to evaluate whether they have already reached the expected level required by the teacher. The test results are sent to teachers who assess the work independently. Often, a standard checklist is available for use in the assessment. The teachers send their feedback to the students through the internet;

5.2   Provide appropriate F2F feedback through the VLE (e.g. a forum, a short video film or an extra online lesson). It should be clear to the students whether their assignments and tests were correct or not and what the correct answers were;

5.3   Discuss the results of the self-study and tests in the classroom. If necessary, provide additional explanations in the classroom and the VLE. The tests might have the same level of difficulty and the same format as the final test;

5.4   Use assignments in which the students must give feedback on the assignments of other students;

5.5   Combine test results with the extra assignment(s) to incentivise additional study periods for students;

5.6   Involve students in evaluating a paper or the products of other students. For example, all students must evaluate two papers with the help of a checklist (peer feedback). Often, students can improve their products and send their final results to the teacher. The teacher assesses the given evaluation and formulates improvements. Then, the teacher will provide the final scores. The teacher might provide feedback in online or F2F sessions. It is recommended that rubrics be used as evaluation criteria. The checklist is discussed and formulated during the course;

5.7   Ask students to develop test questions themselves to demonstrate their understanding. Some of these questions could be used for future test opportunities;

5.8   Provide feedback based on the study result overview of students;

5.9   Check for plagiarism with special software. A computer check for plagiarism is a possibility for evaluating papers and bachelor's theses;

5.10   Follow the progress of students with a (virtual) portfolio;

5.11   Stimulate social (virtual) contacts before and after a lecture or workgroup.

6   Evaluate Your Course

In the VLE and other education software, there is the possibility of collecting information about the learning process of students. For example, Moodle and other VLEs use analytics models to collect and order information about the study progress and the study activities in the VLE of the students. Moodle also gives an overview of the study results of each student. Another example is you can prepare, organise, and analyse a questionnaire in VLE and other educational software.

6. Options to evaluate your course

6.1   Evaluate your course with the help of the questionnaire function available in the VLE;

6.2   Analyse the results of students in the overview of the test results in the VLE;

6.3   Analyse the test results of the students. Did the students meet the learning objectives?

6.4   Analyse the use of the course materials (and the students) with the learning analytics software in VLE (SURF, 2023).

7   Summary

In this chapter, I have tried to provide a valuable overview of the IT options described in the literature. IT options shown in this chapter, in which six pedagogical types were discussed, are summarised in Figures 3 and 4. When you want to use the list in your institute, you might consider rearranging and upgrading the IT options according to the pedagogical vision of your organisation.

The number of IT options is developing relatively fast and new software is being produced for all pedagogical options. Additionally, you can think about 3D experiences, Artificial Intelligence, ChatGPT, which provide new possibilities and sometimes problems for improving the learning of students. This software offers all kinds of interesting possibilities. But, the realisation needs enormous investments to design and develop educational materials and programs of high quality, which should be compared with the game industry.

I believe the education community must be more active, indicating which learning and teaching problems or wishes IT should be available. The IT people can be expected to correctly translate these pedagogical questions and develop practical new ideas. My wishes are, for example, how can you support self-study at home with personalized feedback, digitize modular education (Modular education has been proven effective if well designed) and realistically support teachers in designing a course.

Note

1   A print version of Figures 3 and 4 is available on the website bl.curriculumdesignhe.eu

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Course Development from a Design Perspective

A workable evidence-based design process is the third ingredient for course design. The main feature in my book to build a course design and development process is a combination of the technical design approaches described in the books Delft Design Guide by Van Boeijen, Daalhuizen, Zijlstra, and Van der Schoor (2021), The Snake-model by Van Roozenkrans (2020) and the Vision in Design Approach by Hekkert and van Dijk (2011; Chapter 18, Section 2.1). The typical design features of their design approaches are combined with additional design features from instructional design, complex problem-solving, creativity, design thinking and my experience and that of my colleagues in our educational projects.

This chapter presents the Basic Design and Development process (= Basic DD Process) as described in Figure 5. A short description of the Basic DD process is given in Chapter 6, Section 5. Chapter 6, Sections 5 to 13 give a detailed description of the six main design activities.

The second main feature followed in my book is that different design situations require different design and development activities. In Chapter 6, Section 1, five different design situations of a teacher designer are described briefly.
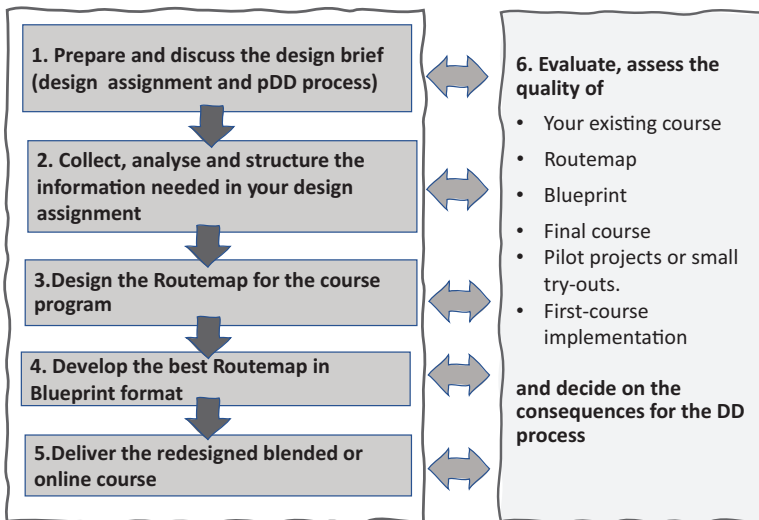
FIGURE 5   Design activities in the basic DD process

In design situation 1, the 6-step DD process in Figure 6 can be followed. The 9-stage DD process described in Figure 7 can be followed in design situations 2 and 3. The Basic DD process, as described in Figure 5, is meant for the more difficult or complex course design situations described in design situations 4 and 5. The context of a design task will be different and should affect the DD process. The design activities in the Basic DD process will be relevant in most contexts. Consequently, the teacher designer should adapt the Basic DD process to decide on their own personal design and development process (pDD process), which fits their situation.

It is possible that in the description of the design activities in this chapter, I sometimes use terms which will be explained in later chapters. In the Glossary, the most relevant terms are explained and in the Index, an indication is given where the term is explained.

The main topics discussed in this chapter are Different Design Situations Ask for Different DD Processes, The Emerging Ideas of Your New Course, Course Design Is An Iterative Process of Alternating Divergent and Convergent Thinking, Teacher Designers Are Craftspeople, Design Activities in More Detail, Design Activity 1: Prepare and Discuss the Design Brief, Design Activity 2: Collect, Analyse and Structure the Information Needed, Design Tools 1: Verbs for Learning Objectives, Requirements and Quality Criteria, Design Activity 3: Design the Route Map for the Course Programme, Design Tools 2 Educational Methods and ITedu-Tools, Design Activity 4: Develop the Route Map in the Blueprint Format, Design Activity 5: Deliver the (Re)designed Blended or Online Learning Course. Design Activity 6: Evaluate and Assess the Quality of the Design Results and Decide on Consequences for the DD Process and Summary.

1   Different Design Situations Ask for Different DD Processes

The purpose of course design is described by Earl (1987) as to find the plan, structure and instruction strategy that leads to pre-specified learning goals. These goals can be described as very precise or very general. Sometimes the goals are formulated by the teachers, sometimes by students and sometimes by both. Beetham and Sharps (2007) described course design as an excellent learning process regarding teaching and learning activities and supporting materials. In my book, I combined both formulations: the design process aims to arrive at an excellent learning process for your course with a learning environment to support and optimally stimulate such a learning process.

In Higher Education, teachers can be confronted with different situations to (re)design a course's learning process. Below is an overview given of five relevant design situations for teacher designers.

The main difference between the five design situations concerns the expected complexity of the design task. The teacher designer:

1. Have a limited number of new ideas they want to implement in the current course;
2. Have several new ideas for some crucial changes in the pedagogical approach they have to design the complete course. The learning environment remains broadly the same;
3. Have to restructure their course because of serious problems or wish to develop the concerning subject matter and learning objectives;
4. Must restructure their course because of new pedagogical visions, unique learning activities and materials;
5. Must design a completely new course: new content, new didactics, new requirements, etc.

For the first design situation described in Table 5, the entire Basic DD process is unnecessary. I advise using a simpler version of the Basic DD process described in Figure 6. This 6-step DD process should be personalised depending on the context. These personalised versions of the Basic DD process are denoted in the book as pDD processes.

TABLE 5   Design situation 1

Design situation 1	Design and development tasks
The teacher already has limited ideas on improving the current course using IT.	– Think up and select IT ideas.
	– Formulate the expected benefits.
	– Update your existing course description.
The maximum of changes is 4–7.	– Create and select ideas for the Route Map and assess the learning process's quality.
Learning objectives and the course content will not change very much.	
The redesigned course should be effective, efficient, valued and well-liked (Table 1).	– Design of learning activities and materials.
	– Elaborate on your Blueprint.
The redesigned course should be feasible for students and teachers.	– Formulate quality criteria and evaluate intermediate products.
The IT environment is already working.	– Prepare implementation of the redesigned course.

| Step 1 | Select your IT changes and formulate the expected benefits. |

| Step 2 | How can you realise the selected ideas about using IT? |

| Step 3 | Describe your existing course with the diamond diagram. |

| Step 4 | Prepare the route map and your requirements. |

| Step 5 | Prepare the blueprint. |

| Step 6 | Develop your redesigned course and deliver your course. |

FIGURE 6   The 6-step DD process

TABLE 6   Design situation 2

Design situation 2	Design and development tasks
The teacher has several new ideas for crucial changes in the pedagogical approach for which (s)he redesigned the complete course. For example, implement the idea of 'blended learning' or 'active learning'. The course content and learning objectives will only change slightly. The design task is more complicated compared with Design Situation 1. The teacher needs more information about the pedagogical possibilities offered in the pedagogical concept.	– Collect information needed in the design process. – Create and select IT ideas. – Describe the course systematically. – Create and select ideas for the Route Map, reflecting the learning process followed. – Design of new learning activities and materials. – Elaborate on your Blueprint and your final course plan. – Deliver the ready-made course program (and official documents). – Formulate quality criteria and evaluate intermediate products. – Prepare implementation of the redesigned course.

For the second design situation in Table 6, the 9-stage pDD procedure can be used. An essential characteristic in the design situation is that the teacher designers start thinking about a complete regular course. There is no need to start with pedagogical analyses like formulating learning objectives or
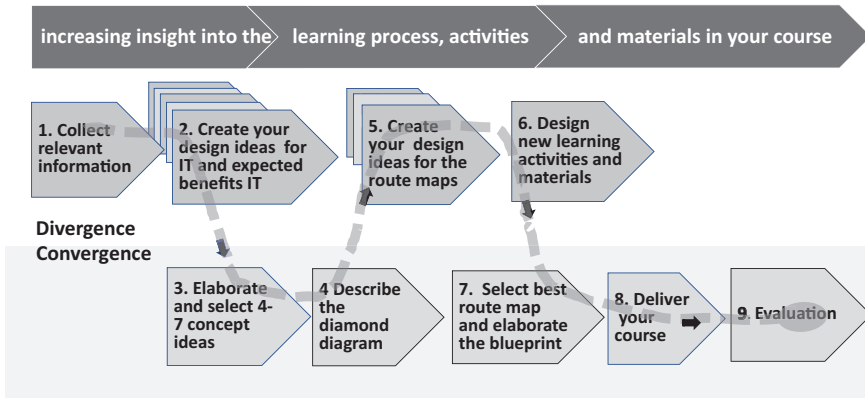
FIGURE 7   The 9-stage DD process

analysing the topics. Besides selecting IT options, the teacher designers might be interested in other pedagogical options of modern higher education. For this, they have the re-analyse the diamond diagram.

In Chapter 9, I describe the programme and learning materials for the workshop Redesign Your Course in a Blended Learning Course. This workshop is meant for teacher designers working in de design situation two. The pDD process used in the Introduction training is described in Figure 7.

TABLE 7   Design situation 3

Design situation 3	Design and development tasks
The teacher must restructure his course because of serious problems or wishes concerning content and learning objectives.	– Formulate the design brief carefully: Problems or wishes and approach.
The main lines of the program will change: there are no simple solutions.	– Analyse the consequences of the formulated problems or wishes.
The teacher does not yet have clear ideas about the format of the necessary changes.	– Formulate and evaluate the ideas for possible solutions. Choose the best one.
The design process is more complex and asks for more knowledge and creativity.	– Describe the pedagogical vision and study the course content's relevance and the didactics.
The teacher should invest extra time in changing the current course.	– A new learning process and learning environment must be designed and developed.
	– The development of new learning activities and materials is necessary.

TABLE 8   Design situation 4

Design situation 4	Design and development tasks
The teacher must restructure their course because of the new pedagogical vision, unique learning activities and materials. The main lines of the program will change: there are no simple solutions. The teacher has not yet have clear ideas about the format of the necessary changes. The design process is more complex and asks for more knowledge and creativity. The teacher should invest extra time in changing the current course.	– Formulate the design brief carefully: Problems or wishes and approach. – Analyse the consequences of the formulated problems or wishes. – Formulate and evaluate the ideas for possible solutions. Choose the best one. – Describe the pedagogical vision and study the course content's relevance and the didactics. – A new learning process and learning environment must be designed and developed. – The development of new learning activities and materials is necessary. – The design brief must be formulated carefully: problems or wishes and approach. – Study the possibilities of the new pedagogical approach in more detail. – Adapt the main lines of the course program.

In the third and fourth design situations, I advise following the design activities of the entire Basic DD process described in Chapter 6, Section 6 to 13. The teacher designers select the necessary design tools and adapt the pDD process carefully. The diamond diagram's five pedagogical or instructional analyses are crucial for a successful design task. I have followed the Basic DD process to design the Blended learning workshop. This process is described as a case study in Chapter 10.

The fifth design situation concerns designing and developing an entirely new course program. Following the Basic DD process stages can greatly help the teacher designer or the teachers' team design the new course.

In addition to these five design situations, the Basic DD process might be focused on solving wicked problems at the faculty or university level. A wicked problem is a social or cultural problem that is difficult or impossible to solve for as many as four reasons: incomplete or contradictory knowledge, the number of people and opinions involved, the significant economic burden and the

TABLE 9   Design situation 5

Design situation 5	Design and development tasks
The teacher designer or the teacher's team must design a completely new course: new course content, new didactics, new requirements, etc. It is an open problem and asks a lot of your creativity. (A wicked problem). The teachers do not have concrete ideas about a possible learning process and environment. It's a full-fledged design assignment.	– Analyse the pedagogics for the consequences of the learning process and the learning environment. – Formulate ideas for the main lines of the course. – Apply the design tools. – Select and structure the course content and learning objectives – Prepare new learning activities and materials expected to be necessary.

interconnected nature of these problems with other problems. Teacher designers will work together with managers and supporting staff to find answers. The problem of wicked problems is that involved faculty should develop new opinions about education. The Basic DD process will give even more weight to the pedagogical considerations besides the practical and political considerations in these situations. Examples of wicked problems are finding an acceptable selection procedure for the students in the first year, introducing Modern Higher Education, counter racism, using English in the various courses, solving diversity problems and improving the quality of the bachelor's and master's thesis.

2   The Emerging Ideas of Your New Course

Design is goal-oriented and normative; this is different from the scientific approach. The teacher designer strives to balance what is desirable from the viewpoint of design, the possibilities of available IT (hardware and software) and the characteristics of students and teachers. The thinking of the teacher designer is driven by possibilities, not constraints (Earl, 1987) and Visscher-Voerman (1999). In design, there is no one best solution. You carefully select the appropriate evidence-based IT options and consider using them in the design of the learning process. The concept of evidence-based course design is explained in Chapter 3. Evaluating your design results using the quality criteria you formulated during the Basic DD process is crucial.

The design process ends when the teacher designers think their new course has the necessary attributes. The teacher designer should have a detailed overview of the course prepared in the VLE, combined with most of the assignments and other learning materials. Still, you may introduce necessary changes or additions to the VLE before or during the course development. One of the most admirable aspects of VLEs is that it is simple to add new exercises, change sequences or add tests.

This way of thinking is different from scientific thought. The researchers will finish their research activities if they prove their findings are correct and publishable.

3 Course Design Is an Iterative Process of Alternating Divergent and Convergent Thinking

Design is an ongoing process of refining your ideas. You do not necessarily have to start with your first design activity. You can begin your course design from where you want and arbitrarily continue with other design activities. Theoretically, you can go through all design activities in just one cycle. However, usually, you need to iterate and go back and forth in your pDD process until you are satisfied enough with the redesigned course. Making mistakes is typical during the design process. You analyse your mistakes, learn from them and formulate new and better ideas. Celebrate trial and error and critical thinking!

An important rule is that the teacher designer should finish all design activities in the design process. The results of the design activities should be coherent with each other.

In a design process, you alternately think of divergence and convergence (Roozekrans, 2020) (Van Boeijen et al., 2020). The alternation between divergent and convergent thinking during the Basic DD process is shown in Figure 8 divergence and convergence thinking are both essential aspects of course design. The divergent side creates possible new pedagogical options for your course design. At the same time, the convergence side makes choices about which ideas are most promising. Before finishing a design activity, always ask yourself: do my ideas fit my educational vision and learning objectives?

Creativity and intuition are vital elements of divergent thinking in a design process. In other words: without creativity and intuition, your pDD process will end. Some tips on stimulating your creativity are given in Chapter 6, Section 9, Table 16. Please also check Chapter 21, in which creativity is discussed.

In convergent thinking, you need creativity to adapt or combine promising ideas.
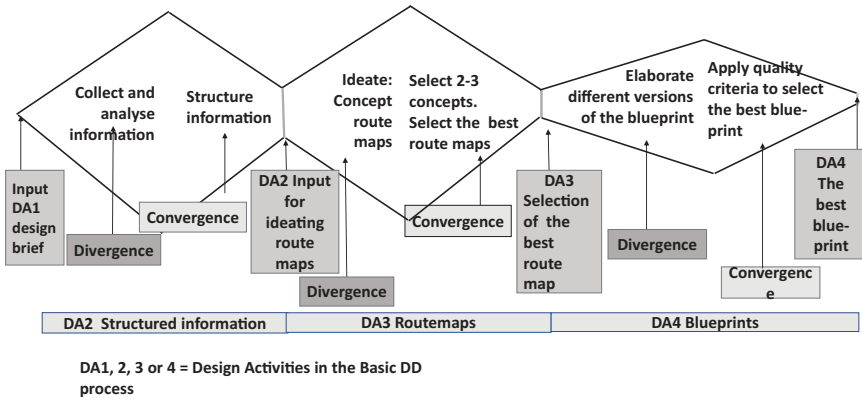
FIGURE 8   Divergent and convergent thinking in the Basic DD process

4   Teacher Designers Are 'Craftspeople'

Teacher designers are craftspeople. They master the necessary instructional course design skills. For example, teacher designers have mastered the skills required to prepare the learning process for students, formulate learning objectives and have insights regarding pedagogical possibilities of learning methods and materials and how to make these materials. They must also understand and apply evidence-based pedagogical options in new teaching-learning situations.

Cooperation in a small teacher group (or team teaching) is an important supplement to help the teacher designer during the course design. The input of your colleagues' ideas and comments can be beneficial. Also, you can divide tasks between the group members, giving you more space to carry out your design task. And very importantly, working together can have a robust motivational effect. Nonetheless, diversity between the group members is complex and challenging. The reward is you obtain more different ideas. Examples of possibilities to work together in the pDD process are brainstorming, the nominal group approach or the project group. A helpful overview of suggestions to work together in a DD process can be found in the Delft Design Guide (Van Boeijen et al., 2020) and the manuscript by van Post et al. (2022) gives a blueprint for teacher design teams to create professional development interventions (see also Chapter 18, Section 3.6).

Another valuable opportunity to think about course design is demonstrated in Figure 9. During the pDD process, an idea for your course emerges. First, the route map, the blueprint and finally, the final programme. Step by step, you create your new course. The main inputs to stimulate the emergent process are the pedagogical ideas to apply IT, ideas about realising the IT ideas in your course and the systematic description of your course in the diamond diagram. The diamond diagram gives a systematic pedagogical description of the course
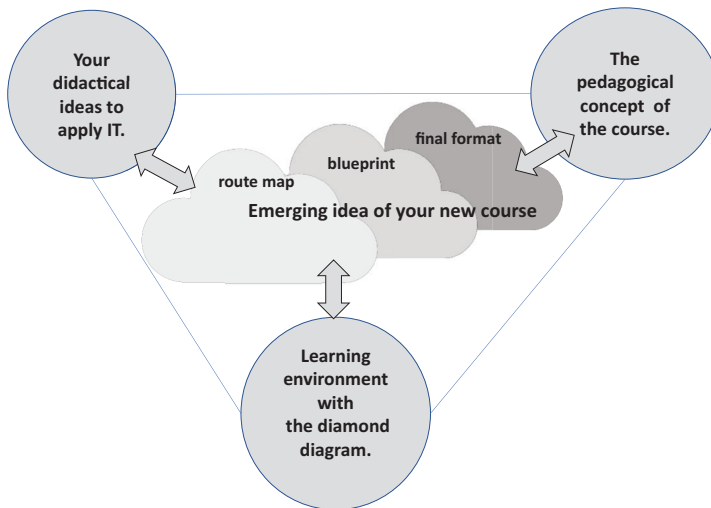
using five essential instructional elements: learning objectives, course content, methods/media, test criteria and constraints.

5   Design Activities in More Detail

The six main design activities in the Basic DD process are presented in Figure 5. In this section, a short description is given of the six main design activities

5.1   *Design Activity 1: Prepare and Discuss the Design Brief (Design Assignment and DD Process)*
1.   Prepare a 'design brief' to explain your course design task;
2.   Prepare the pDD process you like to follow to finish the design task.

When you start redesigning your course, you first need to think about how you tackle your course design task. There is no standard course design and development process that you can follow step by step. The difficulty and complexity of the design task and your experience as a teacher designer determine your course redesign and development process. The consequence is that the teacher designer should make its version of the Basic DD process.

5.2   *Design Activity 2: Collect, Analyse and Structure the Information Needed in Your Design Task*
1.   Make a systematic description of the learning environment (Table 10), including the diamond diagram or the spider diagram (Figures 10 and 11);

2. Formulate the pedagogical concept of your course with the existing and new pedagogical measures;
3. Formulate the quality criteria you and the management decided for the new course more precisely;
4. Explain the other considerations you consider necessary.

A design process is also a learning process. The teacher designer tries to grasp the relevant knowledge, conventions, assumptions, examples, best practices and theories suitable for the design task. You need a certain amount of expertise to find new ideas. Use sources with authority regarding scientific evidence and the experiences of trusted colleagues or educational experts.

5.3   *Design Activity 3: Design the Route Map for the Course Programme*
1. Elaborate on the learning trajectory by building on the structured information prepared in design activity 2 (diamond diagram, pedagogical concept, the learning environment and the blueprint);
2. Use the possibilities offered by design activity 2 to arrive at appropriate concept ideas and design concepts;
3. Select the structure, learning activities and materials you want to use in your course;
4. Think of possible ideas for your route maps. Select three to five meaningful ideas for your route maps. Evaluate these ideas using your list of qualities. Select the final route map concept to elaborate on the blueprint.

5.4   *Design Activity 4: Develop the Best Route Map in the Blueprint Format*
1. Introduce all topics of the course, following the selected structure, as described in the route map:
    – The necessary learning activities for the students;
    – The expected learning results;
    – The teaching activities;
    – The use of IT and practical exercises.
2. Check the blueprint with the four implementation questions from Chapter 3, Section 5. Prepare the IT activities.

5.5   *Design Activity 5: Deliver the (Re)designed Blended or Online Learning Course*
1. Develop the final lesson plan, teaching activities and materials for the course;
2. Develop new assignments and materials;
3. Prepare yourself for your work as a teacher.

5.6   *Design Activity 6: Evaluate and Assess the Quality of the Design Results and Decide on Consequences for the DD Process*

1. After each design activity, evaluate whether you are still on the right track with your course design;
2. Do you still meet your selected quality criteria?
3. Assess whether the design and development results fit the official institutes' requirements for the learning environment, like study hours, classrooms, pedagogical concepts and test format;
4. Decide what adjustments and additional design activities are needed;
5. Prepare the evaluation activities and materials for minor try-outs for new teaching or learning activities;
6. Prepare an evaluation of the implementation of your newly redesigned course.

The order in which you conduct the design activities is not fixed. Sometimes, you begin by collecting additional information. Sometimes, you already have so many ideas that you start devising a new course programme. But when you are ready with your program, you should finish the previous steps and check whether the intermediate products in the pDD process are well connected and fit logically with your design task and the final course design. Sometimes this means you need to start collecting additional information and apply these insights in your other design activities.

6   Design Activity 1: Prepare and Discuss the Design Brief
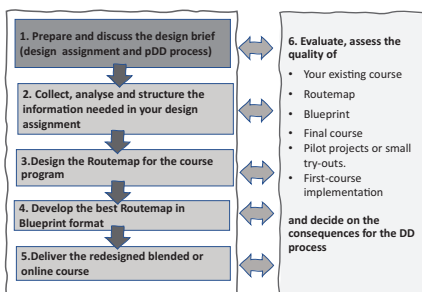
1. Prepare a design brief to explain the course design task and the pDD process you follow to finish the design task;
2. Plan to work in a teacher team, individually or in another group.

You decided to redesign your current course in blended learning or online courses. What benefits do you think you can achieve? When do you think you will have finished the design task? Which qualities should be realised? Which topics will require further elaboration? How will you approach the pDD process? Do you consider working on the DD process with a few colleagues? Team teaching often turns out to be very effective.

You may summarise the answers to these questions in a short design brief, the starting point of the design process.

6.1   *How Do You Compose a Design Brief?*

A design task is only a design problem if it cannot be solved by applying standard approaches. Also, you do not start the design process if you can deduct a solution to your design task from your problem description. A design task should have enough freedom to formulate all kinds of relevant solutions. The design task should not be too broad. You should be able to solve the design task in your available time. But the problem description should not be too small because this might limit your thinking about possible solutions. This means you can miss the best solution.

At first, you formulate some pedagogical ideas on how you think you should face your design task. You may also describe the expected results, the qualities you think the redesigned course should have, the pDD process you like to follow in designing your course and the necessary financial and personal support.

Then, you collect high-quality information to adequately formulate and explain the instructional design for yourself, your colleagues and the management. The text should be short, clear and convincing for you and your colleagues. Discussing this design brief with your colleagues and management would be best. Do they agree with the design brief? Is your plan realistic? Do they have any suggestions? What do they see as possible effects on the other courses in the programme? After all, in most cases, the renewed course will have to fit into the existing curriculum.

7   Design Activity 2: Collect, Analyse and Structure the Information Needed
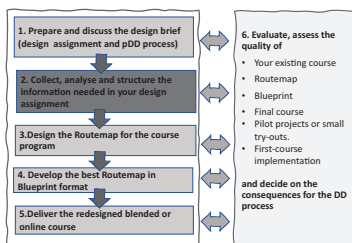
1. Make a systematic description of the learning environment (Table 10), including the diamond diagram (Figures 10 and 11);

2. Draw the pedagogical concept with existing and new pedagogical measures (Appendix A, Chapter 10, Section 3.3);

3. Formulate the quality criteria you and the management set for the new course (Figure 1 and Figures 13, 14 and 15 in Chapter 6, Section 8);

4. Explain the other points that you consider essential.

TABLE 10   The elements of a learning environment

A strong foundation under your course design is the learning environment. The elements of a learning environment

1.   The diamond diagram with the elements of learning objectives, course content, methods/media, formal and informal tests (methods and criteria) and constraints (see Figures 10 and 11);
2.   The pedagogical concept of the programme. What are your pedagogical principles (explained and illustrated with examples);
3.   The sequence to order the content, teaching, learning activities and materials;
4.   Quality criteria you want or have to realise in your course;
5.   Modules to close knowledge gaps (if needed) for certain groups;
6.   The necessary learning spaces: lecture hall, instruction rooms, project rooms, practical workrooms, classrooms, computer practical digital exams hall, exam hall, Computer working room, study workplaces and other meeting places;
7.   A well-functioning IT infrastructure (e.g. staff, software and hardware);
8.   Students and teachers are prepared to work with the proposed (IT) pedagogical methods.

When designing a course, I use various design tools that help me describe the learning environment of the course (Table 10). This detailed, short and precise elaboration of the learning environment forms a strong foundation for the course design process. This book emphasises that you use educational research results as much as possible. Educational and instructional research provides many evidence-based pedagogical suggestions, which I ordered in course design tools. An overview of these tools is given in Chapter 11. The design tools I use are evidence-based. What an evidence-based approach entails is discussed in Chapter 3. The design tools form my interpretation of the scientific descriptions of relevant research results and their possible practical applications as formulated in the scientific literature.

During the course pDD process, you collect and study additional information. Slowly, you will obtain better insights into the design problem and how the students could master the learning objectives and interact with the teacher, the other students and the learning materials. Using these insights, you can formulate additional quality criteria for the final course activities, materials and learning environment. These quality criteria give practical guidelines to teacher designers to decide when they can be satisfied and finish the pDD process.

Design activity 2 consists of five steps in using various design tools. These steps are explained below. A note beforehand. While collecting, interpreting and structuring information, you may obtain exciting ideas about your course. Please write them down immediately. Such ideas come in handy when designing the route map and blueprint of your course in the following two design activities. Sometimes, it is wise to develop such an idea a little further. This will give you insights into whether the concept is helpful and needs further development. After that, you are supposed to continue collecting other information

7.1   *The First Step Is to Fill in the Diamond Diagram*

The first step is to make a systematic pedagogical description of your course using the official course description and your ideas for using IT based on the elements from the diamond diagram design tool (Figures 10 and 11). Preparing a diamond diagram or a spider web diagram is a crucial stage in the design process. It is the first systematic summary of the information you need in the course DD process.

The spider web diagram is more comprehensive than the diamond diagram. All the spider web diagram elements are relevant to the learning based on only five features used in the diamond diagram for the pDD process. During the pDD process, you need to make several pedagogical analyses to help you decide how
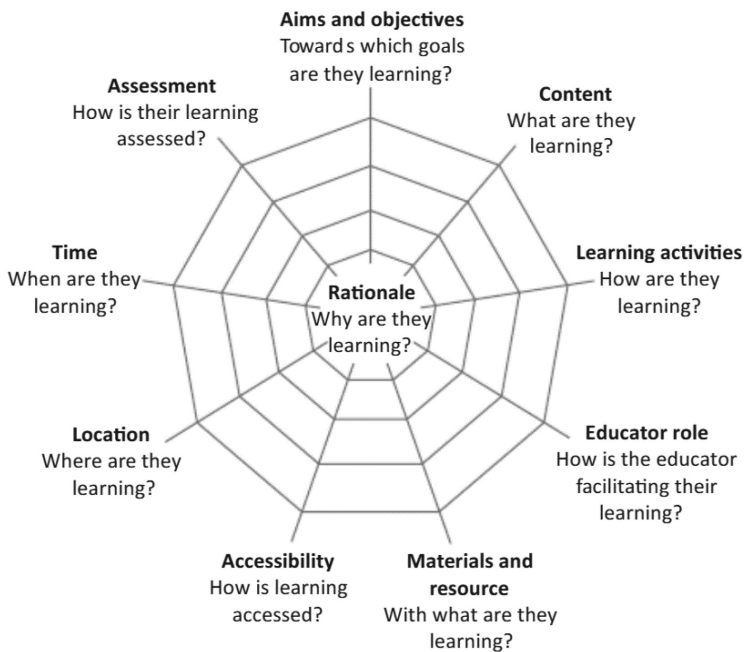
FIGURE 10   Spider diagram (van der Laan and Bron, 2018). The components and key questions of the spider web
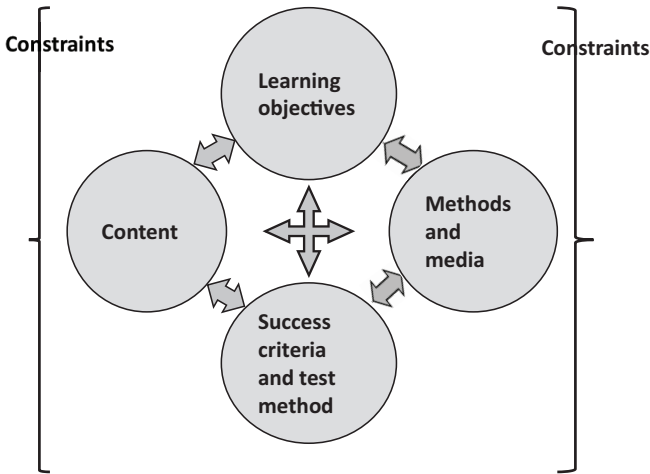
you would like to support the learning process for various groups of students. You will need to summarise or combine all these pedagogical insights into a coherent whole in the learning environment. The components of the learning environment are described in Table 10 to determine your course's nature, content and structure. Different pedagogical models require other formats of learning environments. You must develop more insight into the learning environment in which the course will function. Nonetheless, the focus will be on the environment during the pDD process. Sometimes it is necessary to collect additional information, analyse and structure the learning environment components again: Prepare the nth version of the learning environment.

7.1.1   The Learning Objectives

Do the learning objectives of your course sufficiently reflect these typical outcomes? Do you describe the course's four to six learning objectives (or competencies) precisely enough? What improvements are needed? On the website Creativemath the question Why are the learning objectives important? is answered. Two potential design tools for using verbs in learning objectives are given in Chapter 6, Section 8, Tables 11 and 12.

When the teacher team has formulated a set of learning objectives that the students must master during the programme, the teacher designers should analyse which learning objectives and content are studied in their course. The competencies are described in a professional and education profile. An essential quality of these profiles is that they accurately represent the professional

field. Too often, the description is superficial. Good examples can be found in Nedermeijer and Pilot (2000). However, Bos (2022) is very critical of the curriculum profile. She states that the existing curriculum profiles limit many curricula in the necessary broad development of the students. The profiles do not sufficiently reflect the expectations of the professional field. I believe educational institutes and the professional field can prepare excellent curriculum profiles. (Nedermeijer & Pilot, 2000).

Clearly formulated competencies should reflect how the so-called 21st-century competencies. The basic skillset of the 21st century is broader than IT and media-savviness. 21st-century skills are all the essentials of living, learning and working. They include creativity, innovation, critical thinking, problem-solving, communication, collaboration, flexibility, leadership, entrepreneurship, social skills and many more competencies. See also Stauffer, 2023.

21st-century competencies should be placed in the curriculum and the subject matter. There should be enough room for students to personalisation. The consequences of future professional development for the competencies and subject matter should be evident.

7.1.2   The Course Content

What is the course content? Can you give a brief description? Is there an inventory of future developments with possible consequences for the content? Can you structure the core topics to find a logical sequence to study the content and master the objectives?

Collect interesting pedagogical examples inside or outside your discipline. The examples are indispensable as models or ideas in your future pDD process.

7.2   *The Second Step Is to Formulate the Qualities You Want to Achieve in Your New Course*

The design brief contains a first version of the essential qualities and requirements you, your students, colleagues and your manager will bring to your course. Examples are shown in Tables 13, 14 and 15. In practice, you must further detail and supplement the Basic DD process. Such a list of qualities is intended to keep the desired goals of the DD process in the design brief in mind. Teachers often choose an interim solution too quickly and discard certain qualities. This solution is too easy; a better option is to see if another, more ingenious solution exists.

The quality criteria are divided into needed or wished qualities. Needed qualities mean that the quality criteria cannot be changed (e.g. the number of study hours, availability of IT, the maximum number of students, etc.). Wished

qualities mean a specific quality criterion can be adapted within certain margins. The latter set of quality criteria can be assessed with the help of the Harris profile (Appendix B, Erasmus, 2023), in which various alternatives to concept ideas and design are assessed systematically.

This step is also a good moment to assess the capabilities of the IT infrastructure in your institute. Four questions about this topic are formulated in Chapter 4, Section 5, 'Planning for IT'.

7.3   *The Third Step Is Analysing Some Specific Questions in More Detail*

1.   How can you explain difficult concepts, topics or procedures to the students?;
2.   What are the useful IT options for my course?;
3.   Look for relevant design principles which describe crucial pedagogical qualities to be realised in the course. In Chapter 16, Section 3, the concept of design principles is elaborated in more detail.
4.   Analyse your experiences in the last version of your course. What does this mean for your new course? See Chapter 18, Section 2.4.1, step 'Deconstruction';
5.   Do you already see possibilities to sequence the course units?
6.   How to adapt to the different entry levels of the students?
7.   What learning and teaching materials are already available? Did you look on the internet for relevant learning materials?
8.   What ITedu tools can you use in your course?
9.   Is your course properly aligned considering content, education methods and learning objectives?
10. Do you have already selected evidence-based pedagogical practices? You can check your ideas with the help of the blog from Houx (2020). See also Chapter 18, Section 4.2.5. He described and applied the six evidence-based educational practices presented on the Learning Scientist website.

Suppose you want to study more about blended and online learning. In the introduction of Chapter 5, I give some suggestions for interesting books and websites.

7.3.1   When Will You Finish This Design Activity?

You complete this design activity when you think you are ready for the next or cannot invest enough time into it anymore. But first, you must check whether you have sufficiently answered all questions in the design brief. Another reason to stop this design activity is when you think you have formulated enough ideas to design a course's route map.

TABLE 11   Bloom's taxonomy

Benjamin Bloom (1984) created this taxonomy to categorise the level of abstraction of test questions that should appear on your exams.

Knowledge
– observation and recall of information
– knowledge of dates, events, places
– knowledge of major ideas
– Mastery of subject matter
Question Cues:
List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where

Comprehension
– understanding information
– grasp meaning
– translate knowledge into a new context
– interpret facts, compare, contrast
– order, group, infer causes
– predict consequences
Question Cues:
summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend

Application
– use information
– use methods, concepts and theories in new situations
– solve problems using the required skills or knowledge
Questions Cues:
Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover

Analysis
– seeing patterns
– organisation of parts
– recognition of hidden meanings
– identification of components
Question Cues:
Analyse, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer

Synthesis
– use old ideas to create new ones
– generalize from given facts
– relate knowledge from several areas
– predict, draw conclusions
Question Cues:
Combine, integrate, modify, rearrange, substitute, plan, create, design, invent, what if? compose, formulate, prepare, generalize, rewrite

Evaluation
– compare and discriminate between ideas
– assess the value of theories, presentations
– make choices based on reasoned argument
– verify the value of the evidence
– recognize subjectivity
Question Cues:
assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize

8　　　Design Tools 1 Verbs for Learning Objectives, Requirements and Quality Criteria

You can compare the text in Table 12 with Bloom's levels in Table 11. Bloom tried to overview possible verbs based on learning psychology levels. The scientific explanation is not robust. Still, the idea of an overview of possible group verbs

TABLE 12　　Overview of action verbs for learning objectives (Handson Toolkit – HandsonICT, 2023)

In case you want ...	... use the following action verbs or similar verbs
your students to better understand a concept, model, relationship, theory, perspective	describe · define · compare · identify · explain · give an example
your students to apply a concept, model, theory	illustrate · calculate · draw · demonstrate · estimate · measure
your students to stimulate critical thinking	analyse · classify · determine · interpret · query · examine
your students to develop practical problem-solving or decision-making skills	advice · consult · predict · debate · evaluate · justify · judge
your students to stimulate creativity	compose · transform · construct · design · develop
your students to develop some performance skills	conduct · execute · operate · perform · produce
your students to develop metacognitive skills (learning how to learn)	reflect · self-assess · self-regulate · self-monitor · identify your learning styles and barriers
your students to target attitudes, ethics, moral principles, values, beliefs	express · feel confident · inspire · mobilise · motivate · negotiate · collaborate · nurture · respect · respond sensitively · take responsibility · value · commit to · get excited about · tolerate · care for · resolve conflict · suspend judgement
	collaborate · moderate · negotiate · debate · comment · online meeting · review · question · reply · post and blog · network · contribute · chat · instant message · text

is a powerful instrument. Educational experts have prepared an overview of different learning activities related to these verbs.

When formulating your learning objectives, use the overview of active verbs in the Handon toolkit. Circle the verbs that apply to your activity. I prefer this more practical version of the Bloom categories.

TABLE 13   There are several criteria you can use when assessing the quality of your course

1. The IT activities should form a blend of F2F and self-study activities. This blend should be effective, efficient, liked, valued and attainable for you and the students;

2. The elements of the diamond diagram support each other, which can be compared with the idea of constructive alignment;

3. The course considers the starting level you expect from your students because of the preceding courses. Your course is expected to prepare the students for the following courses;

4. Check if you support the formulated competencies mastered sequentially in the curriculum;

5. You have to keep in mind that students study in different ways. Some flexibility in the course structure is necessary;

6. Have you implemented your pedagogical concepts consistently?

7. Do you meet your quality criteria (hard: non-adjustable qualities or requirements; soft: adaptable qualities)?

8. If you want to use new learning activities and materials in your route map, you should take time to design and practice them. You need extra time to develop teaching and learning situations and materials that are new to you;

9. You can consider organising pilot experiments with your new course components and how you and the students experience the newly designed education. Carefully evaluate to improve your course and what you are teaching;

10. Still, it is always possible that you need additional information, which must be incorporated into the various design results;

11. Take a moment to check whether the pedagogical design and the diamond diagram still match your design results. It is often helpful to summarise your decisions and considerations in a document;

12. The final quality of a design depends on the students and teachers willing to use the product in the way you have envisioned the designed product. In educational terms, the final course design result must be that the students follow the lectures, study the literature, complete the assignments and have adequate test results. The involved teachers should agree on their teaching duties.

TABLE 14   Possible requirements

- Classrooms and necessary audio-visual and IT equipment;
- IT infrastructure, availability of computers for students and teachers;
- Availability of learning materials (hardcopy, virtual);
- Pedagogical principles formulated by your institute;
- Do-ability activities for students and teachers, individual study and learning in small and large groups;
- Expectations from the professional field;
- Organisational matters (support for teachers and students on using IT, time for teachers to redesign);
- Possibilities to meet other concerns of the teachers to discuss concerns and IT possibilities.

TABLE 15   Example of a set of requirements mentioned by participants from the nursing department

- Availability of equipment in the classroom for role-playing, simulations, games, presenting video, PowerPoint and other ITedu tools;
- Availability of technical or laboratory equipment for practical exercise;
- Fitting room or laboratory for skill training;
- Equipment and room to prepare (tutor) video;
- Availability of internet, Intranet and UPS[a]
- Correct procedure because of privacy (permission person, hospital);
- The material fits the level of the students (not too easy, not too difficult and engaging);
- The learning objectives are appropriate;
- Students are willing and able to realise assignments;
- Teachers can prepare and apply new educational practices;
- Teachers should work together to realise attractive learning materials and activities of superior quality;
- IT staff support (with Moodle experiences, preparing videos, etc.).

a   UPS: An uninterruptible power supply or Uninterruptible Power Source (UPS, see Chapter 4, Section 4 question) is an electrical apparatus that provides emergency power to a load when the input power source or main power fails. One minute you are working on your system and the very next minute, you may lose all your work because of the power cut. UPS gives your system the needed time to settle every task before it shuts down.

9   **Design Activity 3: Design the Route Map for the Course Programme**

| 1. Prepare and discuss the design brief (design assignment and pDD process) |
| 2. Collect, analyse and structure the information needed in your design assignment |
| 3. Design the Routemap for the course program |
| 4. Develop the best Routemap in Blueprint format |
| 5. Deliver the redesigned blended or online course |

6. Evaluate, assess the quality of
- Your existing course
- Routemap
- Blueprint
- Final course
- Pilot projects or small try-outs.
- First-course implementation

and decide on the consequences for the DD process

1. Elaborate on the learning trajectory by building on the structured information (diamond diagram, pedagogical concept, the learning environment, route map and blueprint);
2. Use the possibilities offered by the design process to arrive at appropriate concept ideas and design concepts;
3. Select the structure, learning activities and materials;
4. Compile the route map concept;
5. Look for an organiser;
6. Evaluate the route map concept qualities;
7. Select the final route map concept to be elaborated upon in the blueprint.

The main design task in the DD process is to find learning paths to be followed in the redesigned course. You have collected, analysed and structured the information to understand the design task. Visualising your ideas for a learning path is central to Design activity 3. The collected information is structured by applying the various design tools, the learning environment with your Design Principles (DPs) and the learning activities and materials, the diamond diagram, the pedagogical concept, our quality criteria, possibilities to sequence the course content and other structures you like.

Visualisation offers the possibility of a reality check by making your thoughts visible. This allows you to assess whether your ideas will have the desired effect and are practically feasible. Or maybe, you should let go of the idea? If not, how can your idea be improved? Visualising the learning trajectory may be done by making a route map. An example is given in Figure 12.

In the route map, the teachers prepare an overview of the learning process(es) to be realised in their course. The route map is the outline of a course. A route map must consider the following components and questions: What are the main topics and learning activities? What are the sequence topics? Where should the ideas for ITedu tools be introduced? What is the alignment between ITedu tools, F2F and self-study? The route map reflects the learning process(es) thought up by the teacher and helps the teacher designers decide whether their course design can succeed. Creativity plays an essential role in the designing of a route map. Chapter 21 describes the creative process:

Students are given beforehand insight into learning objectives, test criteria and learning activities through the VLE

Tutor video with extra explanation

Available in the VLE
- Remedial lessons
- Content
- Self-study assignments

Organise formative and end tests with help of IT

Support self-study a group work through the VLE

Pedagogical options:
- IT offers many possibilities to support the learning
- Realise an optimal blend between f2f, self-study and IT

F2f: face to face; ZS: self study

FIGURE 12   Example of a route map (see also Figures 15, 34, 37, 42, 43)

problem identification, preparation, incubation, illumination (all parts of your puzzle fall into place), elaboration and evaluation.

In Chapter 13, Hattie and Donoghue describe learning in HE from a learning psychology angle. They have formulated what they consider to be the main components to characterise the student learning process in HE:

> Surface learning and deep learning (for humans), understanding the criteria for study success in a course, the influence of the study environment and the entry-level of students and the learning results concerning knowledge, skills and (study) attitudes.

They described the typical learning outcomes of students in HE as

> they have collected knowledge relevant to a specific discipline and can use it to solve problems and finish relevant professional tasks. In higher education, students need to apply this knowledge in solving problems and tasks (transfer of learning).

A possible intermediate step in creating a route map concept is simplifying the design problem by thinking up the learning processes for separate learning objectives. When you believe the separate learning processes are of adequate quality (e.g. effective, efficient, well-liked, valued and feasible), you can combine them into one learning process for the new course.

TABLE 16   Some suggestions to stimulate your creative process

– Look for a situation where the focus is not on your problem: Have a walk, sleep, party, etc. Creative thinking will go into the subconscious;
– Describe and organise your problem in a short document;
– Visualise your problem on the whiteboard or paper in a flow chart. Look for new relations and ideas to make the problem more visible;
– Try lateral thinking or thinking outside the box (De Bono, 2023);
– Explain and discuss your problem with a trusted colleague. Often, you will find new connections and possible solutions. They can help you look at the problem from different angles or stimulate you to check the coherence and correctness of your ideas;
– Organise a brainstorming group, nominal group or use a Synectic group to think and discuss your problem. There should be an open atmosphere in the group. The mistakes of participants are not the problem but the reason to think again. Sometimes, it is necessary to make a problem diagnosis first because the problem description offers insufficient guidance to the participants;
– Follow the structured approach of Scamper (2019) to think divergently. This approach uses seven heuristics to formulate additional ideas: substitute, combine, modify, put to another use, eliminate and reverse;
– Stimulate your thinking with the help of analogies, metaphors or examples from other teachers. For example, technical designers search the world of animals and plants for analogies.

The basis for formulating ideas for the route map is the diamond diagram, the pedagogical concept and the list of necessary qualities. The steps are detailed below.

9.1   Tools That Can Give You Some Support When You Are Preparing a Route Map

There are several possibilities for checking the quality of the designed route map. Some are already used in stages 1 to 4 of the pDD process. Please use these design tools again in stage 5.
– Use the overviews in Chapter 6, Section 8: Verbs for learning objectives, requirements and quality criteria and Itedu-tools;
– Use of the overview of learning activities and methods in Chapter 6, Section 10;
– Follow the principle of constructive alignment;
– Use the overview of possible sequences to decide the sequence in your route map. See Chapter 8, Section 4.8.1, Topic 13: Design Tools-3;

– There is a standard description of the necessary educational functions to
  support the teaching and learning processes in Chapter 14;
– Check your final concept of the route map with the suggestions from the
  text 'A strange question' (see Chapter 6, Section 9.10.1 and Chapter 15, Some
  Common Mistakes). These are the questions that an experienced course
  designer generally asks.

9.2 Step 1: You Begin by Formulating as Many Concepts for the Route Map Learning Trajectory as Possible

This is a typical divergent thinking process using your creativity and intuition.
The context of your thinking process is the learning environment described in
design activity 2. You play around with all kinds of ideas for your new course.
A concept idea will focus on one or more exciting and meaningful design fea-
tures. You may want additional information because of your growing insight
into the design problem. If it is relevant, adapt the diamond diagram, the peda-
gogical concept, your qualities and your additional questions.

9.3 Possible Sequences in Your Course

Sequencing means you split your course content into smaller or larger topics.
There are many possibilities regarding how to split up the course content. Split-
ting up depends on the curriculum model of the instructional strategy you follow
(see Chapter 12). You must follow a specific order that supports and motivates the
students to master the objectives in an effective, efficient, well-liked and valued
learning path. Such a learning path needs to be feasible for students and teachers.

   You can split your course content according to different principles (Reigeluth
& Keller, 2009). You must elaborate on the splitting idea to see if the results fit
your expectations. After you split your course content, you can follow different
sequences. Some of those are listed in Chapter 8, Section 4.8.1.

9.4 Constructive Alignment

Biggs (1996) stated that learning objectives, activities and assessments must be
well coordinated. The diamond diagram reflects the same principle but adds
two elements: the criteria/requirements and the course content to be studied.
Many educational designers indicate that Bigg's idea means that, in the design
process, you first have to determine the learning objectives, then the learning
activities and finally, the assessment. After that, the results are applied prac-
tically in elaborating learning activities. My view is that this approach is too
rigid. You often already have concrete ideas about your course. You analyse
these ideas to obtain a clear picture of your learning goals. This means that the
design is not linear (Earl, 1987). However, it remains essential that the elements
in question connect or reinforce each other.

9.5   *Step 2: The Most Promising Concept Ideas Are Used To Formulate*
           Your Design Concepts for the Route Map

The assessment is based on (needed or wished) qualities, as explained in design activity 2. These concepts in the route map give you a helpful idea about the learning trajectory of the learning process you have in mind. This is the moment in the Basic DD process when you formulate the *alternative learning processes* the student might follow in your course. This is an opportunity for you to personalise your course to fit into the different learning paths of your students.

An explanation regarding which planning and building activities teacher designers need to provide more attention when designing a course is given in Chapter 14. This chapter briefly describes the planning and building activities and provides possible pedagogical suggestions.

9.6   *Accreditation Organisations, Faculty and University*

You need to check your new design with the vision of your faculty and your department, considering what is described in the pedagogical concept of the curriculum. It will help if you try to follow the criteria of your university and related accreditation organisations. A practical suggestion is that the descriptions you make at the various stages are beneficial in writing official documents, which otherwise usually takes a lot of time.

9.7   *Step 3: Find an Organiser for Your Course*

Earl (1987, website post 2.6) describes this step as when all parts of the design puzzle fall into place. To stimulate that 'click', look for an organiser. An organiser is a 'bit of content' that makes the learning process's essence visible to you as a designer. It might be a working procedure, a problem, a systematic overview of the content, a process, some cases or a poem. This idea can be compared with the advanced organiser. There are two unique properties an organiser needs to have during the (re)designing of courses. It enables the teacher designers to 'see' how they will set up the learning experiences of the students during the course and if the design is feasible. They can use the organiser in the study guide to give the students a clear and correct insight into what they will learn and why. Additional examples of sequences and organisers are given in Chapter 8, Section 4.8.3.

9.8   *Step 4: Use Your Quality Criteria to Assess Which Route Map Concept*
           Scores the Best in Your Course

You can use the Harris profile to help you with this (Appendix B). This assessment is one of the reasons why I always emphasise that the quality criteria and

the requirements have to be clearly (re)formulated from the start, keeping you on the right path.

According to Earl, teacher designers will be satisfied with the designed or redesigned course if it is:

1.   Effective when the learning goals are achieved. The students have good results on the tests;
2.   Valued when the learners found their learning time and activities worthwhile. The students are active in group activities and follow the lectures and study the content properly;
3.   Well-liked when the learning experience has been enjoyed and has motivated the learner for more knowledge. The students are motivated and engaged in learning;
4.   Efficient when the time and energy spent learning what has to be learnt is minimal;
5.   Feasible when the students, teachers and the organisation can handle the course elements (e.g. teaching skills, equipment, buildings and the internet). According to the course design, the students finish the assignments and learn from their mistakes;

Other reasons to be satisfied are as follows:

6.   The course fits satisfactorily in the curriculum, and the committee accepts its description. You have to fulfil specific ()official requirements;
7.   The teacher designers like to do their teaching job and experience the time spent while (re)designing the course as worthwhile;
8.   Teaching and learning materials may be used in the course.

During the pDD process, you will elaborate on the qualities of the design. The qualities should give interesting insights when satisfied with the course design! Examples of more specific qualities are given in Tables 13, 14 and 15.

9.9   *Step 5: Take a Moment to Check Whether the Pedagogical Concept and the Diamond Diagram Still Match Your Design Concepts: Constructive Alignment*

All five elements of the diamond diagram should always complement and reinforce each other. The final test should reflex the learning objectives and the educational methods. The pedagogical methods should enable the students to master the learning objectives and the content. The constraints indicate the requirements that must be fulfilled to enable the teachers to teach properly and the students to master the learning objectives. It is often helpful to first prepare an *overview of the design decisions* and your considerations of

the decisions. You can use this overview in consultation with your colleagues and management. Later, you can also use it to evaluate the renewed course.

9.10 *Step 6: Finally, You Choose the Most Promising Design Concept for the Route Map(s)*

You often combine elements of different design concepts to design a better result. There is nothing wrong with that. Quite the contrary. The selected route map will be elaborated into a blueprint and next into the final course.

Can you start with design activity 3 after you finish the design brief? Yes, that is possible. First, you can collect the information extensively and design the route map (Figure 12). Suppose you already have a lot of information. In that case, you can start by making a route map. Then, you can begin collecting information to check whether your route map has sufficient quality. You will often alternate between specific design activities.

When you finish the design activity, it may be necessary to collect additional information. This added information may have consequences for the pedagogical descriptions already drawn up. You should evaluate the implications of the additional information for the other results in the Basic DD process. Can you accept the consequences? If so, you change the elements of the pedagogical concept. If not, then you look for better concept ideas.

9.10.1 A Strange Question

Think about the possibilities for the students to get a good score without doing much. I provide another formulation: How to cheat cleverly? For example, some students are highly creative in predicting the final test questions. Some students profit from the group work of other students or split the work into projects.

10 Design Tools 2 Educational Methods and ITedu-Tools

Three learning activities are distinguished: cognitive, affective and metacognitive or regulative. Different verbs are used for the three types of learning activities (Vermunt, 1998; Verloop & Lowyck, 2003):
1. Cognitive learning activities: relating, structuring, analysing, concretising, applying, memorising, necessary processing and selecting;
2. Affective learning activities: attributing, motivating, concentrating, judging oneself, appraising, exerting effort, generating emotions and expecting;
3. Metacognitive or regulative learning activities: orienting, planning, monitoring, testing, diagnosing, adjusting, evaluating and reflecting.

An overview is given in Table 17 of different types of learning activities. The possible uses of Itedu-tools are given in Table 18. Another helpful overview of many possible Learning Activity Types in different disciplines is composed by Harris and Hofer (2010) from Technological Pedagogical Content Knowledge (TPACK). The results can be found on the website (WM, 2023).

TABLE 17   Examples of assignments and educational methods

Educational methods	Explanation and types of method
Lectures	Regular-, problem-oriented-, active-, demonstration- or summarising lecture. Presentation by a quest lecturer (40–900 students).
Video registration	Lecture registrations, online lessons, short explanations
Classroom teaching	F2F teaching in a group of 25–40 students.
Flipped classroom (or responsive college)	Students study the course content and formulate questions before the class meeting. Teachers answer the questions of students, ask them their questions and explain complex subjects.
Drill and practice	Root learning through the repeated presentation of prompts and corrective feedback.
Study tasks or assignments for self-study, group work, etc.	Assignments to be finished in the classroom or finished in the self-study. The teacher will discuss results in the classroom, or feedback will be given through Moodle. The study task can focus on a disciplinary, theoretical topic case study.
Several types of assignments	
Different learning tasks	Comparison tasks, explanation tasks, authentic tasks, algorithmic tasks, strategy tasks, construction tasks and implication tasks.
200-word statements and reflection assignments or one-minute statements	Students are asked to make a statement about the presented subject matter. They have to rethink the subject matter (deep learning), keep up with the lectures and be invited to think critically.
Bonus assignment	Students will get a possibility for bonus points to be calculated in their final score. Students are stimulated to start preparing for the final test earlier. As a result, the students will process the subject matter of the lectures more profoundly.
Essays or oral presentations	The activity of an individual student, sometimes two or more students may work together.

(*cont.*)

TABLE 17   Examples of assignments and educational methods (*cont.*)

Educational methods	Explanation and types of method
Research assignment or student research	Students are members of an official research group or work on a personal research topic. They will work on an authentic task.
Prepare professional products or perform services	Authentic tasks: A policy paper, marketing plan, advice, research plan, literature study, etc.
Tutorials	A class conducted by a tutor/teacher for one or a small number of students.
Taking quizzes	Students can check their progress with the help of the questions in the quizzes. The teacher can use test questions already used in the final test.
Consultation hour	Opportunity to ask the teacher, tutor or (student) mentor questions. Often combined with the FAQ section of IT options.
Small study groups	With or without teachers (teacher or student-assistant): Working group, seminar, literature group, theme group, dyad, case study, simulation, role-play, a game, a discussion group, buzz-groups, brainstorming, dyad, working group, etc.
Mentor group	These groups are meant to help the students to learn how to study.
Problem-based or task-oriented groups	Problems from the discipline or the professional field are studied and solved in small groups. Several problems or issues are used: statement, strategy or a dilemma problem.
Project group	Assignments from the professional field are studied and finished in small groups. The progress and final products are discussed with the teacher and clients.
Practical work (hands-on learning)	Experimental work, exercise practical skills. Step-by-step demonstration. An option is the carousel format for practical work.
Internships	Junior and senior internships with supervision and short visits in the professional field.
Excursions	Individual or in small groups with or without a teacher or tutor.
Individual self-study-system or mastery learning	The course is built in small units from two hours to two days of study. Students study texts, finish assignments and pass the test to start with the next module.

TABLE 18   ITedu tools and examples

ITedu-tools	Examples
E-book	Technology and Reading eBooks in Education, Reading Comprehension, Students' E-Textbook Practices in HE
E-mail	E-mail
PowerPoints	Power points, Coursebook PowerPoint, Quick guide
Blogs	BLOG, blogs in higher education, microblogs (Twitter), text messages on mobile phones
Website	DermIS (English) Atlas of Dermatology, Anatomy tools, blended learning in HE, educational tools
Audio recording	Voice boards, Livescribe
Lectures and IT	Clickers, feedback fruits, active lectures, large lecture groups, evaluation use of clickers
Video clips, Tutorials	Examples of how to prepare ... ? or own tutor videos with your phone and YouTube, Video clips or Tutorials, for example, from medical education (*) search for ultrasound= basis foetal biometry, Tutor.com or own tutor videos
Video or web lectures	Video lectures TUDelft, Collegerama, examples of lectures in MOOCS
MOOCS and Open Educational Resources	Seven things you should know about MOOCS, MOOC Français, MOOC (massive open line courses), MOOC-list providers, what is a MOOC-Educause, MOOC List Health, MOOCS Health Informatics Forum, TUDelft Online Education OER: Open Education Consortium, Open Educational Resources (OER), OER for nursing, Educational portal technology, MOOC Infection, Merlot
Virtual learning environment	Virtual Learning Environment (used for a course): Moodle
Wiki	Wiki, an example of Workspaces
Animation	Visual Human Project, Basic Pharmacology TRC interactive program (*), primal pictures
Soft- and hardware used in the discipline	E-health, Domotica and Initiatives Canada Zealand, technology)
Simulation	Dynamic Patient Simulation: Gynaecology 03 I feel pregnant

(cont.)

TABLE 18   ITedu tools and examples (*cont.*)

ITedu-tools	Examples
Games	Medical education, look for game
Social networks/	Facebook, LinkedIn, Function in the VLE
Portfolio	E Pass University of Maastricht, Examples, 7 Ways To Create E-Portfolios, example nurse, University of Maastricht, Denise Vernstrom, NHS Education for Scotland, 7 Ways To Create E-Portfolios
Cloud storage	Google, OneDrive, DropBox
Digital testing and feedback	Turnitin feedback studio, peermark, question mark perception, feedback-fruits Delft, (peer-feedback/assessment in Moodle, Blackboard

Note: A version of this Table *with* hyperlinks can be found in Nedermeijer, post: 2023, look for ICT possibilities in Education?

11   Design Activity 4: Develop the Route Map in the Blueprint Format

1. Describe all topics of the course as described in the route map;
   – The necessary learning activities for the students;
   – The expected learning results;
   – The teaching activities;
2. The use of IT and practical exercises;
3. Check the four questions in Chapter 4, Section 5 Preparation for the future
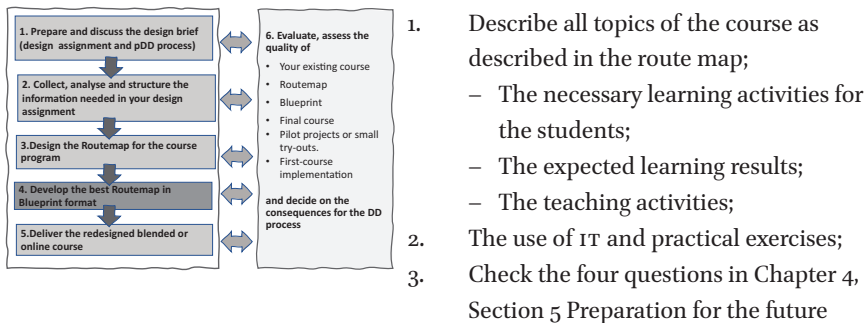
Design activity 4 is the 'delivery of the blended or online learning course' using a blueprint (Figure 13). The route map is reworked in the blueprint into the definitive lesson plan with concrete learning materials, study assignments and test activities.

An important question is whether the blueprint sufficiently corresponds with the pedagogical concept, the diamond diagram, the learning environment, the evidence-based educational practices (Figure 14) and your formulated qualities. It may now be that specific pedagogical ideas do not fit well

The main focus of teaching-learning activities	Before the start of the course: expectations?	Topic 1: Introduction and play with and evaluate ICTedu-tools
Activities Teachers Institute "A"	1. Select 1 of 2 courses for which IT options will be prepared/selected.	1. Introduction PUM-teacher (*PowerPoint*) 2. *The program and course activities* (*in Moodle*) 3. Lecture Blended learning, possibilities and positive and negative aspects with *PowerPoint in the* VLE 4. See and evaluate various ITedu possibilities (*in BLOG*) 5. Discuss results in duo's
Expected results	2. Teachers, the technique and the supporting staff are ready to begin. 3. The management clearly states the importance for the university and the teachers. 4. The main texts are translated.	1. Develop a growing insight into the possibilities of IT options in higher education
Activities PUM-teacher	5. *Prepare the program and the Moodle activities and texts.* 6. *Prepare the Blog so it can be used in the course. Blog* (blended learning course development, various examples and rules for using IT options, copyrights, leading developments in Health education and IT options. 7. Discuss the program with the participants. 8. Look for Indonesian texts.	1. *PowerPoint, who is the teacher* 2. Prepare a Lecture about Blended learning 3. Describe the course presented in the VLE. 4. *Preparation overviews of possible functions of IT options* (*to be included in the Blog/Moodle.*
Activities ICTedu support	9. Software should work for the participant's VLE and PowerPoint, video edit and contents mapping software.	Support technical organisation and advise about the use of VLE and PowerPoint.

FIGURE 13   An example of a blueprint. Text in italics: use of IT options
JN = The PUM-teacher Jan Nedermeijer, VLE = virtual learning environment and ITedu tools = software for higher education.

		Remarks	OK, please continue	OK, but needs improvement	Interesting idea. Let us try	No action
Use the possibilities of the available pedagogical elements						
1.	General	– Pedagogical choices are not always strong (considering active learning, focusing on learning students, IT use, ...) – Coherence between IT, self-study and F2F is crucial. These options should support each other.				
2.	Give information and explanations	– The availability of (asynchronous) video lessons with teachers' explanations and the search option is appreciated. – Short video lectures with search options are preferred. – An overview of the course content and activities is necessary to support the students' learning. – Using learning materials from the internet is recommended.				
3.	Support self-study and study in the classroom	– Present a straightforward assignment, and procedures are valued. Be careful with too strict deadlines				
4.	Prepare for further education	– The availability of projects and special assignments are valued.				
5.	Opportunity for student and teacher and parents/ collaborative learning	– Reach out to classmates. – Working together in small groups is valued. – Motivational, funny social activities have a positive effect. – Communication with parents is crucial.				
6.	Test and give feedback	– Use of example tests and teacher feedback is effective. – Unclear test procedures are a problem.				
Sufficient hardware with enough quality (reliability) to be able to use IT						
7.	Sufficient internet connection	– Difficult to find a hotspot with good internet access. – S. cannot always finish assignments on time. T. should consider this.				

(cont.)

		Remarks	OK, please continue	OK, but needs improvement	Interesting idea. Let us try	No action
8.	Sufficient quality of laptops e.d	– The software cannot be used by all S. – S. cannot finish assignments. T. should consider this.				
Necessary management elements						
9.	Support teachers in using IT	– Practical and timely technical support by IT personnel. – T's should support each other (team teaching). – How to design a short video lecture.				
10.	Support the pedagogical skills of teachers	– Additional training/instruction is essential. – Team teaching: exchange of ideas. – There is a need for 'new' pedagogical models.				
11.	Support students in using IT	– The lending possibility of laptops is valued by S (and T). – Help with technical problems (FAQ, helpdesk).				
12.	Support students using new learning activities/ materials	– There should not be too many different software programs. – Clear instructions on studying new IT activities are given. For example: Using Zoom's options, Google Classroom, …. – A Standard layout of learning material is necessary.				
13.	Support students by the teacher(s)	– The accessibility of T. for questions is crucial. – The FAQ option saves the teacher a lot of time. – Sufficient attention for S. disabilities is essential.				

FIGURE 14   Elements relevant to the evaluation of blended learning and online courses
(S = student, T = teacher)
SOURCE: BROOKS AND GIERDOWSKI (2021)

or are much better than expected. The consequences are implemented in the route map, the pedagogical concept, the diamond diagram, the learning environment and the list of qualities and requirements are processed where necessary and possible. Then, the question is whether the changes are acceptable. It

may be that particular learning or teaching activities cannot be easily achieved. If you want to use them anyway, you need extra design time. You can start a new design project to solve your design problem. Another option is to work out the idea and pick it up later after teaching the course. You can also organise a pilot project to try out your ideas.

In the book *Wise Lessons. Twelve Building Blocks for Effective Pedagogy* (Surma, Vanhoyweghen, Sluijsmans, Kamp, Muijs, & Kirschner, 2019) the authors discuss how you can teach effectively based on twelve evidence-informed principles of instruction. When redesigning your course, it will help if you consider these building blocks lessons for learning. Your course design should enable you to teach effectively. IT offers all kinds of options. Below are some IT options for the twelve lessons for learning, which you can use besides the F2F lessons:

– Activate relevant prior knowledge with learning technology. (indicate in the course book in VLE, which knowledge is expected, offer extra assignments to rehearse this knowledge, …);
– Provide clear, structured and challenging instruction with learning technology. (Prepare a digital coursebook or present your course through the VLE, use the possibility to present additional learning materials which the student offers other learning routes);
– Select examples you will use in your course. (Examples can be presented easily through VLE: cases, pictures, videos, games, …);
– Combine word and image. (Use digital pictures or video in combination with a written or oral explanation, ….);
– Have the subject matter actively processed with learning technology;
– Use learning technology to determine if the whole class understands your explanation. (Use of short MC-test in the VLE to have the result immediately. An essay test is sometimes more helpful but will take more of your time. Often, after checking 8–12 results, you will have an insight is the results of the large group);
– Support with challenging assignments using learning technology. (Present assignment through the VLE);
– Spread exercise with learning material over time thanks to learning technology. (Plan the availability of the assignments in time, ….);
– Variety of practice types using learning technology. (there are many programs with interesting and valuable didactical options);
– Use assessment learning technology as a learning and practice strategy. (The VLE offers many formats for informal testing and giving feedback);
– Provide feedback that makes learners think using learning technology. (You can use the possibility to give direct feedback when the students finish a test, another option is the organise peer feedback);

– Teach your learners to learn using learning technology. (Students should have the opportunity to exercise with new software and hardware).

11.1   *When Will You Be Done with the Blueprint?*

The design activity 'making the blueprint' is finished when you have enough information to start with the following design activity: 'delivery'. Do not forget to note the ideas that could not yet be implemented but look very promising. For specific ideas, you need extra time. Prepare an action plan to work on the implementation of these ideas.

12   Design Activity 5: Deliver the (Re)designed Blended or Online Learning Course
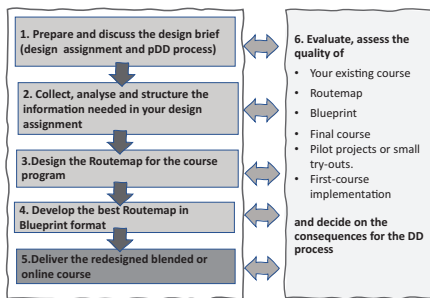
1. Work out the final lesson plan, teaching activities and materials for the course;
2. Develop new assignments and learning materials;
3. Prepare the VLE;
4. Check the IT/infrastructure (e.g. internet, Wi-Fi, VLE, etc.);
5. Prepare yourself for your work as a teacher in blended and online learning.
6. Create a document explaining your decisions

In this design activity, you deliver the course ready-made. The decision must be made whether the designed course can and will be executed. The learning materials, tasks and video presentations are based on the blueprint. Then, complete the VLE course and check whether all materials and exercises can be used properly. The teacher designer ensures that all activities and materials have the desired quality. Two checklists are available for the study assignments in Tables 20 and 21. You can find a checklist for preparing a video presentation on the Website Blended Learning and Online Education (Nedermeijer, 2019).

The ultimate educational activities and materials must enable the students to study well and allow you, as a teacher, to teach well and

The teacher designers had already discussed the design of their new course several times with their colleagues and management. It is essential to check whether all requirements will be realised. Do you indeed have enough space in

the curriculum and on the computer? Is the connection to the other courses in order? You also check whether the more flexible qualities have been sufficiently achieved.

When the course design is new, conducting a pilot experiment with a small group may be wise. You will gain experience in how students react to the new course programme and which weaknesses must be improved. After experimenting with an innovative design in a small group, you can experiment with a larger group. Also, feedback from colleagues and management is beneficial. Before starting the pilot experiments, you should check whether the course programme meets the qualities you and the organisation previously set.

12.1 *Create a Document Explaining Your Decisions*

Your design vision leads to the decisions you make due to an evaluation. Your vision is reflected in the pedagogical concept, the diamond diagram, the route map, the list of qualities, the blueprint and the final course programme. It is advantageous to substantiate your decisions: the conclusion, the judgment, the reasons for making the decisions and what effect you achieved. Make this a separate document. It will help you remind yourself why the course looks like it does.

You can also use the list of decisions to explain the pedagogical concept behind the redesigned course to your colleagues and management. Early notice that the product does not meet the formal institutional requirements; there is still time to solve this problem. Unfortunately, if no solution meets the requirement, killing your sweet is typical in designs. Nonetheless, do not forget clever ideas. You never know if you will need them in the future.

13 Design Activity 6: Evaluate and Assess the Quality of the Design Results and Decide on Consequences for the DD Process

1. Evaluate after each design activity whether you are still on the right track with your course design;

2. Do you still meet the formulated qualities?

3. Assess whether the design and development results fit into the (official) learning environment;

4. Decide what adjustments or additional design activities are needed.

5. Prepare your evaluation plan for your pilots and the actual implementation.
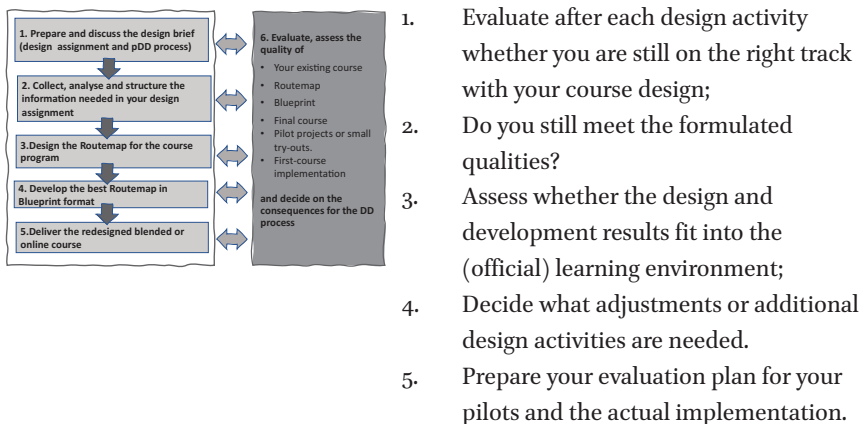
Evaluate your new course. Discuss the results with students and colleagues. Analyse the evaluation results to find strong and weak points. Is your course effective, efficient, valued and well-liked? What did it work? What could be improved? Develop ideas on how you can improve the course further.

You should apply the (updated) quality criteria and requirements formulated in the steps of the Basic DD process. You should use the five main qualities described in Table 1 to make them more workable during the DD process. The five qualities will be more comprehensible and usable in the design process.

13.1   *Moments for Evaluation in the Basic DD Process*

Every design activity has moments to evaluate the results of the Basic DD process.

– Evaluate your current course. You may have an evaluation report. Ask your colleagues to give their feedback about their experiences as teachers. In the Vision in Product Design (ViP)-approach (see Chapter 18, Section 2.4.1), the technical designers call this evaluation deconstruction and formulate a list of possible questions about the former solution;
– Evaluate the route map: Does it reflect the diamond diagram, pedagogical concept, quality criteria and requirements?
– Evaluate the blueprint: Does it reflect the diamond diagram, the pedagogical concept, the route map and the qualities?
– Organise pilot projects and small try-outs;
– Prepare an evaluation plan for implementing the redesigned course in the formal curriculum.

Teachers and IT technicians should work together to optimise the IT technical environments because the pedagogical possibilities and costs of ITedu tools develop over time. Also, during the implementation period, the teachers and IT technicians may discover new opportunities for using IT in their education. All kinds of problems will arise when using the IT technical environment. These problems must be solved without delay. Teachers will need ad hoc practical advice about using ITedu tools.

13.2   *Learning Analytics*

The SURF group (SURF, 2023) learning analytics describes the thinking behind learning analytics as a better understanding of the learning process, targeted feedback to students and, ultimately, an improvement in education. Learning analytics offers many opportunities, but how can it be successfully applied by a study programme or teacher?

13.3 *Pilot Projects and Tryouts*

If necessary and possible, you could organise a (small) pilot project(s) and other tryouts to experience and test the new educational approach. Discuss the results with your colleagues. Does it match your expectations? If not, you have to think about an alternative.

A good reason for organising a pilot is to convince the faculty that a novel approach will succeed. With these experiences and your experiences in the DD process, you can explain to your colleagues how they can redesign a course and help implement new pedagogical ideas.

13.4 *Interesting Elements from Finished Evaluation Studies*

Several organisations have evaluated the use of IT in online or blended learning study programmes organised in 2021 (at the end of the COVID period). Teachers, as well as students, were asked to give their opinions about these programmes. According to teachers and students, these studies provide valuable insight into the elements necessary for successful blended and online learning. A summary of the elements mentioned in the evaluation studies is provided in Figure 14. Your institute can use the overview to decide how to proceed with online education or blended learning activities and which elements function well and should be improved.

You decide on the course format and content during the Basic DD process. Preparing different route map concepts makes the necessary qualities understandable for you and your colleagues and practically usable in the DD process. You will regularly check whether the design results match your formulated qualities. You gain increased insight into the learning process during the Basic DD process. Still, a crucial criterion remains whether you can be satisfied with your design results.

14 Summary

The third ingredient that plays a crucial role in designing a successful blended and online learning course is to apply the literature on design when setting up your pDD process. The literature about design in different professional areas is briefly described in Chapters 12–21. These chapters explain which design activities might be relevant to course design. In Chapter 6, these design activities are combined with existing course design processes and the result is indicated as the Basic DD process. This process should be followed in design situations 4 and 5, described in Chapter 6, Section 1. In design situation 4, the teacher designer must reconstruct an existing course by applying new pedagogical

visions, unique learning activities, materials and content. In design situation 5, a team of teacher designers, managers and education experts has to solve a wicked problem. Following the design, activities in the Basic DD process can stimulate the teacher designer and the management to give sufficient attention to the convergence working approach, structure relevant information, formulate real problems and focus on divergent thinking. Nokes and Schunn (2010) stated that you start with divergent thinking. After selecting various strategies and procedures, you apply them to solve the problem. In this step, you should not prejudge any potential solutions. It would be best if you treated each idea as a new idea worthy of consideration. Conversely, it is not helpful if you take bad ideas with you for too long, giving you extra work.

When teacher designers start redesigning and developing a course in less complex and challenging design situations 1 and 2 s described in Chapter 6, Section 1, they have to adapt the Basic DD process to the complexity and difficulty of the specific design task. In most cases, a pDD process is more straightforward.

A wrong act is 'jumping to conclusions'. Is it the best solution? Take some time to look for alternative solutions, but write down this early idea. The designer often forgets beautiful ideas and having to rethink the idea might be very frustrating (see also Chapter 20). Also, check Chapter 18, Section 2 regarding technical design and Chapter 19 about design thinking, where these remarks can be found. Of course, this will take more time and discussion, but the quality of the results will be much better.

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Examples of Blended Learning Courses and a Case Study Applying the Basic DD Process

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Examples of Blended and Online Pedagogical Models

An overview of evidence-based pedagogical options to apply IT in your education is provided in this chapter. Evidence-based options mean that the pedagogical options have been researched and appear successful in certain situations. The researcher has significant reasons to believe that IT options might also be effective in other situations. Another possibility for an IT option to be evidence-based is the IT option being successfully applied and evaluated by an experienced teacher. There is no 100% guarantee that these IT options will function successfully in a new situation under different circumstances.

The main topics discussed in this chapter are: Pedagogical Model: Stimulate Self-Study to Achieve Deep Learning, The Flipped Classroom Model, A Pedagogical Model for Applying IT is a Course with Lectures and Tutorials, Some Practical Suggestions on How You Can Benefit from IT Options and Description of Pedagogical Models and Best Practices.

1 Pedagogical Model: Stimulate Self-Study to Achieve Deep Learning

1.1 *Educational Situation and Expected Benefits*

You want to stimulate 'homework' by the student. To accomplish this, you need to design an optimal blend of F2F, online and self-study and increase the complexity of the assignments through a VLE. The pedagogical model is based on the ideas of Hattie and Donohue (2016) in Chapter 13 about the learning of students in HE: surface learning, deep learning and transfer of learning. The benefits you expect are that the students apply the studied knowledge in more complex professional cases, resulting in more profound insight into the topics and more experience in problem-solving. Figure 15 presents a possible route map for a course focused on deep learning and problem-solving skills.

1.1.1 The VLE Supports the Self-Study of the Students

– The students will finish two or more cases shown as self-study in the VLE. The complexity of the cases will increase. The students will receive direct feedback through the VLE, formulated by you in advance. Why are the
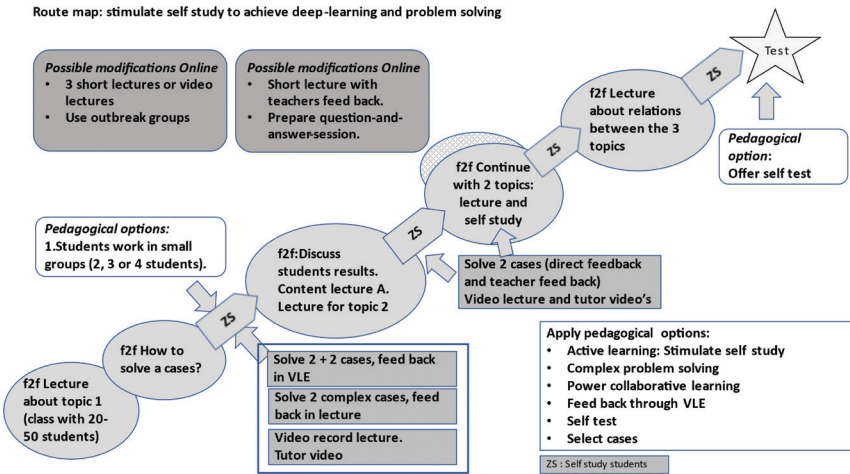
FIGURE 15   The route map stimulates self-study, deep learning and problem-solving

answers of the students correct? Why are the answers wrong? What is your advice for the students on how to continue?

– Students study course content using books, follow a tutor video (see Nedermeijer, 2019) or finish an e-learning course (see, for example, Nedermeijer, 2021). Take care that you prepare this kind of educational materials so you can use the materials (with some improvements) several times. This means the software should enable you to adapt the content;

– After that, the students will finish one or two more complex cases and send the results to the teacher before a fixed date. This date has already been programmed in the VLE. Do not be too strict, with severe penalties for late work.

1.1.2   F2F

– The teacher assesses the students' results and uses them to discuss the feedback in the classroom. Remark: in most situations, it is unnecessary to determine all the results of the students. After evaluating 10–12 results, you will have a good impression of the work of the students and can provide your overall feedback;

– You finish the course topic by summarising the results of the students, considering the studied content and explaining the broader theoretical and practical context of the topic.

1.2   *Some Additional Pedagogical IT Options*

– Combine the subject matter of the formerly studied topics in the self-study cases. Students can exercise again with already studied subjects. They also learn to consider an issue from different perspectives;

– Organise the self-study first in small groups (F2F or online). Later, students work individually;
– If possible, present assignments that reflect the level of the final test;
– Organise a short virtual question session for the students one week before the test. The question session demonstrates the level of the end test;
– Include a self-test in the VLE with feedback with which students can check their performance;
– Grade the assignments to allow the students to gather some credit before the final test. This may be a potent stimulant for studying course content on time during the course.

1.3 *How to Change the Course Design to the Online Format with 80–100% of the Education Followed Online*

– The lecture is divided into three 10-minute lectures. If necessary, additional information can be presented through the VLE. Follow the pedagogical advice on presenting and contacting students in the digital room. This is quite different from F2F teaching. Give some test questions and discuss the results;
– Provide exercise with the case or a problem-solving approach in the work-groups with the co-teachers or senior students. The meeting should be F2F in extra-hired rooms available in commercial and university buildings. Several institutes have used this option during the COVID-19 pandemic.
– If there is a complete lockdown, you need complete online solutions. Groups of 2–6 students can often meet and study the assignments in the VLE together. The teachers receive the results of the students and provide their feedback and additional explanation in an extra video lesson;
– You can inform all students who have sent the results to the VLE. You can contact the non-active students and give them extra support.

2 The Flipped Classroom Model

Text is based on Educause, 2013; Bok Center Harvard University, 2023; Power-School, 2023.

2.1 *Educational Situation*

The pedagogical setup of the flipped classroom is the reverse of a traditional course. Traditionally, teachers explain the primary subject matter. Then, the students study at home and are evaluated on a test. In the flipped classroom model, students learn to master material independently and at their own pace.

Teachers no longer have to explain the basic knowledge students can easily be acquired through self-study. Teachers provide additional explanations in the F2F lecture in working groups or class when necessary. For example, based on questions submitted in advance by students or the results of submitted assignments.

2.2   *Expected Benefits*

The F2F lecture, working group or class is mainly aimed at students learning to apply the studied subject matter in relevant assignments. As a result, the students are more engaged and motivated to participate actively in group activities than in traditional courses. The second benefit of this model is that students spend more time on their studies. The expected result is that their test results will improve.

2.3   *Pedagogical Options on How to Design the Learning Process*

2.3.1   Self-Study

An overview is given of the different activities of the students before, in and after the class and anytime/anywhere in a course organised according to the idea of the flipped classroom. The subject matter studied by students, on the one hand, is offered through textbooks. On the other hand, additional digital learning resources are provided to the students in the VLE. For example, the pre-recorded video lecture by the teacher (if possible as short, interactive videos), assignments, a pre-test, tutor videos and other digital learning resources.

To ensure that the students carry out the desired preparations, they will send the results of some assignments to the teacher through the VLE. Then, the lecturers can determine whether the students have prepared themselves properly. After assessing the assignment results, teachers can provide feedback through the VLE or online meeting.

2.3.2   F2F Activities Are Partly Supported Using the VLE

– A question-and-answer session on the meaning of the core concepts studied;
– A debate;
– Presentations by the students;
– Conducting experiments;
– Solving problems (individually or in small groups);
– Peer assessment.

Some additional pedagogical IT options may be used as follows:
– Providing additional learning materials to close any gaps in the knowledge of certain groups of students;

– Short e-learning courses, animations, simulations and similar materials can be searched online for meaningful and challenging topics or made as extra activities. This often concerns teaching materials that are not updated every year;
– Online collaborations can also be organised in addition to individual studies. During the Covid lockdown or heavy rain periods, students could not meet each other and many worked alone. Why not stimulate contact through the internet in groups of 2–4 students in your class to finish the assignment? Sometimes it is possible for the students can form small groups F2F.

2.3.3 Online Format
– The video lecture is divided into three 10-minute lectures, making them interactive to stimulate students to study. If necessary, additional information is provided through the VLE. Follow the advice on the presentation and contact the students in the digital room. Give some test questions about the lectures and discuss the results in an online lecture.
– Apply exercises using cases in the breakout room in small groups and co-teachers. The meeting could be F2F and (if necessary) in extra-hired available rooms. If there is a complete lockdown, you need complete online solutions, or maybe groups of 4–6 are possible. Students will organise these groups. The teacher will send the results, providing feedback and explanations of the answers by the students.
– Uncomplicated cases will be prepared in separate groups. The results will be sent to the teacher through the VLE. Advice on how to discuss the results will be followed. You can check how many students have sent the results to the VLE.
– If possible, organise subgroups inside and outside the university.

3 A Pedagogical Model for Applying IT in a Course with Lectures and Tutorials

3.1 *Educational Situation*
This section describes the pedagogical model of a course about 18th-century literature. The students considered the compulsory university course in 18th-century literature difficult. The 18th-century novels and poems are too far from students' daily lives. The reading list for this course was considered too extensive. The teacher-to-student ratio is very unfavourable (about 1:80). About 40% of the students did not complete the course the first time. According to the teacher, the teaching process should be done better.

The newly set-up course has a clear structure. Every week, there was a lecture for all the students and a computer session. The self-study hours were planned on a weekly schedule. Each week, there was a focus on a new text, usually an 18th-century novel. The lecturer discussed the relevant subject matter, which was not available digitally, explained the course structure and tried to motivate the students. As a result, the students studied the course content more seriously, increasing their success rate.

The teacher is expected to implement ten recommendations based on the literature and advice about IT pedagogics in HE.

1. Organise regular meetings in which the results of IT activities are linked to activities in F2F meetings. Thus, the combination is more substantial. There should be a fixed weekly rhythm of education and study activities with clear deadlines;

2. Design a clear structure in the course in which the ICT possibilities make their expected contribution;

3. Ensure that the teacher in the assessments reflects on what the students do through IT;

4. Spread the assessment moments during the course. This will promote the commitment of the students to study;

5. Use IT for quick feedback and resit self-assessments, tests and other learning outcomes assessments. Fast feedback also encourages an immediate response from the student;

6. Keep the textual information through IT limited because it should not replace the textbook;

7. Be clear about IT options, such as links to other websites. To what extent this concerns compulsory study material or something of personal interest must be clear to the student. Using assignments that are linked to websites stimulates the completion of that assignment;

8. Without replacing F2F communication, use IT communication to prepare, comment or supplement a discussion in a meeting;

9. Strive for clarity and standardisation in the VLE and the website for all courses in the degree programme. Using different layouts can be confusing and irritating;

10. Consider the quality of the assignments, the input of the teacher and the effort of the students. These features are essential to determining factors for a good study result, even when the recommendations above are applied.

3.2   *Pedagogical Options on How to Design the Learning Process*

– The designed standard week format is provided in Figure 16. During the first eight weeks, the students worked on the assignments in small groups of
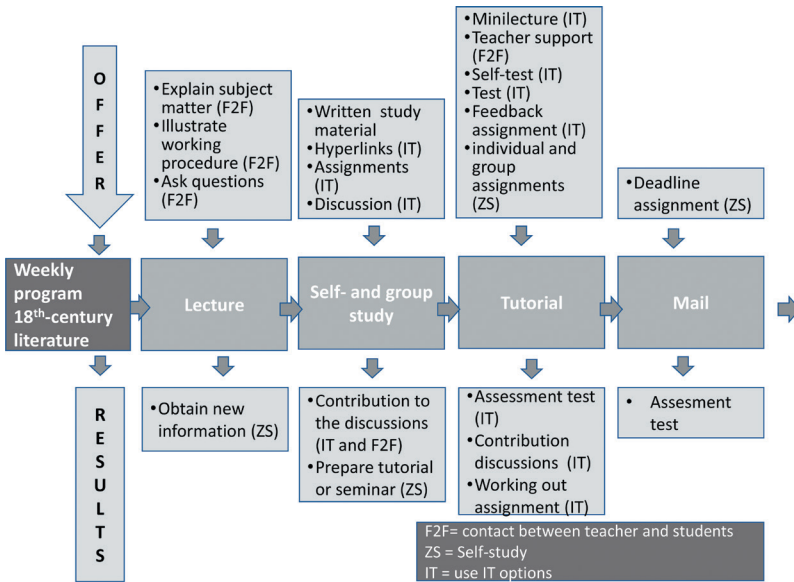
FIGURE 16 The designed standard week

SOURCE: VAN EIJL ET AL. (2000, REPRINTED WITH PERMISSION)

three. In the second half of the course, the students worked individually on the assignments but were encouraged to contact fellow students regularly to stimulate discussions about the texts to read.

– During the IT sessions, the teacher was present in the computer room to answer questions from students. Students could always login to the course website outside lecture moments. Additional IT options included a bulletin board for digital discussion and announcements, a glossary and hyperlinks to relevant websites on the internet. The results of the assignments and the quizzes were used to determine the grade of the students. Consequently, there were no additional exams.

– Ultimately, more than 90% of the students actively followed the course. Reading the books and doing assignments were well spread over the 16 weeks of the course. The IT sessions and the website were experienced as effective by the students. Almost all students were optimistic about this new setup. The success rate of the students increased from 60% to 88%.

3.3 Some Additional Pedagogical IT Options

– In preparation for tutorials, students can answer individual reading and discussion questions and send these to the teacher via the VLE or e-mail. The teacher will discuss the results of the students during the synchronous online lecture. The teacher should communicate as much as possible during

the online session. They can split the students into small groups to have a prolific discussion.

– The discovery, review, valuing and processing of digital information sources through the internet. This includes specific assignments or problem statements to be studied. Sometimes, group assignments are more effective. Then, individual results are discussed and combined to form the group results assessed by the teacher.

– Students assess the study results of each other (peer teaching). Teachers must ensure that the students have enough positive experience with peer teaching. The teacher formulates the test criteria in advance and discusses the requirements with the students. Another option is for the students to propose and discuss the test criteria in advance with the teacher. In most situations, the teacher makes the final decision.

3.4   *How to Change to an 80–100% Online Course Format*

– The pedagogical changes mainly concern how formal and informal contact between students and teachers can be arranged. Often, students can meet in small groups under the supervision of a teacher or a tutor for a tutorial. When students live in different areas, it is possible to select a local tutor. A handy option is that the teacher can answer online questions at an agreed time. Before, during or after the seminar, informal contact between the students can be organised. In an online session, students can work in pairs or triplets and realise informal contacts.

– Lecturers can provide their lectures synchronously or asynchronously through the internet. During the synchronous lecture, the teacher can divide the students into small groups to work together through the internet.

– A lecture recording will be made digitally available to the students and a search function in the video registration is necessary. A translation may be considered depending on the language skills of the teacher and the students.

4   Some Practical Suggestions on How You Can Benefit from IT Options

A short practical explanation of how the IT options can be applied is provided in Chapter 5. The teacher designers can use ideas from their colleagues in their institutes or others. However, finding well-described best practices' appears to be rather challenging. An exciting development is that more valuable courses are available or shared online. Often, you have to adjust such a course to your teaching course. Organisations like SURF in the Netherlands (SURF, 2023b)

organise workgroups from different disciplines to evaluate the quality and usefulness of courses available on the internet. In the workgroups, teachers from other institutes and universities work together. Students do much of the work: They do the first evaluation using the quality criteria formulated by the teachers. In the workgroups, the teachers evaluate the selected courses and advise their use in HE.

4.1   Give Information or Explanations: Some Suggestions
- All course materials can be presented through a VLE. Hard copies of the syllabus and other documents are not necessary. Teachers can change the content of the course in the VLE when necessary. Additional explanations of complicated subjects or skills can be demonstrated through the VLE or a website. Subject matter and case study illustrations (in colour), audio recordings, video recordings, animations or games can be presented. Take care of possible copyrights.
- When solving problems or cases, students need to search for additional information. To prevent unnecessary long searches, you can present this additional information in the VLE, on a particular website or with a simple list of possible helpful URLs.
- Use the possibility of a frequently asked question (FAQ) option. Often, students will have the same questions and standard answers are sufficient.
- All notifications concerning a course or a teacher are sent quickly to all students through the VLE. Often, this stimulates the student to open the VLE regularly.
- Short videos and virtual reality programmes where students show and explain how to study at their university faculty can give them a first idea of what they can expect.

4.2   Support Self-Study and Study in the Classroom
- Students can study in their own time and place, supported by assignments presented on the internet. This meant that there is no need for them to come to school. They study at home and obtain the necessary support through the VLE. Materials on the internet are always available and the students can use them in their time and place.
- The students follow the presentation of a teacher a second time through a video recording. The students can easily find the relevant lecture parts they want to hear again. They find additional exercises for extra training in essential competencies in the VLE and can deliver the results of an assignment or a paper anytime. Teachers can set deadlines to programme the delivery of assignments.

– If the results of an assignment are not used for the final grade, there is no need to assess all the answers. After evaluating the products of 10–15 students, the most favourable results and mistakes will be found. The teachers will report these in their lectures or send all students a summary of their feedback.

– Problem-solving competencies are exercised with the help of cases or topics the student should solve and explain. The cases and the topics reflect essential aspects of the actual working environment. You can consider using peer assessments, in which the students evaluate the results of three student colleagues and send them their conclusions. The evaluated students might improve their products. The teachers assess the given evaluation and formulate improvements.

4.3   *Communication between Students and between Students and the Teacher(s)*

– Students can be involved in the assessment of papers. For example, all students have to evaluate two papers with the help of an assessment checklist. The teacher will give the final scores. Sometimes, the assessment checklist will be discussed and formulated during the course.

– Students will join a discussion in a forum at any time they want. The results will be discussed in the classroom. The participation of the students may be registered in a VLE.

– The teachers may provide individual support through e-mail or chat before and after class meetings, lectures or consultations. When students ask the teacher the same questions, they can write the question and its answer in the FAQ session. Such a FAQ section is an excellent source for a new teacher.

4.4   *Test and Give Feedback*

– Often there is no time for extra exercises in the classroom. Additional self-study assignments with feedback can be presented in the VLE. Students can do progress test testing if they have already reached the expected level required by the teacher or by the working field. Sometimes, small groups of students are organised to discuss their results. The results of the assignment are sent to the teacher. The teachers evaluate the work in their own time. Often, a standard checklist to be used in the assessment is available. The teachers send feedback through the internet to the student. Artificial Intelligence might be applied the formative testing using learning analytics (SURF, 2023a).

– A computer check for plagiarism is possible for evaluating papers and bachelor's theses. However, the introduction of Artificial Intelligence, like ChatGPT, disturbs this possibility. You can ask ChatGPT to change the text so

that the plagiarism software no longer judges the text as plagiarism. Maybe they will make it possible for the plagiarism software to learn whether plagiarism has occurred.

4.5 *Strengthening Relationships with the Working Field*

– Cases represent the typical activities, situations and problems of the professional field. Use a series of authentic cases (from simple to complex, from easy to the complex theoretical content, from 0.5 hours to five weeks) and show them with the help of multimedia in the VLE. The cases are used in the assignments, lectures and tests.
– The working field expects a certain level of knowledge from the interns (students). You can consider taking a digital test before entering an internship or other practical activities at the university.
– The development of students in mastering their competencies during their educational careers can be followed using digital portfolios. Systematic assessment of a specific unit of the digital portfolios of an entire student group is straightforwardly ordered in digital overviews available for the teacher. A practical aspect is that there is no reason to archive the paper version of the portfolios. All student portfolios are in the digital archive.

Present a video recording of a nurse with a patient through the VLE in the classroom.

The video stops at a critical event

Students individually try to analyse the approach of the nurse in the video.
Was the approach correct?
What is the next step the nurse will execute and why?

Students give their ideas in a plenary session. The teacher will provide feedback.

The video will restart and show the next nurse activity. Sometimes, a discussion is needed again.

The continuation of nurse-patient contact is shown. If relevant, the video stops at the next critical event.
Self-study and F2F discussion in the classroom

FIGURE 17   An example of the pedagogical approach

A crucial safety measure is that the backups cannot be changed after the teachers have given their ratings.

5   Description of Pedagogical Models and Best Practices

The 'best practice' is a practical option to support teachers in selecting new pedagogical options. This chapter describes some best practices of courses in HE. Other best practices can be found on the websites of institutes of HE. However, these pedagogical ideas are often hidden behind passwords, which is disappointing. The websites from Merlot and OER commons (2023) provide attractive options, offering many courses and learning materials. A crucial quality of best practice descriptions is that they should enable teachers to translate interesting pedagogical and practical elements of best practice into their courses.

The best practice description of a course should contain the following elements (Agostinho, 2011):

– A short description of the course programme (e.g. title, faculty, duration, study points, study year and number of participants);
– Learning objectives and your expected benefits. What did you expect to realise with the benefits selected? Why? Were the benefits realised?;
– The pedagogical concept explains the application of the design principles (DPs) and the didactical approaches;
– The route map of the course is described with the help of distinctive (IT) learning and teaching activities and materials. A short outline of how the course was progressing;
– The formative and summative tests;
– The requirements the student has to be realised to be successful;
– Are there possible alternative learning route maps?
– Some evaluation results: students' reactions and your experiences. What aspects make the didactical approach attractive to you? What are the test results? Are you satisfied? Time investment for you as a teacher.

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Redesign Your Course into a Blended Learning Course

1 Introduction

This chapter describes the pedagogical concept, topics, learning activities and learning materials of the Introduction course Redesign your course in a blended learning course. The course has been organised for several HE institutes in Indonesia, the Netherlands, Indonesia, Ghana and Nepal.

One of the regular courses from the teachers is used as a tangible object for the redesign process in the course. The design situation of the participants can be characterised as design situation 1 in Table 19. For the most part, the participants are not familiar with IT options, blended learning and Moodle. Nonetheless, they already had specific ideas for improving their current course using IT. There was no plan to change the learning objectives or the current course. Therefore, teachers could use the official course description in the pDD process.

The basicDD process was adapted to this design situation 1 and worked out as the 6-step DD process presented in Figure 18. The course has two parts. The first part focuses on using Moodle and other IT options. The participants followed the 6-step DD course redesign process in the second part of the course.

The 6-step DD process focuses on selecting and applying a small set of IT options. The teacher and the students are expected to benefit from these IT options. The first questions that have to be answered in the course were What are your ideas about IT in your course and especially, what are the benefits? The next step was to find a good blend of IT, F2F and self-study activities and materials. The results were compared with the official learning objectives, pedagogical suggestions, tests and requirements. The following steps were to prepare the route map. If enough time would be available, the participants would develop the blueprint and new learning activities for the final course. Afterwards, participants assessed the consequences of these changes for their official course. When needed, possible difficulties were discussed in class.

The course activities can be executed individually or in small groups. I suggest organising 3 or 4 meetings that last 2–3 hours combined with self-study. The course program can be organised by an education expert or an experienced teacher designer as the instructor.

TABLE 19   Design situation one and the design and development tasks

Design situation 1	Design and development tasks
The teacher already has limited ideas on improving the current course using IT and expects benefits. The maximum of changes is 4–7. Learning objectives and the course content will not change very much. The redesigned course should be effective, efficient, valued and well-liked (Figure 1). The redesigned course should be feasible for students and teachers. The IT environment is already working.	– Think up and select IT ideas. – Formulate the expected benefits. – Update your existing course description. – Create and select ideas for the Route Map and assess the learning process's quality. – Design of new learning activities and materials. – Develop the Blueprint. – Formulate quality criteria and evaluate intermediate products. – Prepare the implementation of the redesigned course.

Step 1	Select your IT changes and formulate the expected benefits.
Step 2	How can you realise the selected ideas about using IT?
Step 3	Describe your existing course with the diamond diagram.
Step 4	Prepare the route map and your requirements.
Step 5	Prepare the blueprint.
Step 6	Develop your redesigned course and deliver your course.
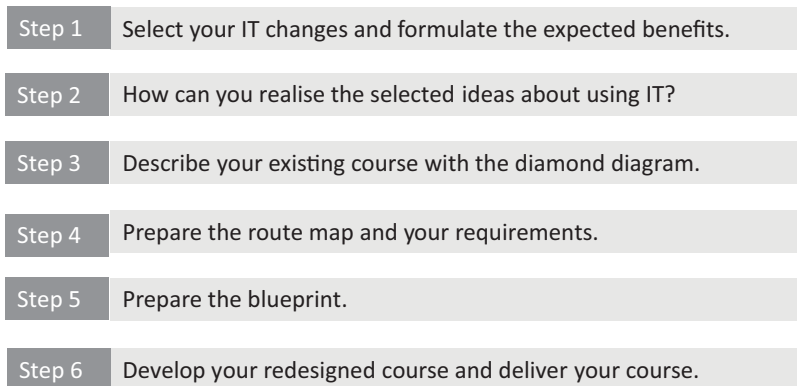
FIGURE 18   The 6-step DD model used in the course

2   Program Course Blended Learning and Moodle

2.1   *Pedagogic Description of the Course*

2.1.1   Learning Objectives and Results

The main aim of the course is to give teachers a realistic impression of how Moodle can be used and how the idea of blended learning may be introduced in their courses.

More specifically, the teachers after the training:
1.   Have experience with the use of several pedagogical functions in Moodle;
2.   Have insight into the concept of blended learning and the possible applications of IT in MHE;
3.   Have some hands-on experience with some ITedu tools available for HE;
4.   Have redesigned a (small part of) one of their courses into a blended learning course to strengthen the course, following the 6-step pDD process;
5.   Have discussed the possibilities of using IT in the programmes of the educational institute and the requirements that must be fulfilled to enable the proper implementation of the blended learning courses.

2.2   *The Obtained Results of the Course by the Participants*
1.   An overview of the possible benefits of using IT in the curricula is prepared;
2.   The group of teachers and tutors have intensively acquainted themselves with (a) Moodle, (b) the blended learning principles and (c) the design and development process. They are prepared to decide if and how IT could be used in their courses;
3.   Some examples of blended learning in the existing education of the educational institute are available.

2.3   *The Pedagogical Concepts of the Course*
1.   The course combines F2F education, individual self-study, discussion forum activities and small group work. This gives the participants an authentic experience of blended learning;
2.   If possible, supporting IT staff should join the course to give them a good impression of the potential consequences for the educational institute and also build a good relationship with the teachers;
3.   There will be no long lectures. It is learning by doing;
4.   The course content connects directly with the practice of the teachers;
5.   The learning activities of the participants are supported with the help of Moodle;
6.   The focus is on doing and experiencing blended learning and active learning;
7.   The course was prepared in Moodle. This means all participants should have permission to use their own Moodle course as a teacher;
8.   The products prepared individually or in small groups were discussed in a plenary session. Assignment results are regularly sent to the course leader (through the Moodle course) and discussed in a plenary session;

9.   More formal topics will be discussed with management during the course. The results of the teachers are demonstrated in a plenary session and a final meeting with the management.

3   The First Part of the Course about Moodle and Blended Learning

The learning materials (Text file, Text Page, Quiz, PowerPoints, URL, eBook and – activities (Assignments) are available for the participants through Moodle. This chapter gives a detailed course description and presents the topic descriptions, the learning materials and the assignments. The assignments and some supporting documents are described in full. For other documents, a reference is given where a (comprehensive) version of the document can be found.

3.1   *Topic 1: Introduction*
1.   Introduction of the PUM-trainer (PowerPoint) and the participants.
2.   The Learning objectives and the training program are explained.
3.   The availability of Moodle for the participants is checked.

> **Document in the VLE**
> PowerPoint: Introduction PUM-trainer

3.2   *Topic 2: What Is Meant by Blended Learning, Online Learning and Hybrid Education and Moodle*
A short explanation of blended and online learning and hybrid education is given. What does it mean by it and why is it useful?

Moodle is an example of an ICTedu-tool used in blended learning courses. The main characteristics of Moodle as a Learning Management System (or Virtual Learning System) will be explained.

> **Documents in VLE**
> 1.   PowerPoint: Blended learning in HE (Based on Chapter 5, Sections 1–5).
> 2.   Text: Overview What are evidence-based IT options in HE? (Chapter 5, Figure 3).
> 3.   Text: Overview of possible Educational functions which Moodle supports.
> 4.   Example of an Assignment in Moodle.
> 5.   Example of a Test in Moodle.

3.3   *Topic 3: How to Use Moodle as a Student?*

Moodle is an example of an ITedu tool used in blended learning courses. The main characteristics of Moodle as a Virtual Learning System (or VLE) will be explained. This session focuses on how to use Moodle as a student.

A plenary demonstration was given of the Moodle functions. A demonstration is given of how the functions can be opened. The participants follow de steps of the PUM trainer on their computer:

1.   How to open Moodle, files, PowerPoints, pages, URLs, images, etc.?
2.   How to do an exercise in Moodle?
3.   How to perform a small test?

3.4   *Topic 4: How to Use Moodle as a Teacher?*

A plenary demonstration and individual exercises about inserting a file, a page, an image, or a PowerPoint on Moodle and how to use the topics. A hard copy with a manual of the step-by-step explanation to open the Moodle functions as a teacher is used to support the participants. See Nedermeijer (2023, post 'learn Moodle') example. Excellent tutor video's about the various functions are prepared by Moodle Academy (MA, 2023).

Documents in VLE
1.   Manual How to describe the topics in your Moodle course?
2.   Manual How to add a page in Moodle?
3.   Manual How to insert a file (word, PowerPoint, images).
4.   Manual Select students for your course from the database with all participants in Moodle.

3.5   *Topic 5: Hands-on Experience with ITedu Tools* (*Optional*)

You have seen various examples of ICTedu-tools and discussed how you could use them in your courses. The Moodle Book systematically overviews current uses of ICTedu-tools in higher education. The two documents describe the possible ICTedu-tools and their possible function.

Documents in VLE
1.   URL Website Design Blended learning and online courses (Nedermeijer, 2023).
2.   Examples of different types of software (= ITedu tools) (Chapter 6, Section 10, Table 18).
3.   Text Matrix Educational functions and ITedu-tools.
4.   Text Various examples of the use of IT in Higher Education.
5.   PDF Various Teaching and Learning situations.
6.   E-learning course: Evidence-based options for applying ICT in Higher education courses.
7.   Moodle Book: ICT is a must! What are the possibilities?

Assignment ICT is a must; advice on how to use ICT in the university

Question:

In the curricula of your university, various learning situations are used. In this assignment, you are asked to decide on one of the learning situations in which ICTedu-tools could be used to strengthen education.

Objectives:

This assignment has two main goals.

– First, it's meant to give you some experience with using the assignment activity in Moodle.
– Secondly, you will study an overview of possibilities to improve your education with the help of ICT.

Please do not worry if you do not entirely succeed in doing the assignment! The assignment is to train you, not to test you.

Activities

1. Select the learning situation for which you like to select ICTedu-tools.
2. Read the Moodle Book ICT *is a must!*
3. Select useful ICTedu-tools for the selected learning situation and describe shortly how you could implement these tools in your education.
4. Send the text of your conclusions (max ¾ A4) to the PUM trainer.

The results will be discussed in the plenary.

4   The Second Part of the Course: Application of the pDD Process

4.1   *Topic 6: Explanation of the 6-Step Process*

An overview is provided of redesigning your course in the blended learning course. The primary purpose of this procedure is to support you in deciding how to enhance/strengthen one of your courses or a part of the course with the help of various ITedu tools, including Moodle.

Documents in VLE

1. PDF: Description of the 6-step Design and development process
2. Text: Some considerations concerning the 6-step process

Text document Some considerations concerning the 6-step process

1. You should formulate the advantages of using IT options for you (and the students);
2. Select 4–7 IT options. More changes are a challenge to translate into a good education;
3. The ITedu activity(ies) obtains a proper place in your education with clear and relevant relationships with your F2F activities and the test;
4. The consequences of new, extra IT activities mean leaving out some F2F activities from your course;
5. Are you sure that you can handle the new F2F and ITedu activities? Are you sure the students will be able to handle the IT options? Maybe some support for you and the students is necessary;
6. Do not forget to check the consequences of your changes for the other courses in the curriculum.

4.2 Topic 7: Step 1: Formulate Ideas to Use IT and the Expected Benefits

You are asked to select a short period of 3–5 weeks from one of your courses. You select 4–6 IT options for this part of the course.

The teachers answer the following questions:

1. What changes do you want to introduce in (a part of) your course?
2. Why did you select these changes?
3. What are the benefits?

Documents in VLE

1. Form 1.1 and 1.2 (Changes and Benefits, Figures 19 and 20).
2. ITedu tools versus possible IT options (See Figure 3 in Chapter 5)

Assignment: Select IT applications and formulate the expected benefits

1. Select the IT applications you want to introduce in your course (Form 1.1.);
2. Add a concise explanation of why you have selected a specific IT application: What benefits do you expect? (Form 1.1);
3. You score these changes with three criteria (Form 1.2):
   a. The importance of IT application is critical (score 1) to not so important (score 5);
   b. Developing an IT application is very difficult (score 1) to and very easy (score 5);
   c. The impact of the IT application on your course is probably very large (score 1) to very small (score 5).
4. Select the 3–5 most relevant changes.

What changes do you want to introduce in your course?	
Selected changes	Why did you select this change/ what benefits do you expect of this change in your course?
1	
2	
3	
4	
5	
6	

FIGURE 19   Form step 1.1

Evaluation of the selected changes			
Selected changes	Change is *very important* (score 1) to *not so important* (score 5).	Development *very difficult* (score 1) to *very easy* (score 5).	Impact *very large* (score 1) to *very small* (score 5)
1			
2			
etc.			

FIGURE 20   Form step 1.2

It might appear that it is not possible to implement all the changes. Please select these feasible changes and choose the changes you like to apply soon.

4.3   Topic 8: Step 2: How Do You Realise the Selected Ideas to Use IT?

F2F, IT and self-study learning activities should be a blend that is effective, efficient, well-liked, valued and feasible. But of course, some requirements must be fulfilled.

Essential quality criteria are efficient, effective, valued, well-liked and feasible. The teacher selects 3–6 engaging IT learning activities.

Documents in VLE
1. Three sets of possible requirements (Chapter 6, Section 8, Figures 13–15).
2. Form 2 How can you realise your selected changes (Figure 21)?
3. Form 3 Requirements (Figure 22).

Assignment: How can you realise your ideas?

Individual:
Fill in Form 2 (how) and Form 3 (requirements);

In small groups of five participants:
1.   Discuss your text presented in forms 2 and 3;
2.   Formulate the subjects you like to discuss in a plenary session as a
     subgroup;
3.   Adapt, if necessary, your text in forms 2 and 3.

Plenary sessions:
Discuss the responses of a selected subject in a plenary session. Send the results to
the teacher.

How can you realise the selected changes?	
Selected changes	How are you going to do it?
1	
2	
Etc.	

FIGURE 21   Form 2

Requirements: what should be possible or developed to enable you to implement the IT changes well?	
2.	
3.	
4.	
etc.	

FIGURE 22   Form 3

4.4   *Topic 9: Step 3: Describe Your Course with the Diamond Diagram*

The diamond diagram is a valuable instrument to support your course rede-
sign. You can systematically describe your course with the diamond diagram:

learning objectives, course content, methods/media, success criteria and test methods and constraints (see Chapter 6, Section 7.1).

An up-to-date diamond diagram acts as the foundation to design the outline, route map, blueprint, prototype and final version of your course. In this

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Documents in VLE

1. Form 4 Fill in the diamond diagram;
2. What is the diamond diagram? (Chapter 6, Section 7.1);
3. Examples of Diamond diagrams prepared by the participants; These files will be inserted in the VLE after the participants send their results to the PUM trainer;
4. Why Learning Objectives are so important (Nic, 2017);
5. Active verbs for learning objectives (Chapter 6, Section 8, Table 12);
6. Bloom's verbs (Chapter 6, Section 8, Table 11).

Text document What is the diamond diagram (Earl, 1987a)?

The diamond diagram consists of the following elements:
– What learning objectives need to be met?
– What test methods and criteria can be used to test the achievement of these learning objectives?
– What concepts, principles and additional information (i.e. course content) will be covered in reaching the learning goal?
– What educational methods and media, including ITedu tools, are needed?
– What constraints must be considered?

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step, you describe the (part of the) course in which you like to introduce ITedu tools using the diamond diagram.

The word 'current' in this context is significant. The diamond diagram changes subtly from moment to moment. At the same time, the designers think up their plan, structure and strategy of instruction.

The diamond diagram is a kind of 'databank' constantly being corrected and updated as the ideas for a design ebb and flow and vibrate in the designer's mind. The content of the diamond diagram at any moment in time can conveniently be labelled the nth generation of data in this databank. The diamond diagram is represented as follows:

The arrows in the figure remind you that the end goal, success criteria and test methods, course content, course method and media must always complement one another. There should be a constructive alignment between the five elements (see Design Activity 3, Chapter 6, Section 9.4). The dashed outer lines indicate that you must make your design decisions within the limits of identified constraints or requirements.

The diamond diagram is always ready to serve your decision-making. It is a tool for monitoring the creative and logical thinking about your course's plan, structure and strategy of instruction.

A learning objective states specifically what a student should be able to do. Here are some examples of good learning objectives: Students will be able to:
– Identify different levels of data in new scenarios.
– Explain in context a confidence interval.
– Determine which probability distribution from binomial, Poisson or normal is most appropriate to model in an unfamiliar situation.
– Compare two-time series of the same data and evaluate which is more appropriate in a given context.

Assignment: Write the diamond diagram (see form 4)

Objective:
Make a systematic pedagogical description of your course, which gives clear insight into the essential elements of your course.

Activities:
1. Fill in the five elements of the diamond diagram model in form 4;
2. Check if the five elements of the diamond diagram model are logically related;
3. Evaluate if your description will result in an effective, efficient, valued, well-liked and feasible education;
4. Adjust the diamond diagram if necessary;
5. Please send form 4 to the PUM trainer through Moodle.

Results:
A pedagogical course description.

Follow-up discussion:
The experiences of using the diamond diagram are discussed in plenary sessions.

Learning Objectives

Course content

Methods and media

Test method(s)

Constraints

FIGURE 23   Form 4. Diamond diagram

4.5   *Topic 10: Step 4: Prepare the Route Map and Your Requirements*

The route map reflects the learning process(es) that the teacher thinks up. What are the main topics and learning activities? What will be the sequence of the topics? Where should you introduce the ideas for ITedu tools? Is there a precise alignment between the ITedu tool, F2F and self-study? The route map should reflect the pedagogical description given in the diamond diagram. The route map indicates where you want to introduce an IT option or the ITedu tools you selected in steps 1–3.

The route map illustrates the pedagogical options: Task-oriented, active learning, focus on the professional field, coherence of the learning objectives, the learning activities and the test, feedback from the teacher and the students and focus on knowledge.

Requirements are essential elements in designing a course. They must be satisfied to enable you to design a feasible course for you and the students that meet the different quality criteria. What are the requirements concerning your course and what are possible solutions? Is it realistic that these requirements can be realised? If not, you have to think about other teaching-learning situations.

Documents in the VLE

1.   Examples of the route map model (Chapter 6, Section 9, Figure 12)
2.   Possible sequences of the topics in the route map (Chapter 8, Section 4.8).
3.   Form 5 Rewrite the requirements.

Assignment: Design the route map (and formulate the requirements)

Objective
– Prepare the route map.
– Indicate the requirements that have to be fulfilled for successful implementation.
– Formulate possible (and realistic) solutions.
– Prepare the route map to show or visualise how you want to organise your blended learning course. In Section 4.8, possible sequences are presented, which you can use for your blended learning course.

Activities
1.   Select the topics for your course and decide on the sequence. An overview of possible sequences is available in Moodle. Use the route map drawing.

2. Add IT ideas for learning activities and materials to the route map. Remark: If necessary, you formulate subtopics or combine topics. The route map should give a clear insight into the learning process.

3. Prepare the Moodle course by introducing selected topics, learning activities and materials. Combine, where necessary, with F2F activities.

Follow-up discussion

Some route maps are presented in Moodle and discussed in a plenary session. We check if the expected study time for the topics in the outline was do-able. The other teachers also evaluated whether the topic outline resulted in an effective, efficient, valued, well-liked and feasible course. Adjust your outline, if necessary, after the discussion.

4.6   *Topic 11: Step 5: Prepare the Blueprint*

The route map of the course will now be elaborated into an actual blueprint. In the blueprint, a description is provided on topics about the necessary learning of the students, the expected learning results, the teaching activities, the use of ICT, practical exercises and other points. An example of a blueprint is given in Figure 24.

The blueprint should allow you to see if you like your design and evaluate whether the learning process is realistic and motivational for the students and fits the needs of different student groups. Also, check whether teaching activities are feasible for you and the students.

Documents in the VLE
Example of a Blueprint (Picture 24)

Assignment: Prepare the blueprint

Objective
Your course outline is elaborated by introducing per topic, the necessary learning and teaching activities and the expected learning results.

Activities
1. First, update, if necessary, the diamond diagram and the formulated requirements. The outline of your course and the Diamond gives you a detailed picture of what you want to achieve. With this picture in mind, you transform the outline into a detailed blueprint.

2.   Think up an organiser which supports you as a designer and the students as learners. See the explanation in the separate text. See also the text about sequencing in courses.

3.   For every topic you formulate:
     –   What are the learning activities of the students?
     –   What do the students learn?
     –   What will be done by the teacher?
     –   What will be done through the Internet, practicals and other remarks

An example of a blueprint is given as an attachment.

4.   When you have finished the blueprint, evaluate again if you are satisfied. The learning path should be effective, efficient, valued (by you and the students), well-liked (by you and the students) and doable (by you and the students).

5.   Some teachers like to make a short explanation of the reasons behind the chosen design. The description helps explain to your colleagues what you have done and why. But also for yourself to remind you of your decisions and why.

6.   The blueprint is discussed with one of two or your colleagues. Questions or remarks are formulated for the plenary session.

Follow up discussion

7.   Plenary session. Questions en remarks are discussed. Experiences with preparing the detailed blueprint are exchanged.

4.7   *Topic 12: Step 6: Development and Delivery of Your Redesigned Course*

The teacher:

–   Develops the required learning activities and material: assignments, lectures, PowerPoints, storyboards for video lectures, test questions, project assignments and case studies. For most learning materials, there are checklists to indicate how you should design them. Below are some examples of such checklists are given;
–   Checks the formulated qualities and requirements;
–   Uses checklists for assignments, video lectures and other learning materials;
–   Discusses with colleagues and management regarding the effect of the course on the curriculum of students;
–   Organise a try-out or a pilot experiment.

	Before the start of the course: expectations?	Topic 1: Introduction and play with and evaluate ICTedu-tools	Topic 2: How to give IT options a proper place in your course (part 1)
Activities Teachers Institute A	1. Select 1 or 2 courses for which you like to use IT options.	1. Introduction of the PUM-trainer. 2. The program and course activities (in Moodle). 3. Lecture Blended learning, possibilities, positive and negative aspects with PowerPoint in the VLE. 4. See and evaluate various ITedu possibilities. 5. Discuss results in duos.	1. Individually: teachers describe their needs and wish to use IT options in the Blog. Prepare several combinations of IT options and F2F activities in your course. 2. Plenary session: some results are presented and discussed.
Expected results	1. Teachers, the technical and the supporting staff are ready to begin. 2. The management clearly states the importance of IT. 3. The main texts are translated.	2. Develop a growing insight into the possibilities of IT options in higher education.	Redesign the course where F2F and IT options have a good place and will improve the student's learning process.
Activities PUM-trainer	1. Prepare the program and Moodle topics. 2. Prepare the Blog with additional information about using IT in HE. 3. Discuss the program with the management.	5. PowerPoint, who is the PUM trainer? 6. Prepare a Lecture about Blended learning. 7. Describe the course presented in the VLE. 8. Prepare overviews of possible IT options (to be included in the Blog.	1. Lecture How to give IT options a proper place in your course (part 1) Resource. 2. Text: Possible uses of IT options in the Netherlands.
Activities ICTedu support	Software VLE and PowerPoint, video edit, etc., should be working correctly for the participants.	Support technical organisation and advise about the use of VLE and PowerPoint.	Support technical organisation and advise about using Moodle, PP, etc.

FIGURE 24   Example of a blueprint

In this step, you deliver the course ready-made. The decision must be made whether the designed course can and will be executed. The learning materials, tasks and video presentations are based on the blueprint. The teacher designer ensures that all activities and materials have the desired quality. You discuss with colleagues and management the effect of the course on the curriculum of students. Think about the possibility of organising a try-out or a pilot experiment.

Documents in the VLE

1. Checklist assignments (Table 21)
2. Checklist for a series of assignments (Table 20)

Assignment in the VLE Prepare an Action Plan

Objective:
Think up possibilities to realise your designed blended learning course.

Activities

1. Make a list of the activities you have to perform to develop the final course;
2. Decide what actions (e.g. from teachers, IT staff, and management) are necessary to start with all the students;
3. Describe the actions in your action plan;
4. Send your results to the teacher.

Follow-up discussion
Some action plans will be discussed in the plenary sessions. Are the actions well-chosen, necessary and feasible? Are there possibilities for internal and external cooperation? Some results might be presented to management.

4.8   *Topic 13: Design Tools 3 Sequencing Topics and the Use of an Organiser*

4.8.1   Possible Sequences in Your Course

Sequencing means you split your course content into smaller or larger topics. There are many possibilities regarding how to split up the course content. Splitting up depends on the curriculum model of the instructional strategy you follow (see Chapter 12). You must follow a specific order that supports and motivates the students to master the objectives in an effective, efficient, well-liked and valued learning path. Such a learning path needs to be feasible for students and teachers.

TABLE 20   Checklist for a series of assignments

1. The series of assignments support the students in mastering the learning objectives effectively and efficiently:
    – Do the learning activities fit the learning objectives?
    – Do the learning activities fit with each other? Is there a logical learning track?
    – Are all learning activities necessary to master the learning objectives?
    – Are the learning activities not too broad or cumbersome?
    – The learning trajectory fits with the entry-level of the students.
2. The students experience the series of assignments as important, relevant and exciting. They like to finish assignments.
3. The series of assignments stimulates the motivation of the students.

TABLE 21   Checklist assignments

Is there a formulated specific learning objective for the study task?;

1. Is the importance of the learning objective clear?
2. Are the study activities formulated and practicable?
3. Is the relationship between activities and learning objectives clear?
4. Are the expected results of the study task clearly described, including the criteria for assessing the results?
5. Is there an explanation for how the result is discussed?
6. Are the study tasks (depending on their place in the course)?
    – Not too easy or too difficult?
    – Not too narrow or too broad?
    – Achievable in the available time; not too complex or too simple?
    – In harmony with the student's independent self-development?
7. Is there good coherence in the study task? The four parts (introduction, teaching objective, instructions and follow-up discussion) must logically connect.

You can split your course content according to different principles (Table 22). You must elaborate on the splitting idea to see if the results fit your expectations. After you split your course content, you can follow different sequences. Some of these principles are listed below:

4.8.2   Different Types of Course Sequences

Use your sequence of topics in ideating the route map. The content topics will be the names of the units in your VLE course. The next stage involves thinking and completing the necessary learning activities and materials.

TABLE 22   Different types of sequences for a course in HE

Different types	Sequences in a course, that ...
Chain	Organises the topics in a linear format.
Network	Organises the topics in a network.
Procedural	Follows the steps of a procedure or vice versa.
Easy-to-difficult sequence	Organises content from the most straightforward examples to the most challenging examples.
Spiral	Follows a spiral organisation of the topics in which the focus is advancing step by step to a higher level of complexity or quality.
Hierarchical	Organises the simple components or skills before the more complex skills.
Structure	Organises the topics following the structure of an organisation, a building, a machine, an organ or a body function, etc.
Learning objectives	Organizes according to the learning objectives and the combination of learning objectives in more complex assignments or case studies.
Concrete to abstract	Organises content from concrete to abstract or vice versa.
Deductive	Organises content from general to specific.
Conceptual	Proceeds from general concepts to complex concepts.
Theoretical	Follows the theoretically based hierarchy in the study book.
Scaffolding	Uses various methods, including a sequence that gradually reduces and removes supports of various kinds (fading). The sequence should gradually increase acceptable performance standards (shaping).
Backward chaining	Starts with the last step of a task and deals with other steps in reverse order. Successful experiences stimulate mastering the task or skill, and you always finish with a good result. Students will realise why specific steps are necessary.

SOURCE: REIGELUTH AND KELLER (2009) AND EARL (1987A)
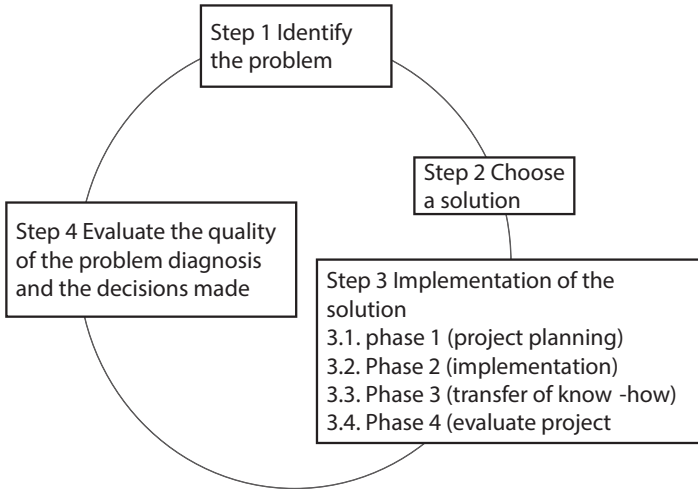
FIGURE 25 Some types of sequences
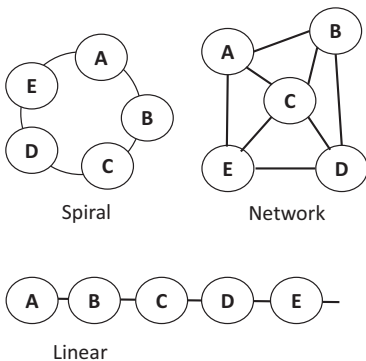
FIGURE 26
Some other sequences

The spiral model relates to advancing to higher levels through an iterative process. You need to improve a product, process or idea by following the steps shown in the figures. A hybrid format: You combine different sequences in your route map.

Additional sequences are shown in Figure 26.

4.8.3 Look for an Organiser for Your Course

An organiser is a 'bit of content' crucial in your course. It might be a working procedure, a problem, a systematic overview of the content, a process, some cases or a poem. This idea can be compared with the advanced organiser.

There are two unique properties an organiser needs to have during the (re)designing of courses. It enables the teacher designers to 'see' how they will

set up the learning experiences of the students during the course and if the design is feasible. They can use the organiser in the study guide to give the students a clear and correct insight into what they will learn and why.

An excellent example is given in Pirsig's book (2006) Zen and the Art of Motorcycle Maintenance: An Inquiry into Values. The main character in the book has to teach students to write an essay. He started his course by discussing grammar, writing styles and techniques. The result of this approach shows that the students are rather pessimistic about him as a teacher and more importantly, the quality of the final essays does not satisfy him and his boss. Next year, he decided to start differently: the students had to evaluate two essays in class. Pirsig's question was what is the best one and why?' 90% of the students select the same essay as the best one. No one could explain which qualities they have experienced to select this essay best. Pirsig challenges the students to find out in his course how to write an essay that matches the professional qualities of the selected essay. (Of course, in the book, the quality of the final essay is increased enormously).

Other examples of an organiser are:

1.   Safety orders for firefighting described in 10 pictures of crucial working situations: a case study.
2.   The 6-step Design and Development process in Figure 18 for an introduction course Blended learning and Moodle for teachers in higher education in Indonesia and Ghana.
3.   The 9-stage Design and Develop process in Figure 28 to redesign a workshop Blended learning for teachers in higher education in Indonesia and Ghana.
4.   Two cards about Irrigation management: Self-study book Water Management (Earl, 1985).

In Figure 27, an example of another type of organiser is given. General partitioners divide pregnancy into three periods of three months. These periods differ vastly in diagnostics, therapy and prenatal care. Also, labour, childbirth and perinatal monitoring of the work of doctors are distinctive. A medical student must learn to work in five different areas using typical case studies.

Diagnoses pregnancy + prenatal care			Labor and childbirth
Semester 1	Semester 2	Semester 3	Perinatal monitoring
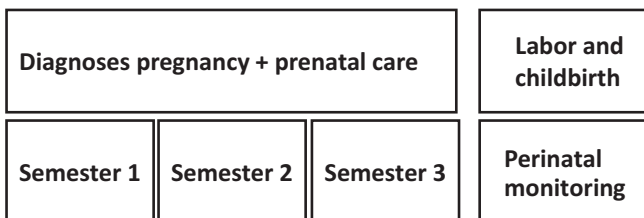
FIGURE 27   Organizer obstetrics
DRONGENDIJK, VAN GENT, NEDERMEIJER AND FABER (1977)

On his website, Earl (1987b) gives some more examples of organisers and the use of them

5 Summary

The first ingredient mentioned in Chapter 1 for successfully designing a blended learning or an online course was adapting the design tasks to the knowledge and experience the participating teachers already have. A course aimed at teachers unfamiliar with IT options, blended learning and the VLE (Moodle) was described in this chapter. Therefore, in part 1 of the course, the teachers first practised using the VLE (Moodle). They then became acquainted with the characteristics and possibilities of blended learning in higher education.

Working concretely with the VLE in the course gave the participants sufficient insight into the positive possibilities for using IT. They experienced technical problems that could arise in blended and online learning. It was now relatively easy for them to formulate several conditions that must be met before starting IT in education. The questions posed in Chapter 4, Section 5 were discussed among themselves and with management.

In Part 2 of the course, participants practice performing the 6-step DD process. The essential features of the Basic DD model were visible during the elaboration of the 6-step DD process. The basic principle of the course was that the learning objectives and content of the teacher courses were not intended to change much. The teachers choose the IT options they (already) want to use in their teaching. The teachers systematically followed the DD process to redesign a small part of their education in the blended learning form. The various design tools, such as the matrix of educational functions or the E-course, the diamond diagram and the route map, provide participants with sufficient support to work out and discuss their IT ideas concretely.

Educators with more experience designing blended or online education, for example, in the Workshop discussed in Chapter 9, could use the course demonstrated in Chapter 8 to support their colleagues in implementing IT in education. Of course, they should adapt the programme, learning materials and exercises to their specific situation.

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Course Program for the 9-Stage DD Process

1 Introduction

This chapter aims to support the teacher designers who have followed the introductory pedagogical course and are interested in introducing MHE ideas to the education in their courses. The design situation and the necessary design and development tasks are described in Table 23. This design situation is more complex than Design Situation 1 in Table 19. Therefore, I made a new translation of the Basic DD process features into a DD process that fits design situation two. The result is the 9-stage DD process described in Figure 28. This process requires more expertise during the course design.

In the workshop 'Redesign of an Existing Course into a Blended Learning Course', the participants practised the 9-stage DD process. This chapter

TABLE 23   Design situation two and design and development tasks

Design situation 2	Design and development tasks
The teacher has several new ideas for crucial changes in the pedagogical approach for which (s)he redesigned the complete course. For example, implement the idea of 'blended learning' or 'active learning'. The course content and learning objectives will only change slightly. The design task is more complicated compared with Design Situation 1. The teacher needs more information about the pedagogical possibilities offered in the pedagogical concept.	– Collect information needed in the design process. – Create and select IT ideas. – Describe the course systematically. – Create and select ideas for the route map, reflecting the learning process. – Design of new learning activities and materials. – Elaborate on your blueprint and your final course plan. – Deliver the ready-made course program (and official documents). – Formulate quality criteria and evaluate intermediate products. – Prepare implementation of the redesigned course.
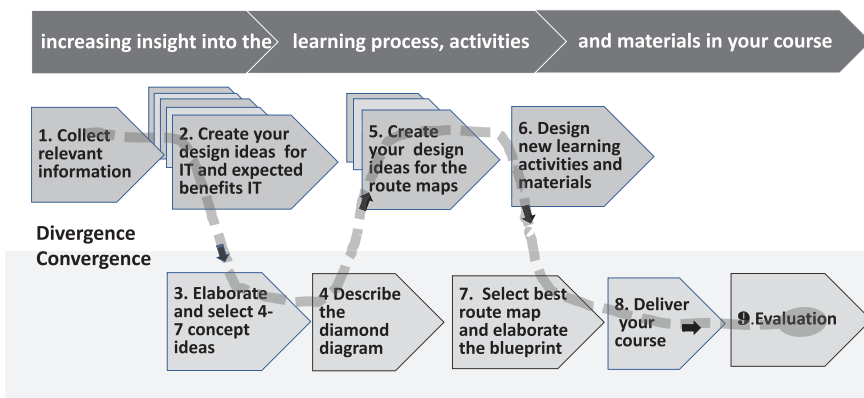
FIGURE 28   The 9-stage DD process was followed in the workshop 'Redesign Your Course in a
              Blended Learning Course'

describes the workshop activities and materials developed for this activity. Individual teacher designers can follow the workshop programme individually to acquaint themselves with the 9-stage DD process. The teacher designers can also use the workshop programme to support other teachers in their institutes.

I decided to follow the design activities of the Basic DD process for the design of the program of the workshop. In Chapter 10, the activities to design the workshop are described in detail as a case study.

The learning materials (Text file, Text Page, Quiz, PowerPoints, URL, eBook and – activities (Assignments) are available for the participants through Moodle. This chapter gives a detailed course description and presents the topic descriptions, the learning materials and the assignments. The assignments and some supporting documents are described in full. For other documents, a reference is given where a (comprehensive) version of the document can be found.

2   Pedagogical Description of the Workshop

2.1   *The Pedagogical Concept for the Workshop*

– The course combined self-study, cooperation between the teachers and distance learning;
– This course is a follow-up to the course 'Blended Learning and Moodle'. The participating teachers had already redesigned a part of an existing course in a blended course in Moodle. The participating teachers finished the redesign and development of their blended learning course in this follow-up workshop. The course should have a format that could be implemented in the regular curriculum or a special planned moment;

– The teachers followed the steps of the design and development process systematically;
– The teachers reconsidered the plan for their pilot project;
– They discussed their results in the group or task force pilot blended learning project with the blended learning coordinator and their managers;
– After the workshop, PUM experts supported the participants through the internet whenever and wherever necessary.

2.2 *The Learning Objectives of the Workshop Were as Follows*
1. Support the completion of the redesign of a blended learning course by all teacher participants;
2. Prepare a plan for the pilot project for the teacher designers to implement their blended learning courses;
3. Explain the didactical possibilities of applying ICT and other DPs in HE.

2.3 *The Main Results of the Follow-Up Course Were as Follows*
1. Teachers' versions of their diamond diagram, route map, blueprint and some redesigned blended learning courses of the participants are available in Moodle;
2. The pilot projects were prepared for future discussions with management. The requirements to prepare and organise a blended learning course were discussed and, wherever possible, realised;
3. The experiences and results of teachers in redesigning and developing an existing course could be used to decide how the other teachers of the university could and should be supported in designing, developing and implementing a blended learning course.
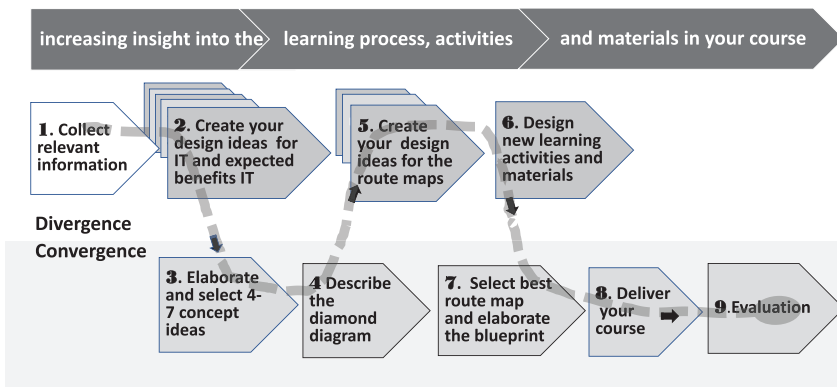
FIGURE 29   Step 1: 9-stage DD process

2.3.1   Stage 1: Collect Information

The teacher designer:

1.   Decide what you like to achieve, plan the DD process and implement the redesigned course;
2.   Describe your wishes or the problems you want to solve. The description should meet certain conditions;
     – Be broad, but not too broad. If you make the domain too small, there is a chance that you will miss some interesting new possibilities. If the problem domain you formulated is too broad, you have to study more aspects, which will take more time;
     – Be aware of your preconceptions;
     – Refrain in this stage from detailed solutions. Keep it short. If you can adequately solve your problem, you should not start this design process;
3.   Prepare a realistic, clear and convincing explanation for yourself and your colleagues;
4.   Prepare your design brief or assignment to describe the design problem, task or desire you will tackle, considering the qualities required and the planning of your design approach (the PDD process).

In the introduction stage, you collect extra information about the IT options for blended learning. In practice, your experiences as a teacher are adequate to think up ideas for the learning process you follow in your new course. Later in the pDD process, you must collect more insights or skills to design a proper course.

The design brief or assignment is the starting point of the design process. The text should be clear, realistic and convincing for you and your colleagues. It would be best if you consider discussing this design brief with your colleagues and management. Does the course fit into the formal curriculum? Do your manager and colleagues expect the students to be willing to finish the assignments and master the learning objectives?

Assignment: Select changes and the benefits

The formulated changes and benefits form the basics for your blended learning course's Design and Development process (DD-process).

During the DD process, you evaluate if the results described in the Route map, the Blueprint and the Final program reflect the changes and their expected benefits.

Purpose

Upgrade the already formulated ideas for change in your course and the expected benefits.

Activities

1. Check your formulated ideas: are these the changes you want to introduce in your course?
2. Study the Moodle book ICT is a Must and the Matrix Functions vs ICTedu-tools. Consider if other possibilities for the use of IT are interesting.
3. Add and (re)formulate the changes you want to introduce in your course (Form 1).
4. Check and (re)formulate the benefits you expect to achieve.
5. Select the content about your course and the didactics, questions, or doubts you like to study in more detail during the D/D process.
6. Send Form 1.1 to the trainer through this Moodle course. Download Form 1, also, in your own Moodle course.

Follow-up

Discuss the results with your colleagues: are the ideas and the benefits realistic? Additional suggestions?
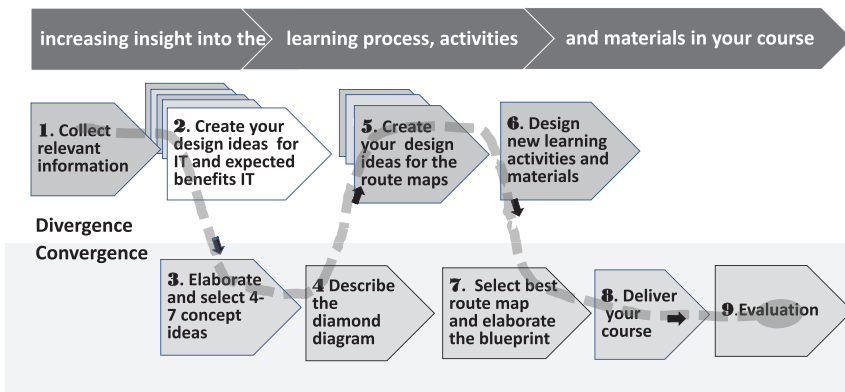
FIGURE 30   Step 2: 9-stage DD process

2.3.2   Stage 2: Create IT Ideas with Their Benefits

The teacher designer:

1. Select the IT options you would like to introduce in your course. Fill in the results in Form 1.1 (Chapter 8, Section 4.2, Figure 19);

2. Add a concise explanation of why you have selected a specific IT application: What benefits do you expect? Fill in the results in Form 1.1;

3. Suggest which topics or doubts you would like to study in more detail.

Documents and learning materials in VLE

– Evidence-based IT options for HE (Text Chapter 5).
– Summary of possible pedagogical options for using IT in HE and Matrix educational functions versus ICTedu-tools (Chapter 5, Figures 3 and 4).
– Form 1.1 and 1.2 (see Chapter 8, Section 4.2, Figures 19 and 20).
– Moodle book: IT is a must: what are the possibilities? Digital course in Nedermeijer, 2021a).
– Various Teaching and Learning situations. A PowerPoint with some pictures of teaching-learning situations in HE.

2.3.3   Document Matrix Some Suggestions

You can use the matrix of education functions versus ITedu tools in Figure 4 to help you think up and describe your IT ideas. In Chapter 5, you can find a more detailed description of the IT options and follow the E-course 'Evidence-based options for applying IT in Higher Education courses' (Nedermeijer, 2021a).

There is not yet a need to formulate a detailed solution in Stage 2. However, the description of the ideas should be clear and convincing to you and your colleagues:

– Be original and have new, unique or unusual ideas for your course. Sometimes it appears that 'fancy' solutions become real through an unexpected change in the situation of the course;
– Be effective: select appropriate and valued ideas (or solutions);
– Be realistic. Can you use the IT option? Does it fit into the pedagogical vision of the faculty?

Remember that implementing your new course starts immediately in the first stage. You can exchange ideas about your blended learning course with your colleagues, management and students. Therefore, they can be familiarised with your ideas. Of course, you can learn a lot from their reactions. If necessary, certain constraints must be discussed and solved. Requirements are formulated. It might appear that you cannot implement your IT ideas satisfactorily. Then, it would help if you start again by thinking up new possible ideas and their potential benefits.

Task How to apply the selected components in your course?

Purpose

The next step is to formulate your ideas on how you want to implement the selected IT-ideas in your course.

Activities

1. Formulate your ideas. Write down your ideas in form 2.
    In the documents, various examples of the use of ICT are described. More ideas can be found in the Moodle Book, the Matrix, the text What are the possibilities for blended learning, and the website.
2. It is advised to limit the number of changes in your course to 5–7. By doing this, the chance that the implementation is a success will increase. Therefore, after you have thought up how you want to realise your ideas, you evaluate these ICT ideas with the help of three criteria given below. The results can be used to plan a feasible number of changes.

Follow up discussion

The participants present their ideas in plenary. The other participants are asked to put forward some of their ideas.

Follow-up

Discuss the results with your colleagues. Are the how-results following your formulated ideas of changes and the expected benefits? Are there additional suggestions? Maybe you can work with another teacher to elaborate on a more complex IT idea.
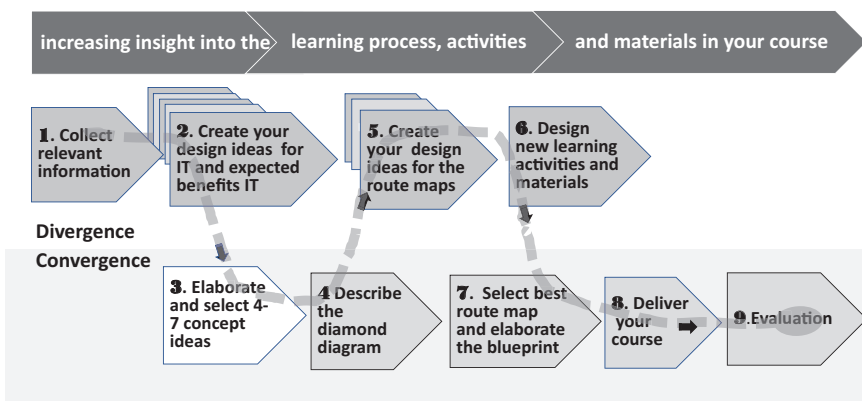
FIGURE 31   Step 3: 9-stage DD process

2.3.4   Stage 3. Elaborate and Select 4–7 Concept Ideas

As the teacher designer:

1. Formulate how you will realise the selected changes in Stage 1. Select the IT, F2F, self-study learning activities and materials necessary to realise the selected ITedu activities. Fill in the results in Form 2;

2. Prepare your first selection of the qualities and requirements crucial for successfully implementing the selected changes. Fill in the results in Form 3 (see Chapter 8, Section 4.3);

3. Score these changes with three criteria. Fill in the results in Form 1.2 (Figure 20);
   – The importance of the IT application is very important (score 1) to not so important (score 5).
   – Developing the IT application is very difficult (score 1) … very easy (score 5).
   – The IT application impact on your course is probably very large (score 1) … very small (score 5);

4. Select the 3–5 most relevant changes. It might appear that it is not possible to implement all the changes. Please select those changes that can be implemented directly and choose the changes you would like to implement shortly;

5. Elaborate on the requirements: What do you mean by it and what are the consequences for your course? Fill in the results in Form 4 (see Chapter 8, Section 4.3).
   Prepare and update the list during the DD process;
   Discuss the requirements with the management and colleagues to realise them in the curriculum. If not, are there alternatives?

6. Think about contingency plans B and C if you, for a good reason, cannot realise in your newly designed course. You better make a plan B in advance. A plan C is a plan if everything is going wrong. Chapter 10, Section 2.3 explains my plans B and C for the workshop I prepared about designing a blended learning course.

Documents in VLE

1. Form 2 and 3 (Chapter 8, Section 4.3, Figures 21 and 22)
2. Text What is meant by the requirements for the design?
3. Text Some requirements mentioned by participants in former workshops (see Chapter 6, Section 8, Table 15).

Assignment: How can you realise your ideas?

Individual:
Fill in Form 2 (how) and Form 3 (requirements);

In small groups of five participants:
1. Discuss your text presented in forms 2 and 3.
2. Formulate the subjects you like to discuss in a plenary session as a subgroup.
3. Adapt, if necessary, your text in forms 2 and 3.

Plenary sessions:
Discuss the responses of a selected subject in a plenary session. Send the results to the PUM trainer.

Assignment 3: Upgrade the selection of IT options for your course
Finish studying the Ebook. Maybe you will upgrade the selection of IT options for your course? The question is: how to realise the needed changes in teaching-learning situations. F2F, ICT and self-study learning activities should be a blend that is effective, efficient, well-liked, valued and feasible. But of course, there are some requirements which have to be fulfilled.

Individual
Fill in Form 2 (how) en Form 3 (requirements).
The results will be discussed in a small group of six teachers in meeting 4.
1. Discuss your text presented in forms 2 and 3.
2. Formulate as a subgroup the subjects you like to discuss in the plenary.
3. Adapt, if necessary, your text in forms 2 and 3.

Plenary
Present and discuss plenary the chosen subjects by the subgroups.

Individual
Adapt forms 2 and 3 of your course.
Send your forms 2 and 3 through Moodle to the PUM trainer.
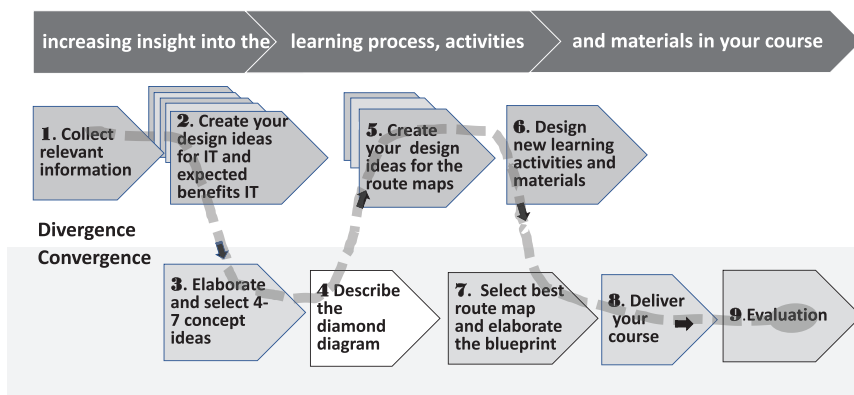
FIGURE 32   Step 4: 9-stage DD process

2.3.5   Stage 4: Describe the Diamond Diagram or the Spider Web
As the teacher designer, you should elaborate on and describe the five main
learning environment elements summarised in the diamond diagram in
Chapter 6, Section 7.1, Figure 11 or the eight elements shown in the spider web
diagram in Chapter 6, Section 7.1, Figure 10. Preparing a diamond diagram
is a crucial stage in the design process. The idea of the diamond diagram is
explained in Chapter 6, Section 7.1). It is the first systematic summary of the
information you need to redesign your course. The diamond diagram will
be updated during the pDD process based on your growing insight into your
design task and your decisions about your course design.
     As a teacher designer, you:
1.   Rely on the official course description in the coursebook and other offi-
       cial course documents. If relevant, make a small inventory of topics, skills
       and professional attitudes that could be given a place in your course;
2.   Use the available design tools (Chapter 6, Sections 8 and 10; Chapter 8,
       Section 4.8.1; Chapter 5, Figures 3 and 4 and Chapter 11) to select evidence-
       based IT options you would like to use in your course design;
3.   Study the pedagogical design principles in Chapter 16, which will help
       you ideate additional ideas for MHE for your course design;
4.   Study the instructional planning and building principles in Chapter 14;
5.   Select the learning activities you need (Chapter 6, Section 10 Tables 17
       and 18);
6.   Formulate the learning objectives using your pedagogical ideas in points
       1–4. The objectives show what you want the students to learn in your
       course. Select the verbs in Tables 11 and 12 that characterise the selected
       IT learning activities and fit with the official documents;

7.   Check the coherence of the pedagogical elements of the diamond diagram (constructive alignment);
8.   Check the coherence with other courses in the curriculum before or after your course;
9.   Analyse specific problems or wishes. For example, how can one adapt to the different entry levels of students? How to explain complex concepts, topics or procedures? How can we cope with available constraints?

Documents in VLE

1.   Text: What are the requirements for the design (Chapter 6, Section 8)?
2.   What is a diamond diagram? (Chapter 6, Section 7.1).
3.   Form 4 Elements of the diamond diagram (Chapter 6, Section 4.4, Figure 23).
4.   Text 'Learning objectives' (Nic, 2017).
5.   Examples of diamond diagrams of the participants from their courses. The results of the participants will be uploaded.
6.   Text 'An intermediate stage in the pDD process' (see below).

Assignment: Write the diamond diagram (see form 4)

Objective
Make a systematic pedagogical description of your course, which gives clear insight into the essential elements of your course.

Activities
1.   Fill in the five elements of the diamond model in form 4;
2.   Check if the five elements of the diamond model are logically related;
3.   Evaluate if your description will result in an effective, efficient, valued, well-liked and feasible education;
4.   Adjust the diamond diagram if necessary;
5.   Adjust the diamond diagram if necessary;
6.   Please send Form 4 to the PUM trainer through Moodle.

Results
A pedagogical course description.

Follow-up discussion:
The experiences of using the diamond diagram are discussed in plenary sessions.

Document: An intermediate stage in the pDD process

If you have hesitations regarding your topic sequence or route map, a simple method is to split the problem into smaller parts:

– Summarise the available learning objectives of your course in 3–5 main learning objectives. In Chapter 6, Section 8, Tables 11 and 12, you can find suggestions on which verbs to use in a learning objective. The overview is based on several types of learning activities;

– Collect relevant background information from learning psychology or the experiences of your colleagues regarding the mastery of the 3–5 learning objectives you summarised previously;

– If you cannot think up some helpful design ideas for the complete route map, you could formulate the learning processes for the individual learning objectives. Combine the 3–5 learning processes you have formulated in activity 3 and prepare some possible design ideas for a route map for your course.

– Another approach might be to find successful examples of course models comparable to your course. This can give helpful input in designing the route map.
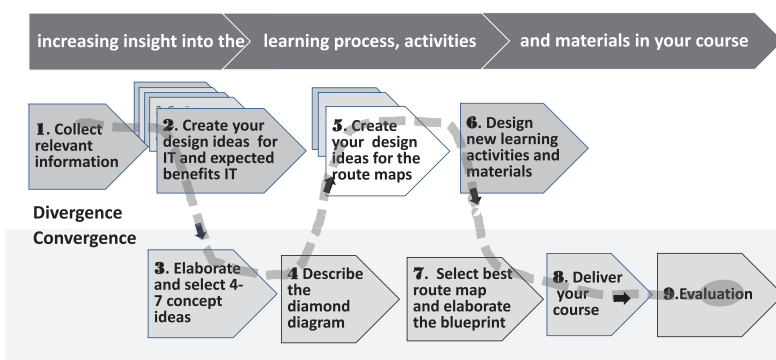
FIGURE 33   Step 5: 9-stage DD process

2.3.6   Stage 5: Create Your Design Ideas for the Route Maps

The teacher designer:

1.   Think about possible sequences for your course topics;
2.   Select the best sequences and insert the selected topics as unit headings in Moodle (the VLE);
3.   Decide which IT options need to be inserted into the route map and at what time;
4.   Think about the kind of organiser;
5.   Prepare the first concept of the route map;
6.   Check the coherence of the programme. The programme is coherent and well-described. There should be constructive alignment between objectives, course content, learning methods/media and tests;

7.   Be sure that your course fits into the learning tracks in the curriculum. Preceding courses prepare the students for your course. Your course will prepare students for subsequent courses.

In the route map, the teachers prepare an overview of the learning process(es) to be realised in their course. The route map is the course outline that the teacher thought up. The teacher designers decide whether their course design can be successful. In a route map, the following components and questions need to be considered:
– What are the main topics and learning activities?
– What are the sequence topics?
– Where should the ideas for ITedu tools be introduced?
– What is the alignment between ITedu tools, F2F and self-study?
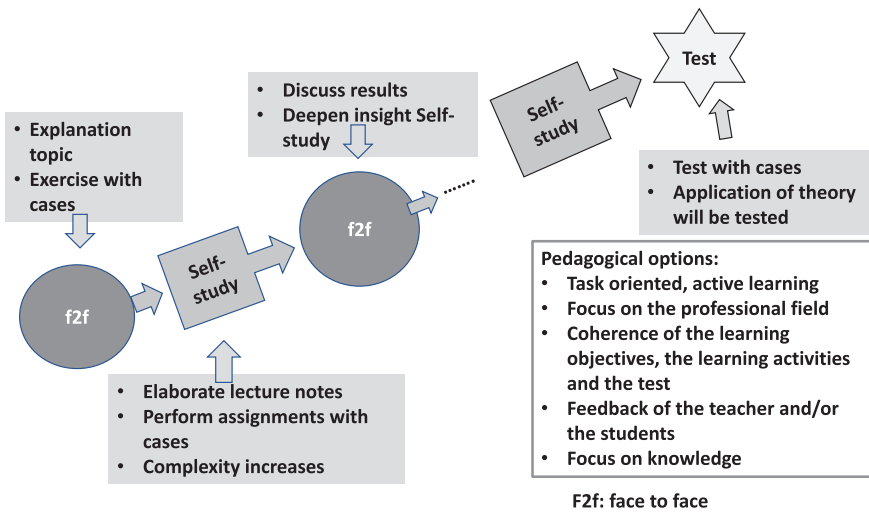
FIGURE 34   Route map

The teacher in the example given in Figure 34 decided to use three IT possibilities to:
– Stimulate self-study by using assignments and feedback;
– Give an additional explanation about complex topics through short videos prepared by himself or a colleague;
– Introduce a simple test to check if the students have mastered the learning materials taught by the teacher and presented in the VLE.

The teacher expects students to study more actively and achieve higher results. She also presumes they will apply the learnt subject matter in the subsequent courses.

Documents in the VLE

1. Form 3 Rewrite requirements (Figure 22).

2. Examples of route maps (Figures 12, 15, 34, 37, 42, 43).

3. Text: Pedagogical models (See Chapter 7).

4. Text Possible sequences in your course (Chapter 8, Section 4.8).

5. Text Accreditation faculty and university.

6. Text: A strange question (Chapter 6, Section 9.10.1)
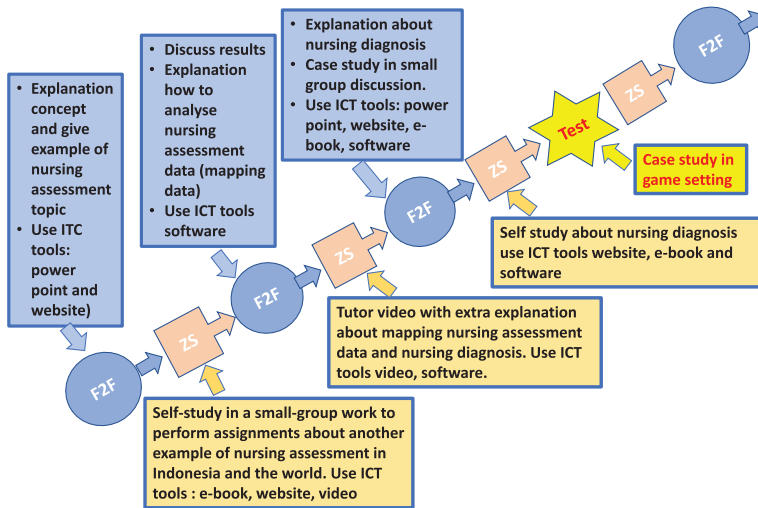
FIGURE 35 Example of a route map from a participant in the course

Assignment: Design the Route map (and formulate the requirements)

In a Route Map, you draw your course outline: What are the main topics, learning activities and materials?

The Route Map reflects the didactical description you prepared in steps 2 and 3.

Requirements are essential characteristics that must be satisfied to enable the changes you want to implement in your redesigned blended learning course.

Objective

Prepare the Route Map and formulate the requirements.

Activities

Finish the description you have made on paper. Try to visualise your outline and uses of ICTedu-tools. Check the activities indicated below.

Select the topics in your course and decide on the **sequence.** An overview of possible sequences is available in Moodle.

1. Prepare the route Map following the sequence of the topics.
2. Prepare the Moodle course by introducing the topics and the learning activities and materials you have selected.
3. Copy your Route Map for the participants.

Follow up discussion
Some Route Plans are discussed in the plenary. We will check if the expected study time for the topics in the outline is doable. The other teachers also evaluate if the topic outline will result in an effective, efficient, valued, well-liked and feasible course.

   Adjust your outline if necessary after the discussion.
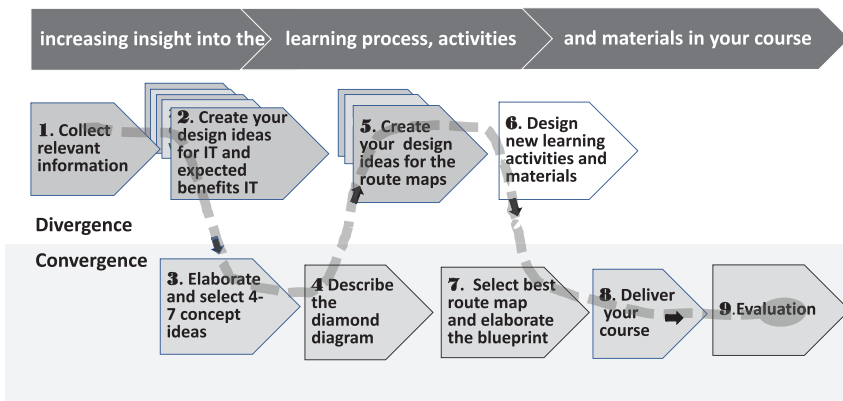
FIGURE 36   Step 6: 9-stage DD process

2.3.7   Stage 6: Design New Learning Activities and Materials
As the teacher designer:
1. Prepare and check the learning activities that are new to you;
2. Check the type of learning activity level using the list of verbs in stage 1 and the list of verbs indicating the learning activities;
3. Look for possibilities to use existing learning materials available on the internet.

   Another inspiration when designing an assignment is the list of verbs in Tables 11 and 12. The figure explains which activities are needed to master the formulated learning objectives. You can find ideas about activities needed to master the learning objectives. You can also check if a learning objective is coherent with the assignment you want to include in the program.

   In Chapter 6, Section 10, overviews are given of different types of learning activities. Another helpful overview of many possible Learning Activity Types in different disciplines is composed by Harris and Hofer (2010) from

Technological Pedagogical Content Knowledge (TPACK). The results can be found on the website (WM, 2023).

Assignment: Work-out the learning activities and materials

Objective
To design the didactical format for learning more complex learning activities or materials from the Route Map.

Activities
1. Select the activities or materials for which you like to make the didactical format.
2. Formulate how- questions for the other teachers and the PUM trainer. Do not hesitate to ask other people. This is normal among blended learning teachers: you have no time to solve all your problems.

Results
If possible, the didactical format of some relevant and more complex learning/ teaching activities or materials with an example.

Discussion
The results will be discussed in the plenary.
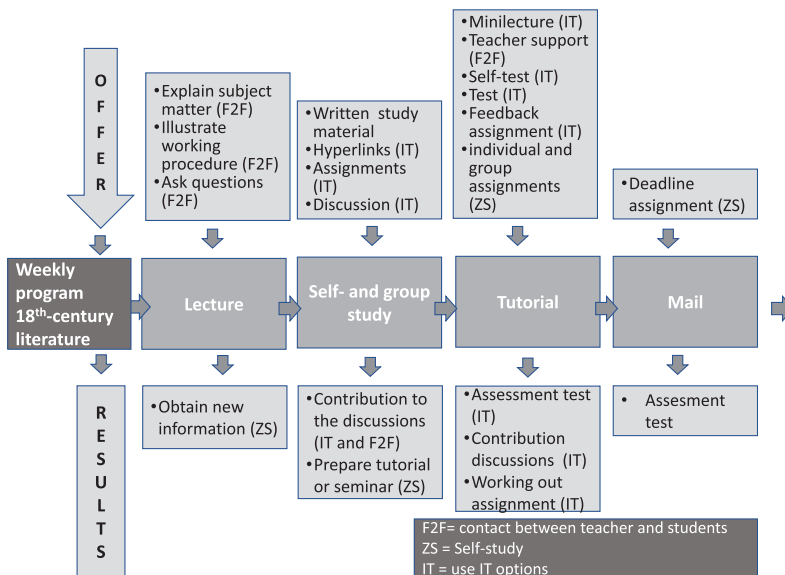
FIGURE 37   Route map stimulates self-study, deep learning and problem-solving
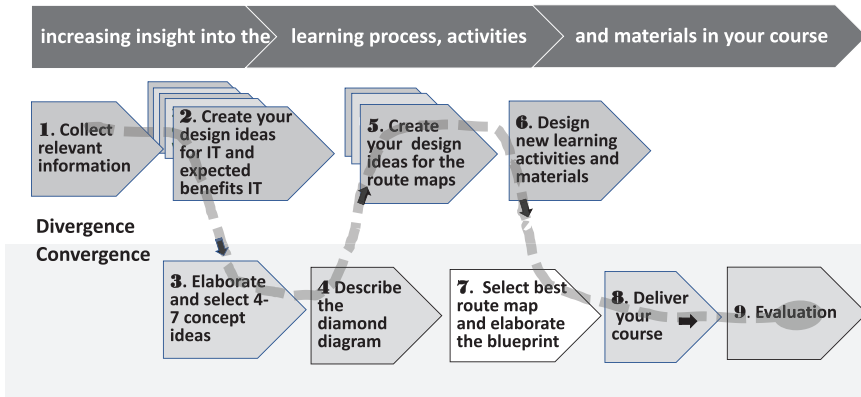
FIGURE 38   Step 7: 9-stage DD process

2.3.8   Stage 7: Elaborate on the Blueprint for Your Best Route Map

The teacher designer:

1.   Prepare the blueprint;
2.   Check the coherence of the course;
3.   Look for the organiser;
4.   Check whether you like the design;
5.   Evaluate if the learning process is realistic and motivational for the students;
6.   Does it fit the needs of diverse groups of students?
7.   Check if teaching activities are feasible for you and the students;
8.   Check if you have realised your expectations;
9.   Change the programme wherever necessary.

A description per topic is given in the blueprint, considering the following:

–   The necessary learning of the students;
–   The expected learning results;
–   The teaching activities;
–   The use of IT and practical exercises.

Documents in VLE

1.   Example blueprint (Figure 39).
2.   Official lesson table in Indonesia.
3.   Examples of blueprints from participants.
4.   Look for an organizer for your course (Chapter 8, Section 4.8.3).

The blueprint can be seen as your classroom schedule. It is expected to explain your ideas regarding the support of the learning process of the students.

Assignment: Design of the blueprint

Objectives
– To elaborate the Outline or Route map of your blended learning course in the detailed blueprint.
– To evaluate if the designed learning process is realistic and fits the needs of different groups of students and to see if your teaching activities are feasible.

Activities
1. The course outline and the diamond diagram give you a detailed picture of your goal. With this picture in mind, you transform the outline into a detailed Blueprint.
2. Think up an organiser which supports you as a designer and the students as learners. See the explanation in the separate text.
3. For every topic you formulate:
   – What are the learning activities of the students?
   – What do the students learn?
   – What will be done by the teacher?
   – What will be done through the Internet, practical activities, etc?

An example of a blueprint is given.
4. When you have finished the blueprint, evaluate again if you are satisfied. The learning path should be effective, efficient, valued (by you and the students), well-liked (by you and the students) and doable (by you and the students).
5. Some teachers like to make a short explanation of the reasons behind the chosen design. The description is useful to explain to your colleagues what you have done and why. But also for yourself to remind you of your decisions and why.

Follow up discussion
The Blueprint is discussed with one or two of your colleagues. Questions or remarks are formulated for the plenary session.

    Plenary session. Questions en remarks are discussed. Experiences with preparing the detailed blueprint are exchanged.

	Topic 1: Introduction of the program	Topic 2: Possible advantages in specific teaching/learning situations
Activities Teacher STIKes Medan	• Listen to the presentation of the PUM teacher and ask questions,….. • Check connection with Moodle, internet, … • Hands-on experience: look up examples of IT tools. • Self-study: surf the internet.	• Evaluation of the self-study. • Listen to the presentation PUM-teacher: how will technology enhance teaching and learning? • Analyse a specific example of a Moodle course or some other examples.
Expected results	• The software works (Moodle, website, PP, Excel, ..). • Some insight into what we mean wit ITedu-tools.	• More insight into the Itedu-tools and their possible functions.
Activities teacher UM	• Introduction JN(adapt PP) and introduction of the participants (some activity???). • Presentation of blended learning with examples (PP). • Check connections Moodle, internet, etc. • Example of use of Moodle/Blackboard. • Introduction practical assignment.	• Prepare screen dumps and PP (text McKeachie). • Select examples to be analysed.
Activities IT support	• Self-study on the Internet should be possible. • Moodle is available for the PUM teacher and all participants.	

FIGURE 39   A part of the blueprint of the introduction course blended learning and Moodle
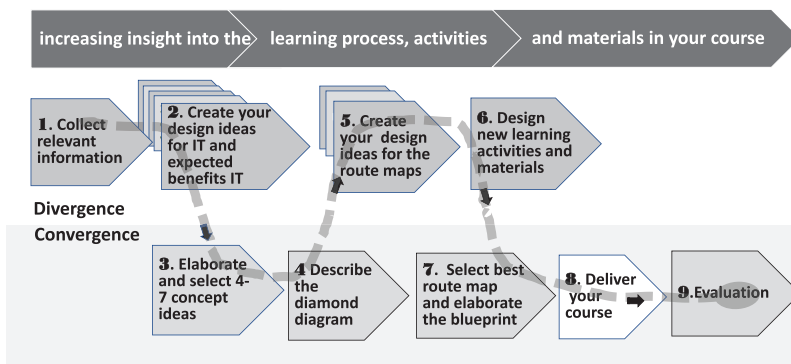
FIGURE 40   Step 8: 9-stage DD process

2.3.9   Stage 8: Deliver the Course

As the teacher designer

1. Insert the final versions of the titles of the topic, the titles for the learning activities and Moodle materials;
2. Follow the blueprint and elaborate on the required learning activities and materials: assignments, lectures, PowerPoints, storyboards for video lectures, test questions, project assignments and case studies;
3. Prepare the teaching and learning activities and materials in the format you want using the available checklist;
4. Discuss with your colleagues and the management regarding the effects of the course on the curriculum;
5. Prepare the course description in various formats, like the coursebook for the student, a short course description for the curriculum study guide and the quality assurance documents.

Documents in the VLE

1. 12 building blocks to use learning technology effectively (Chapter 6, Section 11);
2. Ensure that IT tools work correctly (see text below);
3. Assignment prepare an action plan;
4. Checklist series of assignments (Chapter 8, Section 4.8.1, Table 20);
5. Checklist for an assignment for complex learning activities (Table 21);
6. How to prepare a video presentation (see Nedermeijer, 2023, Storyboard).
7. The elements of a course description (Chapter 12, Table 28).

Document: Ensure that ITedu tools work properly

All students and teachers should have access to a computer and the internet at home and university. The internet connection (Wi-Fi, broadband, etc.) should work correctly. A power generator and UPS are necessary when there are power failures. The acceptance of IT options by the teacher and students is strongly disturbed when they experience IT system problems (see Chapter 4, Section 5).

Teachers will need practical advice about using ITedu tools from colleagues and IT staff on their online searches. Too many different layouts in the various courses IT and F2F learning materials can be confusing. Teachers should be clear about their demands, questions and problems using IT in education. At the same time, IT staff should know the options and costs to meet these demands. A special task force of teachers, IT experts and management should discuss the challenges of using IT in education.

> **Assignment: Prepare a course book and study guide (if necessary) for your students**
>
> In Moodle, you can give relevant information to the students. The relevant elements of a course book are given in Table 28. You have to decide how the necessary information from the course book is available in Moodle.
>
> Besides the course book, the students might be informed through the formal study guide of the university.
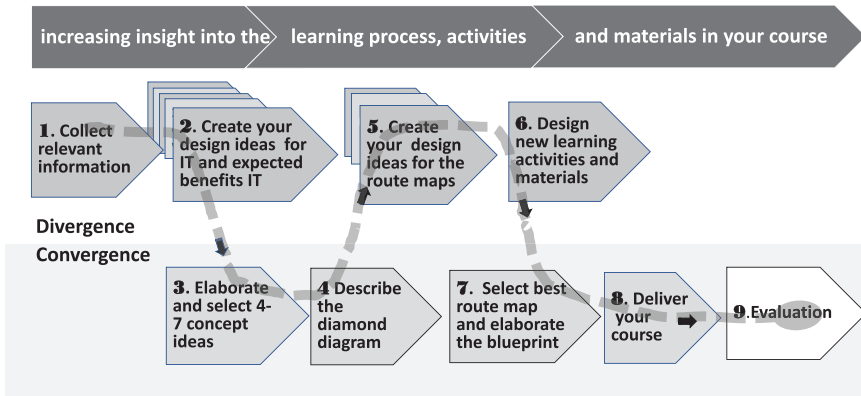
FIGURE 41   Step 9: 9-stage DD process

2.3.10   Stage 9: Evaluation

As the teacher designer:

1. Make an analysis and a work plan of actions necessary to complete the blended learning course. Not all activities and materials are ready for use;
2. Decide which evaluative information should be collected and how this can be collected;
3. Prepare a pilot project or short tryouts before you start the redesigned course. Discuss the project plan with your colleagues and management;
4. Make a course description for the website of your institute and the students.

The experiences of the pilot projects will be meaningful for the university in deciding how to introduce blended learning. You determine which evaluative information should be collected during the pilot projects and which evaluation instruments are needed.

> **Documents in VLE**
> – Figure 14 Elements relevant to the evaluation of Blended learning and online courses

Task Prepare the implementation and evaluation plan for your pilot project

Purpose
In this step 8, you prepare a plan for what should be done by whom and when before you can use the course in regular education. This includes the activities to evaluate the pilot project for your questions and the questions of the university.

Activities
1. List the activities you must perform to develop the course entirely. Sometimes, it helps to indicate the priorities of these activities: Must (as a Minimum), should, could and would (something for the future).
2. Consider organising a try-out of some aspects of your course.
3. Decide how you like to inform the students and how you want to prepare them for using Moodle.
4. Check the technical aspects relevant to your pilot project.
5. Discuss which activities are necessary to report to the faculties. What kind of evaluation information is necessary for you and the university?
6. Prepare a project plan to organise and evaluate the pilot project.

Discussion
Some pilot project plans are presented and discussed in the group. If necessary, adjust your plan.
    The plans are presented and discussed with the Prodies, faculty directors, or both.

3   Summary

The 9-stage DD process was followed in the 'Workshop Redesign Your Course' in a 'Blended Learning Course'. The workshop was intended to further familiar-ise motivated teachers from the introductory course from the previous chapter on designing blended learning. The emphasis in the workshop was mainly on the more complex possibilities of using Moodle and on IT options that fit in with the characteristics of MHE. As mentioned in the matrix of educational functions and the eBook, the possibilities for using IT options are receiving more systematic attention. When thinking about the route map, the matrix of educational functions is often used. The eBook is reviewed and the multiple-choice questions, in particular, are made and discussed in the group to gain more insight into the pros and cons of the IT options. There is ample opportu-nity to discuss the results with each other while working on the pDD process.

The teachers now do not work on parts of the course but the entire course. The idea that the route map represented the learning process was further elaborated and discussed and the importance of a consistent diamond diagram was discussed extensively.

However, the characteristics of MHE are not discussed thoroughly regularly. An aspect of the MHE addressed in detail was the DP of active learning, which played an essential role in designing homework assignments.

Final tips and take-home messages:

– The teacher designer is advised to consider some typical design process features when following the 9-stage design process. Therefore,
– You should formulate the advantages of using ITedu tools. The main challenge is applying available ITedu tool options or affordances. See for IT options: Chapter 5, Figures 3 and 4 The matrix functions vs ITedu tools;
– There is no 'good' solution, but many promising ideas for designing a learning environment will exist. As the teacher, you should select the most promising ideas;
– Design and development processes are not linear. You may expect to go back and forth between the stages in the pDD process;
– You should control your design process by checking the consequences of your design ideas after updating the diamond diagram. Earl (1987) showed the importance of the nth version of the diamond diagram;
– You visualise various products in the pDD process;
– The ITedu activity(-ies) has(-ve) a proper place in your course with clear and relevant relationships with F2F activities and tests;
– Naturally, you must leave out some F2F activities from your current course.

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Case Study Design of the Workshop 'Redesign Your Course in a Blended Learning Course'

This chapter describes my DD process to prepare for the workshop following the Basic DD design activities explained in Chapter 6. This case study of applying the Basic DD process is meant for teacher designers more interested in course design and pedagogics in higher education. The case study gives them insight into the possible approach of the course DD process for the more complex design situation 5. The teacher designers are more prepared to stimulate active IT implementation in their institutes.

The main topics discussed in this chapter are My Activities as an Expert, Design Activity 1: Prepare and Discuss the Design Brief, Design Activity 2: Collect, Analyse and Structure the Information Needed in Your Design Assignment, Design Activity 3: Design the Route Map for the Course Programme, Design Activity 4: Develop the Best Route Map in the Blueprint Format, Design Activity 5: Deliver the Redesigned Blended or Online Course, Design Activity 6: Evaluate, Assess the Quality of and Decide on the Consequences of the DD Process and Summary: Some Tips When Setting Up the pDD Process.

1   My Activities as PUM Netherland Senior Expert and SEC-Senior Expert Contact

The missions of PUM and SEC are to provide entrepreneurs in developing countries with advice for the sustainable development of their businesses. Both organisations are volunteer organisations. As a PUM and SEC volunteer, I have organised several training courses about blended learning with Moodle in Indonesia, Haiti, Ghana and Nepal for private vocational (higher) education institutes and private universities. These educational institutes ask for support from PUM or SEC to modernise and improve their education. Another reason private institutes ask for support is that their students expect the institutes to apply IT in their education. Often, the governments of many countries in Asia and Africa stimulate the introduction of IT in education.

I have organised two types of programmes:

1. An introduction training to acquaint the participants with blended learning and Moodle. The program is presented in Chapter 8.

2. Workshops are follow-up training to support the teachers in redesigning their complete course in a blended learning course. Another possibility is to adapt the workshop program so that these teacher designers might support other teachers in implementing IT. More focus is given to strengthening the pedagogical and course design background. This course program is presented in Chapter 9.

2 Case Study Design Activity 1: Prepare and Discuss the Design Brief
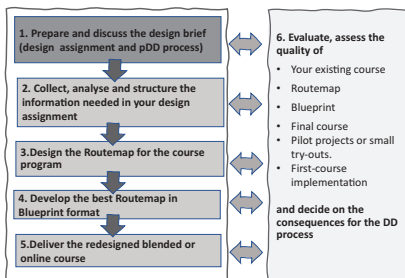
Prepare a design brief or assignment to explain the course design task and the pDD process you like to follow to finish the design task.

2.1 *Description of the Target Group*

The target groups in my training programmes and workshops were teachers, managers and supporting (IT) staff of HE institutes. They were from different fields of expertise, such as health, teacher education, law and information technology. The number of participants in the training programmes varied between 15 and 50. The number of participants in the workshop varied between five and eight teachers and IT staff. Besides the teacher training, most institutes organised a special 2–3 hour meeting for 30–300 students to inform them about the possibilities of using IT in their education.

Education in the countries mentioned above is still strongly teacher-oriented. There is often not much self-study besides studying books for tests. Active learning, group work, self-study assignments, project work and other MHE elements are not popular. Often, teachers are hesitant to change their teaching. Team teaching is not popular. This situation can be compared with the university teacher in the Netherlands (see Chapter 22). The Indonesian Ministry of Education recommends these modern educational methods through official documents. Some young teachers have already used VLEs in their university courses. A few teachers might be seriously interested in MHE. IT staff provide minimum support for the teachers to apply the pedagogical software and modern pedagogical ideas. Consequently, the participants in the training programmes differed significantly in terms of teaching experience and knowledge of blended learning and MHE.

TABLE 24   The components which need special attention for the case. Analysed with the help of the serious game (Chapter 16)

Component 1	**Provide many assignments related to the discipline**
Expectation	Well-structured assignments, able to follow the six steps process.
Design principle	2. Professional fields
Requirements	Prepare self-study assignments that the students will finish in the classroom or by self-study
	Create more scaffolding with preformulated forms
Component 3	**Different types of learning activities and learning objectives**
Expectation	Focus assignments, no long presentations about learning theories, questions and answers in the F2F presentations.
	1. Active learning
Requirements	Make an analysis and description of the nine stages DD process in Moodle
	Availability of a whiteboard or large sheets?
Component 4	**Use the power of collaborative work in face-to-face education**
Expectation	Relevant for the preparation for the future developments
Design principle	5. Collaborative learning
Requirements	Can I introduce small-group learning
Component 16	**Stimulator student motivation in the course**
Expectation	Produce concrete results recognised by the teacher (like preformulated forms for result assignments and route maps for design course/implementation IT options.
Design principle	2. Professional fields
Requirements	Create more scaffolding with preformulated forms
	Are allowed to organise small groups
	Analyse the six stages and Moodle options
	Availability of good examples of IT
Component 31	**Strengthen relations with the professional and academic field**
Expectation	Everything is focused on the task of the teachers. How do you use IT and Moodle?
Design principle	2. Professional field
Requirements	Analyse the six stages and Moodle options
	Get insight into the IT hard and software experience (in particular Moodle) of the teachers (during the first meeting) and the IT organisation (before the mission: is Moodle available?)

2.2　*Pedagogical Considerations*

You need insight into the pedagogical options offered by IT to redesign your course into a blended or online learning course. Consequently, essential IT knowledge should be available in the 'Introduction' course. There are many blended learning and online education options available in the literature. These options are made possible by a steadily growing number of software packages. My course design constraint has been short course presentation time as a teacher to provide a systematic overview of all blended learning options. Therefore I made overviews like Chapter 5, Figure 3 Summary of possible options for using IT in HE and Chapter 5, Figure 4 Matrix of possible educational functions versus ICTedu-tools and a short E-learning program (Nedermeijer, 2021).

I decided to use the pedagogical approach typical for MHE. During the MOOC Serious Games of MIT, I developed the game 'Design Modern Higher Education' to help me select useful pedagogical options when involved in course design. The game is described in Chapter 16.

2.3　*Requirements for the IT Infrastructure*

The best situation as a trainer is that the IT staff can already download Moodle on the local server. I could use their software version to prepare for my course. The participants also could use the local Moodle version and their institute could experience what it means to use IT in education.

You can expect power breaks, server problems and sudden loss of the internet connection. This means you cannot be sure that you and the teachers can use the local version of Moodle. Therefore, you need plans B and C. A necessary plan B for me was to use my Moodle from the Dutch provider. In that case, the participants can use Moodle through the internet connection of the university, the hotspot on my telephone or the internet connections of the participants on their telephones or laptops. Plan B is possible without the internet when electricity is still available. I use my laptop with a local version of Moodle, the beamer and PowerPoint to demonstrate blended learning in an interactive lesson. Plan C concerns continuing the training and the workshop if there are problems with the internet or even a power break. For plan C to work, it is necessary to use a whiteboard, a large sheet of paper or a static white sheet to support an explanation or a discussion.

2.4　*My pDD Plan*

My first idea was to prepare the workshop by copying-pasting existing teacher training courses organised in the Netherlands. However, the participants differed significantly regarding their MHE pedagogical backgrounds compared with Dutch teachers. The latter group has already been dealing with modernising HE for a long time.

The design task for the workshop is more complicated than the design task for the 'Introduction' course (see Chapter 6, Tables 8 and 9). In the workshop, the design task is more complete. The teachers must redesign their complete course instead of a small part. The teacher needs to collect, analyse and structure more extra information about the possible pedagogical options. Another idea was that the workshop should be an example of a typical blended learning course.

The three critical challenges in my design task were finding a suitable pDD process supporting the teacher designers, ensuring that the selected IT options give added value and that the teachers gain experience applying ideas from modern higher education.

A complex problem I liked to solve was that most courses on DD processes in the literature were too difficult or too general to support the teachers in their redesign process. My idea was to find helpful design features by studying technical design, design thinking, complex problem-solving and creativity. Crucial input was given by the technical design. All kinds of design processes have been analysed for relevant design features. These analyses can be found in Part 4 of this book.

The workshop design was not an easy task that I could solve following the 6-stage or 9-stage DD process. So I decided to follow the Basic DD process described in Chapter 6, Section 5. to design the workshop. The result of the Basic DD process is the workshop described in Chapter 9.

3 Design Activity 2: Collect, Analyse and Structure the Information Needed in Your Design Assignment

1. Prepare and discuss the design brief (design assignment and pDD process)
2. Collect, analyse and structure the information needed in your design assignment
3. Design the Routemap for the course program
4. Develop the best Routemap in Blueprint format
5. Deliver the redesigned blended or online course

6. Evaluate, assess the quality of
• Your existing course
• Routemap
• Blueprint
• Final course
• Pilot projects or small try-outs.
• First-course implementation

and decide on the consequences for the DD process

1. Make a systematic description of the VLE, including the diamond diagram (Chapter 6, Figure 11);
2. Draw the pedagogical concept with existing and new pedagogical measures;
3. Formulate the quality criteria you and the management set for the new course more precisely;
4. Explain the other points that you consider essential.

3.1　*ITedu Tools, IT Options for HE and Existing Training Materials*

Not many texts in Dutch or English can be used in the workshop by copy-paste their contents. However, these texts are very relevant. For example, the assignments used in teacher training programs of ICLON and E-merge. How to acquaint the teachers with IT in education? How to learn using a virtual learning environment like Moodle? Other valuable exercises are using the internet safely and finding Open Educational Resources – OER.

The content has to be adapted to the situation in Indonesia, etc. The above-mentioned finding means that I had to prepare some new learning materials. Some of these materials include:

1.　Examples of possible IT uses in HE are arranged into six main IT pedagogical functions (Chapter 5);
2.　The matrix of educational functions versus IT tools (see Chapter 5, Table 4);
3.　An overview of possible types of ITedu tools and examples (see Chapter 6, Section 10, Table 18). The overview with hyperlinks is available on the website Design Blended Learning and Online Education (Nedermeijer, 2023);
4.　Some short manuals about using Moodle as students and teachers;
5.　The Game Modern Higher Education, with a systematic overview of evidence-based pedagogical options for MHE (see Chapter 16);
6.　A systematic description of the 9-stage pDD process (see Chapter 6, Figure 7).

3.2　*The Diamond Diagram for the 'Workshop Blended Learning and Moodle'*

The results of the design activities regarding collecting, analysing and structuring the information are systematically shown in the diamond diagram. When preparing the diamond diagram, you can check if its five elements described in Figure 11 have robust coherence (or constructive alignment). This is a crucial result of my pDD process.

3.3　*The Pedagogical Concept: Applying the Principle of 'Teaching What You Preach'*

3.3.1　Theory and Practice Are Combined

The training programme and the workshop should be similar to a typical blended learning course and participants should experience typical IT learning activities. The workshop combines F2F education, individual self-study and small group work. The introduction of blended learning is often a reason to modernise education. This is why I have included elements of MHE in the programme and workshop. Some specific MHE options [e.g. active learning, test and (peer) feedback, the interaction between participants and the trainer(s) and motivation of

TABLE 25   The diamond diagram for the workshop blended learning

Learning objectives and results

After the introductory course, a workshop can be organised for a small group of teachers interested in obtaining more experience redesigning their blended learning courses. In principle, these teachers can support others in their redesign tasks.

The goals of the follow-up course are as follows:

1. Support completing the redesign of one of their courses in a blended learning course;
2. Prepare a plan for the pilot project to implement their blended learning courses;
3. Explain the didactical possibilities of applying IT and other DP s in HE;

The main results of the follow-up course were:

4. Several blended learning courses for the participants are available on Moodle;
5. The pilot projects were prepared and will be discussed with the management of the institutions of the teachers. The requirements to succeed in blended learning have been discussed and, where possible, realised;
6. The experiences and results of teachers in redesigning and developing an existing course can be used to help other University teachers design, develop and implement blended learning courses.

The content of the workshop

1. The *matrix of educational functions vs ITedu tools* summarises the most crucial elements of MHE, which should be realised (see Figure 4). In a separate *E-course*, the pedagogical options are explained in more detail. The first E-course is prepared in the Moodle Book option. The second version was prepared with the software H5P (Nedermeijer, 2021).
2. *Serious Game*: An additional tool is the *Game Modern Higher Education*. In the game, you can select all kinds of options for MHE (including IT options). However, there will be no time to use the game. But if teachers are interested in MHE, this game is a possible learning option to be in contact with MHE in a short 2–3 hour session. (See Chapter 16);
3. PowerPoint: Who I the PUM trainer? What is blended learning? The DD process;
4. Manuals: The main functions of Moodle will be explained and exercised F2F in the classroom. Some schematic procedures are prepared and used beside a laptop or computer. Thus, there is no need to switch screens. Participants are stimulated to help each other. After the training, the teachers should continue supporting each other. On the Blended Learning website, participants can find some tutorial videos about most Moodle functions;

(*cont.*)

TABLE 25   The diamond diagram for the workshop blended learning (*cont.*)

5.   Website: An overview with hyperlinks for examples of ITedu tools and back-
       ground information about blended and online learning is provided. It is pos-
       sible to find answers to questions like 'How to implement IT in the education of
       an education institute'. Teachers who want to know more about blended learn-
       ing can find background materials on this website. The website also provides
       relevant background information about course design and learning psychology.
6.   A systematic description of the 9-stage pDD process.

Methods and media

1.   The course combines F2F education, individual self-study, discussion forum
       activities and small group work;
2.   The course is prepared in Moodle and this means that all participants should
       have permission to use their own Moodle course as teachers;
3.   The individual and group activities of the individuals are supported with the
       help of Moodle, the BL website and online education;
4.   The products prepared individually or in small groups are sent to the trainer,
       presented and discussed in plenary sessions in the classroom;
5.   More formal topics will be prepared and discussed with management.

Assessment

I did not plan special test activities, only some feedback activities. The training
focuses on being active, doing assignments and joining discussions. Participants had
to send the results of their assignments to their trainer, who gave comments in the
plenary sessions. Often, the participants discussed their assignments with each other.

Some requirements

1.   The IT activities must be coherent with the existing F2F and self-study activi-
       ties of your study programme. (1) This blend should be effective, efficient, liked,
       valued and feasible for the trainer en de participants. (2) The elements of the
       diamond diagram must also support each other. The need to be coherent can
       be compared with the constructive alignment principle;
2.   A clear connection with the expected starting level from the participants;
3.   Keep in mind that the participants have different starting levels. Therefore,
       some flexibility in the course structure is necessary;
4.   The final quality of the redesigned course depends on the willingness to use the
       product in the way I have envisioned the design product.

participants] were applied in the training programme. These options follow self-
determination theory: assignments with self-study, group discussion of relevant
topics and presentations by participants in the F2F classroom.

The participants should redesign their courses in a blended learning course. The participants introduce the results of the training assignments in Moodle. Then, teachers selected the IT options they prefer to apply in their course, explaining the reasons for their decisions. A helpful principle is that the IT options should improve the quality of the course for teachers by applying modern design principles, new IT options and assignments.

The learning products are prepared individually or in small groups and are discussed in plenary sessions. The results of the assignments were regularly sent to the trainers of the teachers through Moodle. These assignments will be evaluated and discussed in plenary sessions.

If this approach is followed, blended learning possibilities, VLE and MHE will not remain abstract ideas.

3.3.2 Learn to Use Moodle

The learning activities of the participants are supported with Moodle, in which the training programmes and workshops are also prepared. All participants should have permission to use the Moodle course as a teacher. The essential functions of Moodle are exercised in the 'Introduction course'. Also, there is time and the possibility of exercising in the workshop with other Moodle functions. For example, using tests and showing the progress and video calls of students.

3.3.3 Specific Focus on Design Activities

1. Visualising the learning process, learning environment and other parts of the DD process in route maps, diamond diagrams and blueprints;
2. Focusing on the DD process, the learning process and the learning environment. Including an explicit and robust emphasis on applying results from educational research;
3. Weaving the stages of the basic technical design cycle into the DD process;
4. Focusing on applying evidence-based IT options;
5. Formulating feasible course design tasks instead of giving general and abstract assignments. Try to prepare more concrete assignments and structure the activities of the participants;
6. Stressing the need to describe better pedagogical models;
7. Formulating and applying the quality criteria and requirements of the final result in the DD process.

3.4 *Structure of the Training Programmes*

The learning process of the course is structured according to the 9-stages of the pDD process.

Flexibility in course design is necessary for most countries, as several problems may occur. For instance, there might be no internet or even no power. The

group size of participants was larger than expected (30 instead of 15 or 50 instead of 30). The beamer does not work and Moodle is unavailable on the local server. The use of whiteboards or flip-overs is not always possible. Thus, self-adhering plastic electric static sheets are an excellent solution in some cases.

3.5   *Input from Management*

Besides the training programme, the PUM trainer should meet management to explain the program and discuss essential requirements to be arranged in the blended learning and Moodle implementation process. Sometimes, managers like to join a part of the training. This might cause problems, but I think it is worthwhile that they have their experiences with Moodle and Blended learning.

FIGURE 42   The first version of the route map for my workshop 'Blended Learning and Moodle'
Q: questions to be answered; F2F: presentations to be prepared (PP); A: assignments to be developed; T: topics to be filled out in Moodle.

4 Design Activity 3: Design the Route Map for the Course Programme

1. Prepare and discuss the design brief (design assignment and pDD process)

2. Collect, analyse and structure the information needed in your design assignment

3. Design the Routemap for the course program

4. Develop the best Routemap in Blueprint format

5. Deliver the redesigned blended or online course

6. Evaluate, assess the quality of
- Your existing course
- Routemap
- Blueprint
- Final course
- Pilot projects or small try-outs.
- First-course implementation

and decide on the consequences for the DD process

1. Elaborate on the learning trajectory by structuring the available information (the diamond diagram, pedagogical concept, VLE, route map and blueprint);

2. Use the possibilities offered by the design process to reach the appropriate concept ideas and design concepts;

3. Select the structure, learning activities and materials;

4. Compile the route map concept;

5. Evaluate the route map concept based on the list of your qualities;

6. Select the final route map concept to be elaborated upon in the blueprint.

Several route maps were designed for the introductory course. The final version of the route map is shown in Figure 43. The more profound academic backgrounds focused on IT options were omitted. Instead, the matrix of educational functions (Figure 4) was used. The idea of concentrating on the learning process by making a route map was introduced: The course organiser applied the Basic DD process to make the blended learning education last for four 4-hour sessions.
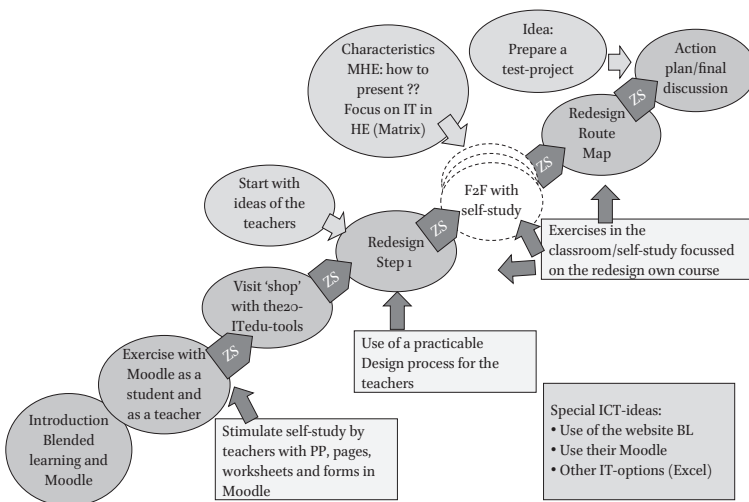
FIGURE 43   The final route map

5   Design Activity 4: Develop the Best Route Map in the Blueprint Format

1. Prepare and discuss the design brief (design assignment and pDD process)
2. Collect, analyse and structure the information needed in your design assignment
3. Design the Routemap for the course program
4. Develop the best Routemap in Blueprint format
5. Deliver the redesigned blended or online course

6. Evaluate, assess the quality of
- Your existing course
- Routemap
- Blueprint
- Final course
- Pilot projects or small try-outs.
- First-course implementation

and decide on the consequences for the DD process

– Describe all topics of the course as described in the route map;
– Describe all the necessary learning activities for the students;
– Describe all the expected learning results;
– Describe all the teaching activities;
– Describe the use of IT and practical exercises. Check the four questions in Chapter 4, Section 5. 'Preparation for the IT'.

The final programme depends on the available time for F2F meetings and the possibility of 'homework'. A separate module about using the internet was organised in some courses. It is challenging to stimulate teachers to look for relevant course materials online. This is also a problem in the Netherlands. Most teachers think that the materials available on the internet differ too much from their courses and learning materials. It appears that teacher designers can adjust such internet courses, make a good blend with their course, or only use the content to adapt it.

The final program selected in design activity 3 might be changed. Compare the route maps in Figures 42 and 43 with the final blueprint in Table 26. Some essential topics disappeared from the final programme, while others reached a more prominent place.

In the first example, the topic '4 Prepare the outline' was upgraded to 'Prepare the route map'. The reason was that in technical design, the visualisation of an idea is strongly advised. The route map is my attempt to visualise the learning process. The focus is often on a specific formula or technical process in technical design. You can translate this into course design by focusing on the learning process. Finding a proper learning process is a priority in course design.

A crucial additional reason to give the outline in the format of the route map is that all teachers can think in terms of activities and materials in the learning process. The result can be used to fill out the topics, assignments and documents in a VLE.

The pedagogical background disappeared from the final route map in the second example. The reason was simple: there was not enough time to teach

TABLE 26   Part of the (concept) blueprint for the introductory training (Italics: use of ITedu tools)

The main focus of teaching-learning activities	Before the start of the course: expectations?		Topic 1: Introduction and play with and evaluate ICTedu-tools		Topic 2: How to give IT options a proper place in your course (part 1)	
Activities Teachers Institute	1.	Select 1 of 2 courses for which IT options will be prepared/selected.	1.	Introduction Mr JN (*PowerPoint*)	1.	Individually: teachers describe their needs and wish to *use IT options in the Blog. Prepare several possible combinations of IT options and F2F activities in your course.*
			2.	*The program and course activities (in Moodle)*		
			3.	Lecture Blended learning, possibilities, positive and negative aspects with *PowerPoint in the* VLE		
			4.	See and evaluate various ITedu possibilities (*in BLOG*)	2.	Plenary session: some results are presented and discussed.
			5.	Discuss results in duo's		
Expected results	3.	Teachers, the technique and the supporting staff are ready to begin.	3.	Develop a growing insight into the possibilities of IT options in higher education.		Redesign the course where F2F and IT options have a good place and will achieve Students will master the learning objectives.
	4.	The management clearly states the importance for the university and the teachers.				
	5.	The main texts are translated.				

(cont.)

TABLE 26 Part of the (concept) blueprint for the introductory training (Italics: use of ITedu tools) (*cont.*)

The main focus of teaching-learning activities	Before the start of the course: expectations?		Topic 1: Introduction and play with and evaluate ICTedu-tools		Topic 2: How to give IT options a proper place in your course (part 1)
Activities PUM-teacher	4.	*Prepare the program and the Moodle activities and texts.*	1.	*PowerPoint, who is the PUM trainer?*	1. Lecture How to give IT options a proper place in your course (part 1) Resource.
	5.	*Prepare the Blog so it can be used in the course.*	2.	Prepare a Lecture about Blended learning.	
	6.	Discuss the program with the participants.	3.	*Describe the course presented in the VLE.*	2. *Text: Possible uses of IT options in the Netherlands.*
	7.	Look for Indonesian texts.	4.	*Preparation overviews of possible IT options (to be included in the Blog/VLE).*	
Activities ICTedu support	1.	Software should work for the participant's VLE and PowerPoint, video edit and contents mapping software.		Support technical organisation and advise about the use of VLE and PowerPoint.	Support technical organisation and advise about the use of Moodle and PowerPoint.

this content and giving lectures was monotonous and ineffective. Still, pedagogical ideas were essential. The solution was to combine the pedagogical content with other topics. For example, the matrix of educational function vs ITedu tools. If teachers want to learn more about the MHE pedagogical ideas, an E-course and the game are available through the VLE and the website BL and online education.

Considering the course description, there is insufficient time to play the game seriously. Therefore, I believe the topic was not interesting for the participants.

As the fourth example, the pedagogical concept is crucial when designing a course. However, the training was focused on the redesign of an existing course. The course had already been described in official documents for the Ministry of Education. This meant that the participants were not motivated to rewrite these documents. The solution was to ask the participants to fill out the diamond diagram using the official course plan and send me a copy. The diamond diagram's coherence was a vital evaluation question when discussing the participants' results.

6 Design Activity 5: Deliver the Redesigned Blended or Online Course

1. Work out the final lesson plan, teaching activities and materials of the course;
2. Develop new assignments and materials;
3. Prepare yourself for your work as a teacher.
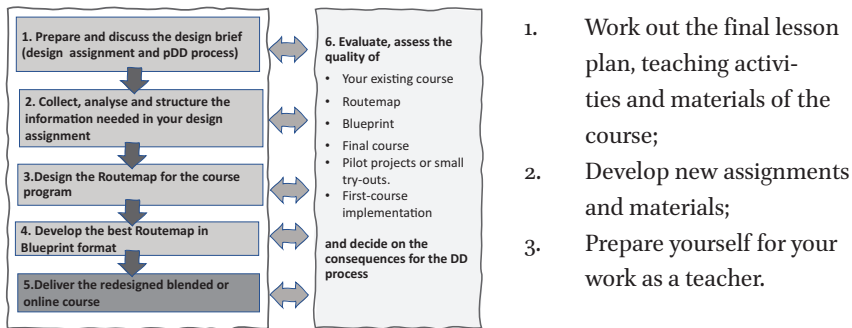
Depending on the developments and the preliminary interview with the management, the final programme was prepared and presented in Moodle. You can find the learning activities and materials of the workshop in Chapter 9.

6.1 *Design New Activities and Materials*

The overview of evidence-based IT options for blended learning is used in three different learning materials: (1) A serious Game MHE (see Nedermeijer, 2023), (2) a Moodle e-book (in Moodle) and (3) the e-book 'Evidence-Based Options in How to Apply IT in Higher Education Courses' (see Nedermeijer, 2023). The Game MHE comprehensively overviews eight DPs and 52 IT options. The game could be used at the end of the course if the teachers are interested in aspects of MHE other than IT. The game is too complex to use at the beginning course, in my experience. The Moodle book systematically describes the leading IT options and examples. The results were not motivational to read. Some multiple-choice questions were added to the H5P eBook version of the E-course and could be used in the classroom. The answers were an excellent start to

a discussion about implementing IT. Other learning materials were prepared using existing texts in Dutch and English.

7   Design Activity 6: Evaluate, Assess the Quality and Decide on the Consequences
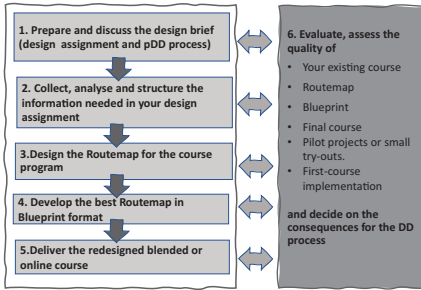
| 1. Prepare and discuss the design brief (design assignment and pDD process) |
| 2. Collect, analyse and structure the information needed in your design assignment |
| 3. Design the Routemap for the course program |
| 4. Develop the best Routemap in Blueprint format |
| 5. Deliver the redesigned blended or online course |

6. Evaluate, assess the quality of
- Your existing course
- Routemap
- Blueprint
- Final course
- Pilot projects or small try-outs.
- First-course implementation

and decide on the consequences for the DD process

1. After each design activity, evaluate whether you are still on the right track with your course design;
2. Do you still meet the formulated qualities?
3. Assess whether the design and development results fit into the (official) learning environment;
4. Decide what adjustments or additional design activities are needed.

The main evaluation activities are described in the above four points. During the preparation of the course, you try to understand the necessary quality criteria for a successful training course. What will be the size of the group? What to do if there is a large or a smaller group? What to do if the quality of the internet is not stable? In these cases, I think about plans B and C. Is there a good translator? The course and the workshop were adjusted based on the collected information from former programme versions and remarks from colleagues.

7.1   *Some Experiences*

Evaluation with a questionnaire is not straightforward because participants prefer to give a very positive reaction in an oral or written evaluation. Most evaluation results are obtained informally: the experiences of the teachers and the manager, supporting staff and other contact persons, the results of the course activities, my experiences, the experiences of the translator and, in two cases, the comments of the colleague trainer. Also, requests for follow-up activities can be seen as an essential evaluation result.

However, a beneficial informal evaluation was that some participants reported their experiences to their managers. For example, the internet connection was awful. A staff member of the university Rector experienced this problem in using Moodle. The next day, the problem was solved.

In most training activities, the participants must sign in to check the attendance list. Sometimes, one of the participants is responsible for the presence of participants. Most participants were motivated to participate in the programmes and regretted not joining all activities.

It was never difficult to access management with any questions. Often, the managers were interested in the progress of the training and my opinion about the participants.

Not all the participants understood the English presentation; a professional translator was needed to have good contact with the participants. It is crucial to make use of a translator with whom I could discuss the ideas behind blended learning, the pedagogical ideas and course activities with the translator. He or she knows the local situation. They will help you adapt the training to the needs and possibilities of the participants.

Nonetheless, paper documents with a short and clear explanation clarify what the trainer expects from the participants. The assignments were demonstrated in a structured format, with subtasks to be finished in the classroom or at home. The possibilities in a VLE were often used, in which participants sent the result of an assignment to the teacher. Assignments were sent during homework periods and when they were finished in the classroom. Everyone could see on the VLE how many participants had finished the assignment. This possibility stimulated all participants to complete the assignments. They would even discuss the best answer, an excellent opportunity to facilitate active learning. Not all teachers have experience with active learning. Therefore, gaining experience with active learning is essential for courses to support blended learning implementation.

8   Summary: Some Tips When Setting Up the pDD Process

The case study reported in this chapter was about how I performed the Basic DD process for designing the workshop described in Chapter 9. The purpose was to show how the Basic DD process can be conducted in practice. This case study was focused on collecting the necessary information and design. The second and third ingredients mentioned in Chapter 1 for successfully redesigning an existing course into a blended and online course were given particular attention in the case study. A close follow-up of the Basic DD process offers the opportunity to make HE courses more effective, efficient, valued, well-liked and feasible (Table 1). The Basic DD process also provides possibilities for tackling wicked problems (Chapter 6, Section 1, Design Situation 5) in HE more systematically, creatively and successfully.

Some tips for the adequate development of a redesigned course are:

1. I worked with colleague experts from PUM with experience in Indonesia and Ghana. Such expertise helps you to understand the target groups as a designer;

2. You must understand the theoretical considerations of the how and why of the pedagogical options in a design process. This insight helps you think up design ideas for your course. Chapter 16 gives a summary of evidence-based pedagogical options in MHE. More in-depth theoretical explanations can be found in recent books about HE, such as Neelen and Kirschner (2020), Last (2022), Last & Jongen (2021), Luckin (2018), Kirschner and Hendrick (2020) and Bates (2015);[1]

3. Besides the information in this book about IT in HE, important sources are the educational programmes and materials, pedagogical models and best practices used in your discipline and by your colleagues from other disciplines. These descriptions of best education give insightful pedagogical and practical descriptions of all kinds of ideas to redesign courses for interested teachers. Be careful with a copy-paste approach;

4. Do not be stuck in design activity for too long. Enough is enough. After you have gained more insights into your design, you can return to the design activity;

5. Do not be too quick to think you have found the best solution. Always remain critical and sceptical when assessing whether the solution fits your original design problem or wish, as formulated in your design brief;

6. Do not drop your formulated needed qualities too quickly if you think they cannot be met. This observation should encourage looking for a more ingenious solution;

7. Use the design tools mentioned in Chapter 11. Combine the given suggestions with your experience and that of your colleagues;

8. A convenient result of the course design and development process is that it enables you to prepare a course description, giving the students a clear idea of what you expect from them in advance. Such insight promotes their learning process;

9. The different texts prepared during the course design and development process can also be used to prepare the necessary official documents, such as the course description for the website, the study guide for students, the pedagogical concept and the documents required in the quality assurance procedure;

10. Suppose you want to make changes to your course over time. In that case, you can easily check the possibilities and consequences with the help of your previous analyses in your pDD process;

11.   As the teacher designer, you decide what features of the Basic DD process you want to use in your pDD.

Note

1   The following websites are also advised: 3-Star learning experiences, lde-studentsuccess.com, www.te-learning.nl/blog/ from Rubens and bl.curriculumdesignhe.eu

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PART 3

A Course Design Toolbox for Teacher Designers

∵

Input from Instructional Sciences Course Development

The teacher designer prepares various educational products during the pDD process: learning objectives, teaching and learning activities, assignments, tests, route maps, blueprints, modules and a study guide. Some crucial design tools were already explained in the two course descriptions in Part 2. Still, other valuable tools are described in Part 3. The design tools presented are evidence-based, meaning that educational research results are summarised and incorporated into these tools. The teacher designer can use these tools to generate or assess design ideas.

TABLE 27   Overview of the design tools

Design tools presented in this book:	Where in the book?
The necessary elements of the learning environment	Table 10
Evidence-based IT-options	Chapter 5
Elements of the course or module book.	Chapter 12, Table 28
Verbs for learning objectives	Chapter 6, Section 8, Chapter 8, Section 2.1, Chapter 9, Section 2.1 and Chapter 10, Section 3.3
Examples of ITedu tools (software)	Table 18
The Matrix ITedu-tools vs learning function	Figure 4
Possible sequences in a course	Chapter 8, Section 4.8
Example of blended learning course models	Chapter 7
Route map	Figures 12, 15, 34, 37, 42, 43
Blueprint	Figures 13, 24, 39 and Table 26
Instructional planning and building principles to be realised in your course	Chapter 14
Learning in higher education, according to Hattie and Donoghue	Chapter 13
Design Principles in Serious Game MHE	Chapter 16

TABLE 27   Overview of the design tools (*cont.*)

Design tools presented in this book:	Where in the book?
Examples of assignments/educational methods	Chapter 6, Section 10, Tables 17 and 18
Formative and summative testing	Chapter 17
Some common mistakes (Earl)	Chapter 15
Brainstorm techniques	Table 16 and Chapter 21
Examples of requirements and qualities	Chapter 6, Section 8 and Tables 13, 14 and 15

Besides these design tools, some valuable books and appealing websites have evidence-based results that can be applied in the pDD process. For example, Nedermeijer (2023), Neelen and Kirschner (2020), Luckin (2018), Kirschner and Hendrick (2020), Picciano (2019), Stein and Graham (2020), Last (2022), Last en Jongen (2021) (Dutch) and Bates (2015). Additionally, the following websites: 3-Star learning experiences, lde.studentsuccess and (T)E-Learning Blog Rubens (Dutch), should also be used. Often, these websites give the recent results of educational research. Some books and websites focus on practice-oriented teachers, while others are more research-oriented. The latter is further from practice and needs more pedagogical insight to apply these results to the pDD process.

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Curriculum Models in HE

Suppose that your faculty decided to apply the MHE characteristics. For example, the managers want to increase the opportunities for the students to actively study and create enough room to learn how to regulate their learning processes. This chapter explains the most common curriculum models to give teacher designers insights into the pedagogical possibilities of these models. The teacher designers should translate this new pedagogical vision into their (re)designed courses. This chapter is a translation and an edit of the corresponding text in the book of Nedermeijer and Pilot (2000).

The curriculum models explained in this chapter are Case Studies, Research-Based, Problem-Based Education, Project Education, Traditional Education Combined with New Teaching Methods, Task-Oriented Education and Modules.

1 Case Studies-Oriented Curricula

Lkoundi and van Woerden (1997) described the case study as a learning tool in which a problem, situation or event from the actual context is used and is structured according to learning objectives. An essential characteristic of the case study model is the use of authentic case studies. A constructed case study is usually ineffective; therefore, the problems or tasks the students work on need to be embedded in an authentic case study. Case studies offer excellent opportunities for practising and developing more general competencies.

Main characteristics of case studies-oriented curriculum

Orientation in the knowledge
There are excellent possibilities if you choose a suitable case study. Professional knowledge is necessary for working on the case study.

Operationalisation of knowledge about study tasks and competencies
A case study is a real-life situation where a practitioner must perform a task or address a problem. It provides excellent learning opportunities when a suitable case study is chosen. Good practice and feedback in context-relevant situations are appropriate in elaborated curriculum learning lines.

Use social learning possibilities
The choice to discuss a case study before and after in a group and have the case study elaborated in small groups depends on the teacher.

Sufficient attention to reflection
In principle, case studies offer good opportunities for reflection.

Appropriate testing
A formal assessment is often challenging in case studies when students work with them for more than a few hours. A case test is a form that offers many possibilities for cased based education.

2 Research-Based Curricula

Universities want their students to acquire high-level subject-based research, leadership and personal competencies to prepare them for higher positions in the future society. Research-based teaching seems to be a suitable approach for this purpose (Van der Rijst & Jacobi, 2010; Elsen, 2009; Van der Rijst & Driel, 2009; Dekker & Wolf, 2016). Research-based teaching occurs through meaningful and authentic hands-on experiences in research, such as: (1) teaching research results, (2) making research known, (3) showing what it means to be a researcher, (4) helping to conduct research and (5) providing research experience.

The teaching-research nexus can be considered a continuum from no relationship to a strong relationship between teaching and research (Figure 44).

Main characteristics of a research-based oriented curriculum

Orientation in the knowledge
Connect the curriculum to the scientific professional practice of academics. Use typical real-life situations from science that students find themselves in. Studying and discussing original scientific research articles and writing a scientific research article review.

Operationalisation of knowledge about study tasks and competencies
Formulate learning lines through the curriculum in which scientific and professional competencies have a clear place. Discuss developments in the discipline the academic

student is studying, collecting and analysing data to answer a research question and writing a paper or article about such research.

Use social learning possibilities
There are excellent possibilities. Students regularly work as individuals or with fellow students in a research group. Give the students responsibilities for research from the first year.

Sufficient attention to reflection
At the start, during and at the end of the study component in the curriculum, attention must be paid to the (self) reflection of students developing their scientific competencies. Plan moments in the curriculum for the students to make decisions about developing their scientific competencies linked to reflection moments. Writing a reflective assessment of a learning process is an excellent opportunity for students to find their interests and decide how to continue their studies.

Appropriate testing
The test methods are presenting a product, making a report, making a process report, evaluating the input, portfolio, (case) test and oral exams of others.

Students as participants
Student focused

Research tutored Writing and discussing papers or essays at challenging insights existing in the discipline	*Research-based* Working on authentic research activities that contribute to new insights into the field
Research-led Active learning of (recent) research results	*Research-oriented* Learning the process of knowledge construction in the discipline by conducting research

Emphasis on research content (left) — **Emphasis on research processes and problems** (right)

Students as audience
Teacher focused

FIGURE 44   Course design and the research-teaching nexus (based on Elsen et al., 2009)

3 Problem-Based Curricula

Several books have been published regarding problem-based education implemented at Maastricht University (Dolmans, Wolfhagen, Van der Vleuten, & Wijnen, 1999; Snellen & Dolmans, 1998; Bouhuijs & Moust, 1999). In problem-based learning, students study the subject matter starting from a problem. The possible solution to the problem in which previously acquired knowledge must be used is not a priority here.

At Maastricht University, the students work on problems in small groups in seven steps (the 7-jump). The faculty believes that learning is a constructive process and that learning from a concrete context increases the usefulness of the knowledge learnt. Also, the faculty believes that problem-based education will stimulate students' intrinsic motivation. The problem-based approach also helps students develop metacognitive skills (e.g. reflection, evaluation and diagnosis).

Problem-based education at Maastricht University comprises blocks of four or six weeks. The theme blocks are multidisciplinary and are studied by the students in small groups. A tutor in a guiding role supervises the students.

4 Project-Based Curricula

Project-based education focuses on making a product using previously acquired knowledge and study additional knowledge needed to solve the problem and finish the task. The entrance to acquire knowledge and skills and the learning tasks are well organised. Project-based education almost always involves problems in which the solution route and the result are unknown in advance. Consequently, working and applying the knowledge is not unambiguous but provokes many discussions and additional learning.

Working on projects promotes ideas and motivation for the profession and the future profession. Another specific feature of project education concerns that students direct their educational learning process. Project education includes making reasoned choices based on questions such as: (1) How should the problem be tackled? (2) What information is needed? (3) Which authorities should I consult? (4) In which books in the library can I find the necessary theoretical knowledge? (5) How should the tasks be divided in the group? (6) How should the data be collected and analysed? (7) Who does keep an eye on the time? (8) Who does take responsibility for the realisation of the group result? (9) How are the activities performed and the results of the research written? and (10) How do the group agree on results and conclusions?

Guo et al. (2020) believe it is necessary to encourage HE teachers to adopt project-based learning. The reason is that project education supports the autonomy of students during learning tasks. This competence raises the competitiveness of students in the labour market.

Main characteristics of a project-based curriculum

Orientation in the knowledge
Students orient themselves to the topic content by making a work plan. Teachers can indicate what they find essential through accompanying education. After the project, the teacher can reflect on the knowledge studied by the students and fill in the gaps in the acquired knowledge.

Operationalisation of knowledge concerning study tasks and competence
The students use the knowledge in relevant cases or professional situations studied in the project. Before or after the project, the students follow additional F2F explanations and discussions from the teacher as content experts. Only a successful project result is not enough to master the necessary theory. Additionally, they are expected to take an exam on the subject matter studied in the various assignments, including the specific topics.

Good practice and feedback in a context-relevant situation and appropriate in an elaborated learning line
Projects work on relevant, authentic assignments and the students are responsible for implementing the work plan of the project. Projects are focused on tasks or problems from the working field.

Use social learning possibilities
Usually, work is done in small groups. The programme must consciously choose to use the extra possibilities of group work. An important principle is that all students should have a meaningful task. Sometimes students benefit from the work of other students. These students will not learn much but still get official credit for the written reports. Other students are very negative against these students. Of course, this must be prevented.

Sufficient attention to reflection
This process is the intention but must be explicitly planned. Notably, using a portfolio when working with a tutor or in working groups can play a role in reflection. The teacher can evaluate the extent to which the students master the work field competencies in the students' portfolios.

Appropriate testing
Various solutions have been devised for this. Test methods are presenting a product, making a report, making a process report, evaluating input, portfolio, (case) test and oral exam of each other.

5 Traditional Education Combined with New Teaching Methods

New teaching methods are often seen as a logical consequence of developing competencies. After all, the combination of lectures or F2F teaching in a class with book study usually does not seem adequate to enable students to learn core competencies. Nevertheless, there are more than enough opportunities to practice and develop competencies within an educational structure with lectures, practices and working groups. The educational organisation forms discussed in this section can easily be combined with this, for example, in a practical or working group context. Many examples can be found in current education. However, a condition is that the teachers ensure, in mutual consultation, that there is a systematic structure of the core competencies in the successive or parallel study components. The increase in assignment complexity and the degree of independence of students should be well organised in the courses and the curriculum. Where possible and relevant learning lines can be introduced. In a learning line, students master a competence of a topic step by step to the necessary level.

6 Task-Oriented Curriculum

Task-oriented education (a learning objective-driven curriculum or a study task-driven curriculum) can be an efficient and effective educational organisation. The teaching team supports the learning processes of students with the help of 3–9 weeks modules. The students' activities and materials for every module are described (see also Module-based curriculum). The responsibility of students is crucial and will increase during the curriculum. In doing so, the programme establishes the learning objectives that the students must achieve. Subsequently, a learning path (Design activity 3 in Chapter 6) and associated study tasks were designed to support the students in attaining the learning objectives. If the study assignments aim to develop competencies, simple assignments, such as 'read chapter X' or 'do the following sums', are insufficient. The teachers will have to design assignments that give the students a real

chance to learn the desired skills and develop competencies. This can be done using case studies, working on project assignments and preparing presentations or discussions about interesting or challenging topics.

Main characteristics of a task-oriented curriculum

Orientation in the knowledge
The first study tasks usually allow students to study several topics seriously. The study tasks in the second part of the curriculum are preferred to be competence-oriented education. The topics will be chosen partially by the students.

Operationalisation of knowledge about study tasks and competencies through separate sub-study tasks. Sometimes, cases or other assignments are closely related to later professional practice.

Sufficient practice and feedback
When designing the study tasks, explicit attention must be paid to sub-study tasks that allow students to orient themselves and give meaning to subject knowledge and practice. Assignments must offer sufficient space for self-study and students' initiative.
   Sufficient practice and feedback in context-relevant situations and appropriate in elaborated learning lines. The study assignments will have to become broader and broader during the training.

Use social learning possibilities
Social learning can be advantageous if students can discuss the self-study results in working groups. For this, there will be some group work assignments besides the individual study by the students. Often, the faculty organise a project of 4–6 weeks in which the students has to solve an existing research or professional problem using the studied knowledge from the past semester or trimester.

Sufficient attention to reflection
This process depends primarily on the approach of the teacher. The results of the self-study assignments are discussed in the working groups. The teacher can also discuss important topics via group assignments in the working group.

Appropriate testing
The students receive feedback on their self-study during the working groups. The learning objectives are formulated. The teaching team ensures that the assessment form and content are geared towards the learning objectives of the relevant study component. A knowledge-oriented multiple-choice test is not sufficient to evaluate students.

7 Module-Based Curricula

7.1 *What Expectations Do Teachers Have?*

A module is a completed, internally coherent study component with clear learning objectives and entry requirements. The learning path, the chosen teaching and testing methods and the study load distribution are based on an explicit pedagogical concept.

Wherever necessary, there is recognisable coherence with other modules (e.g. via learning pathways). A module organiser can support this (see Chapters 8, 9 and 10). This indicates coherence with the other modules and offers a clear focus on the learning of students.

7.2 *Why Does the Institute Choose Modules?*

One of the reasons that an institute chooses a module system is that the Modules give the teacher the possibility to structure the learning of the students. For example, more first-year students should obtain the necessary study points to be allowed to go to the following year. Another example is when more students should obtain a bachelor's degree in the standard period. The consequence is that the study becomes more intensive. Running behind is not an option. In this curriculum model, the students are closely supervised.

The students are stimulated to study nominally or regularly through:
– Fewer courses at the same time;
– Fewer resits, interim tests and clear deadlines for assignments;
– Using a module book or study guide;
– Strong focus on own student responsibility.

Often, the result is that the students' study success will increase.

7.3 *The Extra Design Requirements for Modules in the First Semester*

Students often do not follow an effective study strategy on their own. However, they are personally responsible for their study commitment by following a realistic study plan, including preparing for exams on time. A module book explaining the course program can help them to follow a more successful study strategy.

Another goal, especially in the first semester, is to enable the students to learn the necessary study strategies to be 'professional' university students, among other things, through more structured or suitable assignments.

TABLE 28   Elements of a module (or block) book

A course description can be presented in hard copy or the VLE. This will make the course transparent for the students, teachers, colleagues and the accreditation committee.

1. *Introduction*
   – Introduction (organiser);
   – Learning Objectives and test criteria;
   – Study credits;
   – Expected entry level of the students. If necessary additional modules to clear backlogs;
   – Description of course materials;
   – Relationship with other modules in the curriculum)(learning tracks);
   – Teacher team, consultation hours, e-mail.
2. *Program*
   – Module structure;
   – Schedule study activities, including the contact hours;
   – Study load;
   – Educational methods;
   – Study Directions and support;
   – Scheme testing.
3. *(Self)study assignments;*
4. *Sample tests plus answers;*
5. *Literature and other educational resources;*
6. *Attachments.*

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8   Summary

This chapter briefly describes the most common curriculum models used in HE. The curriculum models are case study-based, research-based, problem-based, project-based, traditional with modern pedagogics, task-oriented and module based. Sometimes a curriculum might be organised according to one specific model. Often, different models are combined in a curriculum. The overview is meant to provide insights to teacher designers into the main characteristics of these different curriculum models. Teacher designers should carefully consider these characteristics during the design of their courses.

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The Model of Hattie and Donoghue about Learning in Higher Education

Hattie and Donoghue (2016) formulated a model of learning in HE. Their model explains the MHE learning strategies and other pedagogical options.

The main topics discussed in this chapter are: Introduction, What Is Meant by Learning in HE?, Surface Learning, Consolidate Surface Knowledge, Deep Learning in Higher Education, Consolidate Deep Learning, Transfer, Component 2: Students Must Know and Understand the Criteria for Study Success, Component 3: The Influence of the Study Environment in Which the Students Are Learning and Component 4: Input and Outcomes about Knowledge, Skills and (Study) Attitudes.

1 Introduction

Unfortunately, there is no all-encompassing HE theory of learning and teaching. The current learning theories are behaviourism, cognitivism, constructivism and social constructivism. A helpful description of these theories can be found in Bates (2019) and Van der Stel, De Rijter and Ribbert (2021, in Dutch). Helpful pedagogical options that you can use when (re)designing your course are given in these references. Nonetheless, these references do not provide a systematic overview of learning in HE. Hattie and Donoghue proposed an engaging, practical, helpful learning model for HE. With the help of this model, they try to answer the following questions:

1. What is meant by learning in HE?
2. What can you, as a teacher, do to support the learning process? Which strategies should be learnt by the students?
3. What must the students know and understand about the criteria for study success?
4. How does the students' physical study environment (education spaces) influence their learning?

These questions are answered in the following sections. In my opinion, not all components of the model are sufficiently evidence-based. My summary of

the Hattie and Donoghue model focuses on the more robust evidence-based components and could be helpful when designing the learning process.

2   Component 1: What Is Meant by Learning in HE?

The HE learning outcomes are the relevant knowledge students have acquired in a specific discipline. Students may use this knowledge when tackling problems or performing new discipline tasks. More generally, students learn how to tackle academic and professional problems. As Hattie and Donoghue formulated, 'learning is the outcome of moving from surface to deep learning and applying the knowledge in new situations (transfer). This is typical of HE.

Lodewijks (1993) gives another practical description of the core aim of adequate HE. Professional knowledge and thinking strategies are taught and learnt in conjunction. The primary purposes are to build, change and use that knowledge. During the study, the intuitive views of students are replaced by theories and models from the field. The most important characteristics of a good learning environment are as follows:

1. Conditions in education are as much as possible following later use, including real-life work situations;
2. The students are encouraged to obtain work actively;
3. The teacher is a coach and an expert on the subject matter;
4. The education (lecturer, fellow students and the study material) provides impulses to work and think independently. The students are given increasing responsibility for learning;
5. The students develop a sense of their competence.

2.1   *Surface Learning*
Surface learning is the first step in the learning process of university students. The teacher presents and explains the knowledge through lectures and teaching materials.

Surface learning refers to studying without much reflecting on the purpose or strategy, learning many ideas without necessary relation theme and memorising facts and routines/skills routinely. It is shown in the meta-analysis by Hattie and Donoghue that many learning strategies effectively improve the study of knowledge by the students (surface learning). Surface learning includes codified knowledge (the content of the lesson and learning materials) and tacit knowledge, such as experience gained. Hattie and Donohue advise that the student learn to apply study skills like taking notes by hand or a laptop, to a limited extent underlining or highlighting notes (too much underlining or

highlighting is counter-effective), using mnemonics, preparing a basic overview of broad ideas and concepts using outlining and transforming, schematising, explaining the knowledge to a fellow student and training the working memory (read the course content aloud, repeat and make visual imagery).

It is not uncommon for students to use a minimax notion, i.e., the minimum effort for maximum return in passing tests. Students can take the surface strategy to reproduce information and learn facts and ideas. This surface learning strategy is often sufficient to meet the desired grade. Sometimes, the course learning objectives are focused mainly on 'knowing'. Then, a surface learning approach combined with a knowledge test is correct. Still, if the course learning objectives focus on higher cognitive skills, the test should focus on these skills. However, these tests are often mainly focused on knowledge, so the surface learning approach can offer a good result.

2.2 *Consolidate Surface Knowledge*

Students must be able to retrieve the studied knowledge at appropriate later moments; therefore, they need to consolidate the learned knowledge in the long-term memory. Learning must then be actively processed and practised with the result that the long-term memory organises knowledge to enable effective future use. There are two learning strategies for coding. The first strategy develops storage power (the extent to which a memory is well learnt). The second learning strategy develops retrieval strength (the extent to which a memory is accessible at a specific moment). Both consolidating learning strategies require students to invest in the learning process. This includes activities to seek out, engage in, enjoy and continually seek and perform relevant cognitive activities. It is a willingness to practice, be curious and explore and tolerate ambiguity and uncertainty during this investment phase. This requires the students to develop good metacognition strategies and understand their progress towards the desired learning outcomes.

The consolidation strategies to memorise knowledge include practice testing, spaced versus mass practice, learning how to prepare and make a test, rehearsal, maximising effort, seeking help, time on task, re-studying notes, learning to receive feedback and deliberate practice (it refers to targeted and task-centred training programmes based on instructions).

2.3 *Deep Learning in Higher Education* (*see also Nedermeijer, 2016*)

Students use higher-order cognitive skills (e.g. analysing, synthesising, problem-solving and metacognitive skills) to construct long-term understanding. Deep learning refers to seeking meaning, relating and expanding ideas, seeking patterns and underlying principles, checking evidence and relating to conclusions,

examining arguments carefully and critically and becoming actively interested in the course content.

This involves critically analysing new ideas and linking them to already-known concepts and principles. Therefore, students may use this understanding in the learning transfer phase. This process also comprises seeking help and listening to others in the discussion, self-expression and questioning. Deep learning involves a sustained, substantial and positive influence on how students act, think or feel and promotes understanding and application to life (lifelong learning).

2.4 *Consolidate Deep Learning*

Suppose students have acquired the subject matter through surface and deep learning to the extent that it becomes part of their repertoire of skills and strategies. In that case, Hattie and Donohue argue that the learners have 'automated' such learning. Therefore, the cycle continues from a simple idea to deeper knowing. The learner will consider the learning result again as simple.

Several learning strategies help learners develop the learners' ability to consolidate deeper thinking and become more strategic in learning. This includes self-verbalisation, self-questioning, self-monitoring, self-explanation, self-translation of the steps in a problem, peer-seeking help and peer guidance, collaborative learning, evaluation and reflection, problem-solving and critical thinking techniques.

2.5 *Transfer*

Transferring knowledge, skills and (professional) attitudes is a dynamic process that students develop step by step during their studies. In HE, students must learn to apply their acquired knowledge, skills and academic and professional attitudes in new, unfamiliar (professional) situations. The students use the learning results of their deep learning to tackle new problems when they are in a new professional situation. Every course can contribute to this learning process.

The first step in transferring knowledge is to determine the differences between the (professional) situations studied at the university and the new situations in the professional field. Students learn to detect differences and similarities in studying various occupational and new situations, observe patterns in new professional situations and apply the relevant knowledge, skills and attitudes learnt with this approach. The following steps are that the students should have the opportunity to learn the right strategies for transferring their knowledge, evaluate the suitability for usefulness, and choose and then apply them in a new situation. For an effective learning transfer of knowledge,

students need to obtain or seek feedback so that they can improve these skills. In a university, students should have enough opportunities to learn, transferring their acquired knowledge into new tasks or problems because this competence is necessary to have a decent start after university study in a job in the professional field. Students learn to detect differences and similarities in studying various occupational and new situations, observe patterns in new professional situations and apply the relevant knowledge, skills and attitudes learnt with this approach.

3   Component 2: Students Must Know and Understand the Criteria for Study Success

Teachers will formulate success criteria for assessing the students and should help students understand the criteria used to assess their work. Too often, students know the learning intent but do not know how the teachers will rate their performance. The success criteria should be as clear and specific as possible, allowing students to monitor their progress during the course.

4   Component 3: The Influence of the Study Environment (Education Spaces)

It is essential to consider several features of the environment in which students are studying, such as the following a quiet room or study place, Internet and other equipment availability, high levels of social support, allowing students to study at preferred times of the day, ensuring sufficient sleep and physical exercise, think about new designs for learning spaces, such as hybrid active learning classrooms, virtual classrooms and teaching and learning laboratories, are developed.

The Cookbook Education Spaces version 2.0 describes requirements for lecture halls, instruction rooms, project rooms, classrooms, PC-halls, exam halls and study workplaces at the Delft University of Technology (the Netherlands) (Van der Zanden, 2020). At Utrecht University (the Netherlands), new designs for learning spaces are developed. In the Future Learning Spaces project, teachers may experiment with new concepts to explore how the physical learning environment contributes to the vision of education at Utrecht University. Below, a short description is given of these new concepts. On the website of Utrecht University, these new concepts are described in detail.

A Hybrid Active Learning Classroom (HALC, 2023) is a space where interactive, student-oriented learning occurs and stimulates active learning through its layout. Students work in groups using their laptops at adjustable sit-stand tables, with a screen and whiteboard for each table. A teaching station is located in the middle of the room, which an instructor can use to select which information is visible on the various screens; either the lecturer's screen, the screen of a group at a specific table, or the work of students from another table'.

Virtual Classroom (VC, 2023): 'The Virtual Classroom was designed to give students and instructors an educational experience comparable to education in a physical learning environment remotely. In a Virtual classroom, an instructor teaches students remotely. The instructor sits in a specially furnished room with six large screens showing six online participants per screen. Two other screens can show presentations, interaction tools or the students' questions, as needed. The benefits of a Virtual Classroom over a webinar, for example, are that the instructor can make eye contact with all the participants on the large screens and that more interaction is possible between the instructor and students and among students. Teaching and learning lab (TLL, 2023):

> In the educational and testing facilities of the Teaching & Learning Lab, the education determines (VC, 2023) the layout of the space, instead of the space determining how the instructor can teach. Tables and chairs, sitting or standing tables, or no furniture at all: anything is possible in these experimental learning spaces. In addition to the flexible furnishings, the space has modern equipment available for use during the teaching moment, such as digital whiteboards, an interactive wall for mind mapping and brainstorming sessions and observation cameras for educational research.

5   Component 4: Input and Outcomes Knowledge, Skills and (Study) Attitudes

The most important factor when designing a course is understanding what the learner already knows and can do. Therefore, teachers should enable learners to continue building on this knowledge, skills and attitudes. Other factors influencing the learning process are the views, beliefs, expectations and cultural backgrounds of students.

The learning process must lead to the knowledge, skills and professional attitudes described in a course's learning objectives. The student should have a clear idea of what the teacher expects. The test should reflect these criteria.

Some remarks about such criteria are provided:

1. If specific skills or topics are not part of the test, you cannot expect students to study those skills and topics seriously;
2. Students should develop a professional attitude during the training and grow from novice to experienced professionals;
3. Students learn competencies and learning strategies in the discipline context. The so-called 21st-century skills are probably developed better with disciplinary learning content.

6   Summary

Hattie and Donoghue tried to answer seven critical questions about higher education. Their answers to their critical questions provided some insight into the characteristics of MHE. They combine results from the most commonly used four learning theories to answer these questions: behaviourism, cognitive, constructivist and socioconstructivism.

In their study process, students should be supported by a suitable physical environment and an insightful learning environment which fits their needs and possibilities.

A helpful idea is distinguishing between surface and deep learning and learning to transfer knowledge, skills and attitudes. There are two steps: learning and consolidation. You need knowledge and should be able to apply this knowledge, skills and attitudes to the problems and tasks students obtain from university teachers. Nonetheless, students must also learn how to apply their knowledge, skills and attitudes to problems and tasks in their professional careers.

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Instructional Planning and Building Principles to Be Realised in Your Course

When designing a route map or blueprint, the instructional planning and building principles provided in this chapter can be helpful designing tools. I prefer the choice supplied by Reigeluth and Carr (2009) for this set of principles. This is because I like to consider creating the instructional plan and the instructional resources separate from the design principles (DPs), which are described in Chapter 16. Chapters 14 and 16 have different perspectives from which you can look at the course design. The first instructional planning and building principles are based on instructional design theories. It explains the pedagogical activities that should be fulfilled in your course to realise a good learning process, as explained by Hattie and Donehue (2016) in Chapter 13. The second set of design principles in Chapter 16 reflects your pedagogical vision by choosing evidence-based principles from learning psychology. Of course, when applying the two sets of principles, you should try to find principles that support each other and might counteract each other.

Instructional planning and building principles to be realised in your course are as follows:

1. Connect the course with the student's initial knowledge, skills and attitudes;
2. Provide information about the program's learning objectives, structure and pedagogical approach to the study programme;
3. Surface learning offers orientation on concepts, relationships, systematic approaches and learning goals;
4. Consolidate and operationalise the studied knowledge and skills;
5. Practice applying knowledge, skills and professional attitudes in new problems or situations and skills (transfer);
6. Give feedback to students about their performance on study tasks;
7. Assess and give feedback on learning outcomes;
8. Motivate students in higher education;
9. Involve the social and situational context in the course activities;
10. Arrange for reflection moments on results and study progress of students;
11. Contribute to competence development and academic training.

The planning and building principles are based on Nedermeijer (1990–1917), Pilot (1992), Nedermeijer and Pilot (2000), Holleman et al. (1999), Holleman and Pilot (2003), Hattie and Donehue (2016), Merrill (2009), Chickering and Gamson (1987) and Reigeluth and Carr (2009). A brief description of each principle is given with suggestions on which learning activities and materials can be used to realise a principle. In the literature, both sets of principles are sometimes considered to be pedagogical or education functions.

1 The Principles Are Explained and Illustrated with Pedagogical Options

1.1 *Connect the Course with the Student's Initial Knowledge, Skills and Attitudes*

Presenting new subject matter is more effective when students connect it with previously learnt knowledge. Therefore, the following options are indicated to provide such a connection:

– Indicate the knowledge and skills students are expected to master in the coursebook;
– Refer to parts from other courses on which your course is built;
– Activate the foreknowledge through executing and discussing study tasks in which the previous and newly learnt knowledge is combined;
– Consider a series of easy-to-complex study tasks so students can check whether they have sufficient prior knowledge. If not, they need to study the topic in remedial learning materials;
– Use adaptive tests (test questions are becoming increasingly difficult);
– Organise refresher activities to activate prior knowledge (e.g. via a VLE);
– Provide extra learning materials to help the students eliminate their deficiencies (e.g. through a VLE).

1.2 *Provide Information about the Program's Learning Objectives, Structure and Pedagogical Approach to the Study Programme*

The course description should give the students a meaningful insight into the curriculum structure and necessary learning activities. The following suggestions are indicated to make such a promotion:

– Indicate and explain the 'red threads' in the curriculum;
– Describe the courses and the curriculum (e.g. learning objectives, study activities, test format and requirements, course content, schedule and preconditions);

– Explain the location of the course in the curriculum;
– Identify possible learning pathways, including free subject choices by the students;
– Ensure that the students experience the relevance of the course(s) for future professional practice.

1.3 *Surface Learning Offers Orientation on Concepts, Relationships, Systematic Approaches and Learning Objectives*

In the first phase of the learning process, the student obtains a complete orientation on the new subject matter of the course: main concepts, relationships and the systematic approach to deal with it in the assignments and issues. The learned knowledge should be consolidated in long-term memory.

The following suggestions are indicated to orient students during the learning process:

– Indicate the structure of the course by titles, enumerations and introductions;
– Offer lecture sheets (through the VLE);
– Use of authentic professional situations in study tasks;
– Provide a study guide;
– Summarise subject matter and experiences (on paper or as a lecture in the working group/college);
– Show and explain the learning objectives;
– Give an overview of the skills to be practised;
– Offer a test to give students insight into the desired final level assessed in the final examination(s);
– Create an index and a core list of concepts;
– Compile schematic summaries of (professional) knowledge;
– Provide additional explanations or additional topics (on paper or digital);
– Offer additional educational materials, such as sheets, pictures, video, Computer-Based Training (CBT) and multimedia;
– Create an educational situation in which students feel safe.

1.4 *Consolidate and Operationalise the Studied Knowledge and Skills*

Students need to understand the subject matter and exercise the ability to apply the knowledge to relevant problems/cases to make this knowledge operational. They obtain a certain speed, familiarity and routine. They integrate the different parts of course content. A robust cognitive structure should be built into their long-term memory during the course(s).

Two key concepts are knowledge agility (the ability to use the knowledge in various situations) and knowledge availability (the ease of finding the memorised knowledge).

The following steps are indicated to provide such concepts to students:
– Use of intermediate questions and study questions in texts and assignments;
– Present and exercise an approach to tackling problems in the relevant disciplines;
– Prepare study tasks that focus on these learning skills (e.g. self-study, working groups);
– Discuss (reflect) study results in the working group and responsive discussion environment (via the VLE).

1.5 *Practice Applying Knowledge, Skills and Professional Attitudes in New Problems or Situations and Skills (Transfer)*

The practical assignments refine knowledge and supplement it with experience usage details. This type of knowledge will remain partly implicit. Students usually work with increasingly complex tasks, exercises, cases and projects. The focus will be on topics and cases relevant to future situations. Also, exercise is necessary to obtain a certain speed, familiarity and routine and integrate the different parts of the course content. Assignments and group discussions are vital to stimulating learning to use the subject matter. The following course attributes are required to reach these objectives:
– Provide exercises available per theme;
– Provide integrative exercises based on the course content of multiple topics to students;
– Offer issues of an increasing level per learning goal or by topic;
– Consider that there is a considerable spread in the difficulty of the various questions: multiple-choice questions, thesis discussion, open questions, questions around issues, cases and group practices;
– Follow the idea of interleaving assignments. Instead of massed practice (aaabbbccc), you follow interleaved practice (acbcacbab). Students have to follow different solving approaches in different assignments). Interleaved practice is far more effective than massed practice (see blog 3-Star learning experiences (Kirschner & Neele, 2023). Interleaving leads to better long-term retention and a better ability to transfer learned knowledge;
– Give short tests or assignments distributed over time. Spaced testing/learning can be very effective. Use a variety of activities (see 3-Star learning experiences (Kirschner & Neelen, 2023). A crucial aspect of spaced learning is the repetition of concepts. Repetition helps to memorise and improve long-term learning and recall the studied knowledge and skills;
– The most difficult issues represent the main learning objectives, the final test, the pre-test and the home trainer;

– Draw up a model for solving the cases/problems in the field. The steps in such a model often form the questions in a study task;
– Provide additional, more complex cases that can be used in additional education.

1.6   *Give Feedback to Students about Their Performance on Study Tasks*

Providing feedback is inextricably connected with study tasks or tests. Learning is better when students receive information about the quality of their work. Based on the feedback, the students obtain suggestions on what they can do to eliminate the deficits. Reflection on students' study results is necessary to bring their self-knowledge to a higher level. Students should learn to 'diagnose' their weaknesses and strengths. They should follow up on their new insights in their study, which is a vital element of 'learning to learn'. The assignments and the accompanying feedback can be offered on paper via a VLE or other software. The following procedures should be implemented in the course to obtain such results:

– Apply possibilities for feedback in the study tasks;
– Explain common mistakes;
– Indicate what a student has done right and wrong (linking to study sections or chapters of a book);
– Use of diagnostic tests with automatic feedback (via the VLE);
– Provide additional exercises for students to follow up on feedback;
– Use a digital portfolio.

1.7   *Assess and Give Feedback on the Learning Outcomes of Students*

Students are assessed to determine whether they have mastered the formal requirements during the course. The tests must align with the learning objectives and activities set in the course (= coherence). The following procedures should be included in the course to improve it in such a direction:

– Provide digital tests (different types of multiple-choice tests);
– Use sound, still and moving images (in addition to text) in critical questions;
– Provide the test results within the planned period;
– Review the test results with the students;
– Use tests focused on professional skills (e.g. competence-oriented education);
– Offer a realistic timetable for the tests and second chances.

1.8   *Motivate Students in Higher Education*

Students' motivation is to be motivated to start with the study process and persevere. The following course features are suggested to motivate students:

– Introduce cases and other examples representing the main learning objectives of the course;

– Try to bring forward the experiences of students;
– Choosing visual elements to make the study material attractive;
– Use possibilities of active learning: asking questions, the minute paper, students discussing in pairs or threesomes, using a clicker, relating with entry-level, and giving assignments for homework;
– Explain learning objectives and test criteria;
– Give feedback to the students;
– Stimulate students' motivation in the course according to the Self-determination theory: Designing for competence, relatedness for autonomy (see the PowerPoint of Van Merrienboer, 2015).

1.9 *Involve the Social and Situational Context in the Course Activities*

Student learning has a vital social component. An educational group can perform several functions: social bonding is essential to keeping the students committed, active and on track. The students learn from each other by verbalising and exchanging their knowledge, insights and approach. Peer learning is often applied in blended learning. The students have to learn to work together with other professionals and clients. The suggestions below should be added to your course to improve it in this direction:
– Illustrate a study part with a case, practical problems (e.g. multimedia, a picture or a sound fragment) or both;
– Organise team-building exercises to obtain a good group atmosphere. Offer a kick-off meeting;
– Organise group activities that bring shared success for the students;
– Use existing social structures;
– Realise comments by professionals (e.g. experienced researchers);
– Treat each other as professionals;
– Use groupware software;
– Gain work experience through internships, dual learning, simulations and virtual companies;
– Organise student clubs, mentor groups and year groups;
– Organise student support by student advisors and teachers;
– Involve students in quality assurance and curriculum matters;
– Establish a virtual professional community for the students to which teachers and external experts can be invited.

1.10 *Arrange for Reflection Moments on Results and Study Progress of Students*

Reflection on students' study results is necessary to bring their self-knowledge to a higher level. Students should follow up on their new insights in their study, which is a vital element of 'learning to learn' or the personification of their

study. The following procedures should be included in the course to improve it in such a direction:

– Discuss how a student functions in a group or an internship;
– Offer assignments designed to give students insight into their strengths and weaknesses and eliminate their shortcomings;
– Discuss how students can orient themselves to a topic by comparing the working methods followed by other students.

1.11 *Contribute to Competence Development and Academic Training*

The curriculum design promotes the development of students' competencies and academic training. This is the idea of learning lines. A course builds on what students have learnt before and prepares them for the following courses. The model posits that this learning should be embedded in some content, something worth knowing. The 21st-century skills are often promoted as content-free and can be developed relative to some content. The model by Hattie and Donoghue (2016) suggests that such skills are likely best designed with relevant content. The following course suggestions are indicated to improve your course in this direction:

– Explain the academic or professional skills that have to be mastered by students in detail. The students should judge themselves accordingly;
– Specify the focus on competencies per academic year or specify the focus on competencies per subject;
– Create a learning line per competency;
– Use a portfolio focused on competencies;
– Use activating methods, research projects, practical assignments and internships;
– Use skill tests based on practical situations;
– Ensure that educational activities focus on relevant professional networks;
– Maintain contact about your course with your colleagues and professionals in the work field to update your course;
– Support a good start to the study;
– Offer electives for students;
– Create possibilities for personal development;
– Offer extra activities for excellent and motivated students.

2 Summary

Many suggestions are provided in this chapter on how to design a course in HE. I consider this to be a handy mnemonic or design tool. These recommendations

can be found in theories about learning and teaching to be successful. Still, there is no guarantee of success. Certain combinations of course features may not work because they have an opposite effect or make the education not liked or valued by the students or the teachers. So teacher designers should try to find principles that support each other.

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Some Common Mistakes (by Earl, 1987)

A unique and helpful chapter in the website version of the book by F.A. Earl is 'Testing and Revising a Design'. The section 'Some Common Mistakes' provides critical insight into how teacher designers can evaluate their courses. The text is shortened and you can find the full version of the text, with the examples of Tony Earl, in his digital book. I liked this chapter because it told me not to rush the last design step. Is it really a good design? Did I formulate clear and meaningful assignments? You have to sit back a few days to be open-minded enough to look critical of your work.

The main topics discussed in this chapter are as follows: The Missing Imperatives; The Missing Overview; The Impracticality of a Design; The Missing Melody; The Non-Integration Problem; Some Minor Critical Faults; An Always Avoidable Fault and A Fundamental Fault.

1   The Missing Imperatives

Learners like being told what to do. 'Think aloud …', 'draw a diagram …', 'talk to yourself about …', 'label this picture of …', 'explain this too …', 'match the items in list A with those in list B', 'conjure up a mental picture of …', 'explain to your neighbour …', 'listen to the silence in this film' are some of the imperatives you can use to sharpen the pace of the learning process. 'Make the connection between … and … ', 'paraphrase …', 'solve this …', 'translate …', 'work out …', 'stop and think …', 'give yourself two minutes to …', 'rewrite ibis', 'underline …', 'cross out …', 'till in …', 'lookup …', 'throw out …'.

Imperatives demand action and attention. Without them, a learning experience can be too passive. Their absence can slow down the tick-tick-tick of an effective, fast-moving learning process.

2   The Missing Overview

Learners like to know where they are going. They need some (verbal or visual) navigational aid at the start of the course or lesson that maps out or hints at their learning route. This is often called an 'overview' at the micro-level in the design world. Subtly, this overview can anticipate things that will be critical

later in the course or lesson. An overview creates a mood and a reason to start and go on, like an overture to an opera. An outline must convey why it is worthwhile to be attentive and do what you ask as a learner.

Learners and teachers often think and listen within their frames of reference. There may be no communication because both sides made the wrong associations. The overview is critical in establishing a joint frame of reference. Out of this joint frame of reference, the teaching-learning process can begin.

3   The Impracticality of a Design

'Nice', 'good', 'beautiful', 'exciting', but remaining forever gathering dust in its worked-out form on the shelf of designers: this is sometimes the fate of a good design. The designer involved has not been sufficiently sensitive to the practicality of the design. A worked-out design must be capable of installing the systems for which it was made. This means in the first try-out that questions such as: 'How is the new course or lesson received by teachers and by students?', 'What rostering difficulties (if any) are going to come up?', 'Will there be time and space problems?', 'Does the design demand training of teachers and their assistants?', 'Is the design just too new and too different to be accepted in an existing and perhaps conservative curriculum?' should be asked. Impracticality can be the Achilles' heel of a clever design.

4   The Missing Melody

This is a typical explanation of Tony Earl as a designer. He creates a powerful metaphor about how a teacher can prepare a proper mix and alternate teaching and learning activities.

A learning event where the primary goal is 'to instruct' has a sharp, business-like sound. It has to deliver some pre-defined knowledge or skills. In contrast, a learning event, an 'encounter', gives the learners plenty of room to respond in their way. An encounter has no end-performance goal and it has an evocative sound. Events with 'explain' or 'tell' have goals and sounds somewhere between.

In the 'Think Tank Workshop', I nickname these four types of events as 'ching', 'chang', 'chung' and 'chong' events. From a pedagogical perspective, the best learning event is the melody of 'ching', 'chang', 'chung' and 'chong'. A good lecture, for example, is a 'chung' event with lots of 'chong'. Its primary goal is to tell something of importance. However, it must also explain and, to some

degree, instruct. More than anything, if what is said is to be remembered long after the lecture is over, the lecture must be a vivid encounter. The melody of a good lecture is 'chung', 'chong', 'chang' and 'ching'. Hearing the melody and at the same time, recognising its source can tell you about the success of a course or lesson.

5 The Non-Integration Problem

As a teacher or designer, how often have you heard the complaint that separate course parts 'do not seem to belong to each other? You have probably had to respond to the criticism of non-integration in a course or lesson more than once. It is a common problem. Usually, in my experience, the fault stems from a wrong decision about the learning sequence over the 'response pathway' of the student through the course content. The backwards-chaining technique is a powerful teaching and integrator to remind this.

6 Some Minor But Critical Faults

'Tek frak', 'tooterm', 'non-crit art', 'non-crit info', 'transition', 'wow!' and 'speed up' were some editing codes used in editing self-study texts in Basic Systems Inc., New York, in the 1960s. I learned a lot from these codes. Usually written in red pencil or red ink, there was no escape. You had to discover the critical programming fault that each pointed to having done that and put it right.

The *Tekfrak* term warned you to look at the technical content of some information. It was suspect and possibly wrong. There was a 'fracture'. The *Too* term told you that you would likely confuse the learner with a previously defined concept. It was used too early in the text. It would give your learner trouble at or before the indicated point if you did not explain it.

The *non-crit art* term told you that the artwork (some scheme, diagram, picture, or photo) was little more than decoration. The artwork was non-critical in the learning process. The *non-crit info* term warned you that some information you used in a course or lesson was 'non-critical information'. Its existing form, place or content added nothing to the learning process. Information is 'critical' only if necessary for a correct response if it prevents a wrong answer, excludes some interfering response or is essential for some affective component in the learning process.

The *Transition* term indicated an unsmooth or confusing move from one stimulus-response learning event to another. It can be a timely warning that

you will likely lose some learners in your course or lesson. Therefore, you need to tighten or clean up something at this spot. Continuity is vital in a workout design.

The term *Wow!* told you to beware. You might be using some example or anecdote that would hurt the sensibility of someone in your audience. This coded item reminded you to be alert to possible sensitive reactions from your learner population. Not all learners shared their prejudices and sense of humour! The *Speed up* term told you that the pace of learning was too slow. You needed to obtain the instruction elements, explaining, telling and letting encounters serve each other better.

7   An Always Avoidable Fault

A fault in your needs specification is always an avoidable fault. This fault refers to any breakdown in the relationship between components in the diamond diagram. The diamond diagram supports you in making decisions that ensure that the essential ingredients of the design ('end goal', 'success criteria', 'content' and 'method and media') are coherent. When you fail to prepare a coherent diamond diagram, you will only have yourself to blame when breakdowns between the components manifest themselves. As a result, poor learning results during developmental testing or end evaluations of your workout design may occur.

8   Summary

In the beginning, every designer makes mistakes. You never stop making them, but they grow less in number as your experiences develop. Most faults are made in working out the design and giving the abstract idea its concrete form. In my experience as a mistake maker, there are seven special ones against which you must guard.

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A Serious Game Design of Modern Higher Education (MHE)

The Didactical Frame of Reference to select new options for your blended learning course version 2020.

Many practical, evidence-based and clearly explained pedagogical options for HE are available for university teachers. The importance of research evidence is often recognised, but the possibilities are not yet realised. Of course, the implementation of such options is not simple.

My answer summarises the research evidence in eight DPs and 52 IT options for modern higher education (see Figure 2). I designed a simple, serious game that the players can use as a mnemonic tool for remembering the pedagogical options when I have to think about selecting pedagogical options and requirements. The critical questions in building the game were 'What pedagogical options do you need?', 'How can you realise them?' and 'Were you right to select these options?'. The serious game MHE (Modern Higher Education can support teacher designers in selecting new pedagogical options. The main topics in this chapter are The Concept of Design Principles, The Serious Game Modern Higher Education, Design Principles and Their Evidence-Based Options and Summary.

1 The Concept of a Design Principle

The concept of design principles has been researched for various pedagogical situations. Chickering and Gamson (1987) make one of the first descriptions of design principles. Other sets of design principles are described by Theelen and van Breukelen (2021), Parker and Hankins (2002), Reilly and Reeves (2022), Wals, Wesselink, and Mulder (2017) and Picciano (2017). In these articles, design principles are described as an abstract version of research result descriptions. In a set of 5 to 12 design principles, the pedagogical qualities, which should be realised in the design of a course, are described. Design principles are formulated, for example, for the benefit of designing, developing and evaluating hybrid learning (Cremers et al., 2017), DPs about Oral presentation (Ginkel, Gulikers, Mulder, & Biemans, 2015), Project-based learning (Guo et al., 2020), Sixteen design principles (Visscher-Voerman, 1999), the principles of authentic eLearning (Reilly & Reeves, 2022), Teacher design teams (Post et al., 2022), and

Modern Higher Education (Nedermeijer, 2020). The design principles can also be used to formulate and discuss the pedagogical concept for a curriculum. See, for example, the pedagogical concepts formulated in Chapter 8, Section 2.1, Chapter 9, Section 2.1 and Chapter 10, Section 3.3. In Annexe 1, the design principles describe the pedagogical vision for a medical curriculum. In the literature about university education, more examples of design principles can be found which can support the teachers very well in designing their courses. Teachers from different disciplines should be able to use design principles.

Design principles are not ready-to-use recipes (Theelen & van Breukelen, 2021). The essential quality of a design principle is that it should be appealing, understandable and valuable for university teachers in general and that the teachers should be able to translate these design principles into ideas for their courses.

The design principles can effectively support teacher designers in designing their courses. Because of the messiness of DP's, Hanghoj, Handel, Visgaard and Gundersen (2022) stress the importance of discussing design principles with teachers or in a project group. This discussion about DPs could be combined with teacher training activities on how to use these design principles. The participants discuss how to interpret and apply them with a researcher. An interesting side product might be a more helpful description of the design principles when applying the teachers' experiences. The various authors report that discussing the possible application of the design principles has given crucial support to teachers in educational development projects.

The idea of design principle is a crucial defining element of design-based research or educational design research.

2   The Serious Game Modern Higher Education

In the serious game MHE, I try to overview all existing ideas on modernising the HE programmes described in Chapter 4. All these possibilities are evidence-based. Still, there are no standard solutions with guaranteed success. As a teacher, you must decide which ideas are helpful for you and how you will use the ideas you selected.

The serious game is an interactive list of evidence-based ideas for course design. The ideas have been more practically explained than in the research literature. The game is meant to support you in selecting valuable ideas for your new course.

The game results are that you have selected 5–7 ideas about modernising your education course and have formulated your expectations and

requirements. The next step is to discuss the feasibility of the ideas with your colleagues. You can help each other prepare for the learning and testing activities. The game can be used in design activity 2, 'Collect, analyse and structure information needed in your design assignment' in Chapter 6.

The game Modern Higher Education can be found on my website Blended Learning and online education (Nedermeijer, 2020). The design and development of the game was a design assignment in the MOOC Delft Design Approach (course code DDA691x2014). A fellow course participant, F. Sachs, realised the technical part of the game design.

2.1   *Context of the Game MHE*

Recently, many university teachers have been organising online education. Why not apply some newly discovered teaching and learning activities from the online course in your regular blended learning course? Are there other possibilities for modernising your course? How can you use IT options in combination with F2F education? Can you find more opportunities to update your F2F and IT education?

The game can be played individually or in small groups.

The learning objectives are:

1.   To give the player clear insight into the DPs of MHE and the options for applying these principles in HE;
2.   Select the most promising options to modernise the course of players (the what question) and formulate the expected implementation results (the why question);
3.   Formulating the qualities that have to be realised to achieve the expected learning results;
4.   Prepare a team discussion with a teacher about which MHE options should be introduced in the programme and the courses.

2.2   *Game Content*

The game content includes the following:

–   The eight main DPs of MHE are explained in Chapter 16, Section 3;
–   Possible options to apply these DPs are described;
–   The qualities must be realised in the final implementation of the course of the player;
–   Players can ask for extra information when playing a game. Additional information and backgrounds are available on the website (Nedermeijer, 2023).

The principles and options are supported by research evidence and practical experiences. A crucial consideration is that there are no standard solutions
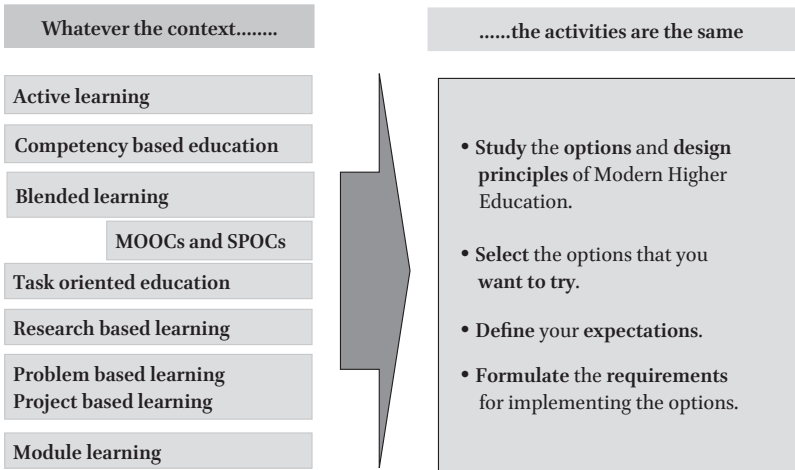
Whatever the context........	......the activities are the same

| Active learning |
| Competency based education |
| Blended learning |
| MOOCs and SPOCs |
| Task oriented education |
| Research based learning |
| Problem based learning Project based learning |
| Module learning |

- **Study** the **options** and **design principles** of Modern Higher Education.

- **Select** the options that you **want to try.**

- **Define** your **expectations.**

- **Formulate** the **requirements** for implementing the options.

FIGURE 45   Design concept for the game MHE

or advice. The players have to decide which options will increase the quality of their education.

The IT options are arranged in the game from two angles: (1) to the eight DPs and (2) to three practical questions: What to do in your class? What preparation by you is necessary? What should be done by the team of teachers? Players can (de)select the IT options and use them to prepare an action plan. Teachers can add additional IT opportunities and requirements based on their experiences. At some points in the game, the player obtains a modernity score for their selection. All options have a certain level of modernity (based on my opinion): modern (easy/simple solutions), very modern (some new pedagogical approaches) and really modern (but still practical and feasible). The score should be as high as possible.

2.3   *Summary Game*

Teachers select 5–7 serious options to modernise their course. The eight DPs and IT options are explained in the next chapter. An explanation of the individual IT options is provided in the serious game.

In my workshop, the teachers (players) showed and discussed their selection of options. The next step is to think about the 'how' question and the game results are used to evaluate the answers to the how question. The selected options should be placed in the learning process of the course of the teacher. The resulting learning process should be profitable for the students as well as for the teacher.

The principal results of the educational research are ordered in the game (in my professional format, not as a researcher). An explanation and examples are given. You can plan and assess whether your ideas are working on the route map.

Senior teachers should work this way and provide feedback to the researcher about their working solutions.

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31. Strengthen relations with the professional or academic field

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– Work with problems and issues from the professional/academic field(s). These are found through systematic analyses of the professional field and discipline. The analysis is focused on the main tasks, issues, problems, developments and necessary knowledge and skills in the professional field for relevant roles and real work scenarios.
– Use input from professional experts in the course: lectures, formulation of cases and projects and support project work.
– Use the available description of the professional field(s) and related programs in deciding upon your course's content and learning activities. Check where the course sits in the relevant learning tracks of the program.
– Keep abreast of professional websites and other sources of information.

3   Design Principles (DP) and Their Evidence-Based Options

The content of this chapter is based on the pedagogical analyses I performed over the last 30 years. The results are assessed and updated with the help of recent books about Higher Education: Neelen and Kirschner (2020), Luckin (2018), Kirschner and Hendrick (2020), Shand and Farrelly (2016), Picciano (2019), Stein and Graham (2020), Last and Jongen (2021), Bates (2015) and also the two books of Romiszowski (1984 and 1995). The following websites are also consulted: 3-Star learning experiences, lde-studentsuccess.com, (T)E-Learning Blog Rubens (Dutch) and Blended and online learning (bl.curriculumdesignhe. eu). More specific literature is consulted, described in Chapter 6, Section 1.

The eight design principles are:
– Active Learning
– Issues and problems from the professional field are central
– Focus explicitly on knowledge
– Qualities necessary in a nominal program
– Consider seriously collaborative learning and learning from fellow students
– Testing and feedback are the motors of students' learning
– IT is a must!
– Possibilities for personal growth

In this section, the design principles are described and possible pedagogical options to apply the principles are presented. More information about these design principles is given on the website Design Blended Learning and online education (Nedermeijer, 2023). Besides an explanation of the design principle, the following aspects of the implementation of the design principle are explained in detail: What are the necessary focus points, necessarily required pedagogical preparation and other options to modernize your course by applying the design principle and examples for using IT to support self-study and classroom study.

The eight DP s summarise the multitude of teaching and learning research results. In practice, you see other summaries with different formulations. However, the similarities predominate. These differences can mainly be found in the pedagogical option. Different words are used or specific pedagogical options are seen as more important than my set of DP s in the different learning theories. Another reason not to stick strictly to my eight DP s is that it might be necessary to use more recognisable words for the teachers and managers in a specific context to describe the chosen design principle. However, the design principles should always be based on scientific evidence.

How modern is your course? To be able to answer this question, the pedagogical IT options were divided into three groups: the basic ones that should always be applied, the advanced options, which are the first step to modernising your course and the more advanced options that make your course modern. This division below is not evidence-based; this text box is my subjective opinion.

You should check whether these characteristics are adequately addressed for each course or curriculum. Sometimes, one or two DP s dominate your design and the others play their role in the background. This does not mean that those 'other' DP s can be forgotten. An example of neglecting a DP is that in the first MOOCS, learning from each other received little attention. The students had to assess each other, but the assessment criteria were too general and did not stimulate the participants to give serious feedback. A summary of the judgments made by an experienced teacher was also missing or too vague. In later MOOCS, more opportunities were sought to give group learning a place. This can promote the learning and motivation of the participants.

Another example is online learning. During the covid pandemic, teachers and students soon lost contact. After the strict lockdown, a few institutions sought a blended learning approach to emphasise online environments. For example, by making it possible for teachers and students to speak to each other at a distance of 1.5 metres. There were plenty of suitable spaces in those days because many cultural and sports activities were prohibited. Another option to promote 'learning from each other' was to work on an assignment in small groups outside the institute. This option was supplemented by ensuring digital contact.

Design principle 1. Task-oriented learning (active learning)

– Students study actively in the classroom, in groups or self-study to master the learning objectives instead of passively listening. Active learning enables complex learning. The students learn to apply their knowledge in the assignments in the classroom or their self-study. The assignments are focused on learning tasks relevant to the learning objectives. The students will get feedback after finishing the assignments;
– The teacher's expectations concerning the students' learning are transparently described in the coursebook. The course's learning objectives logically relate to the other courses in the curriculum through the learning tracks;
– Teachers, tutors or both support the self-study of the students. The students will have to study increasingly independently during their study (= scaffolding);
– A practical principle is Time-on-task and more hours of meaningful studying results in more learning. The design task for teachers is to find meaningful learning activities which stimulate the students to study regularly instead of waiting until just before the test.

1 Pedagogical options to realise design principle

Remark: the numbers of the MHE options have no special meaning. They are used in the Game MHE (Nedermeijer, 2020). In this game and in Nedermeijer (2023), the pedagogical options are described in detail.

nr	Basic		Advanced		More advanced
3	Arrange feedback	2	Consider entry-level and use of remedial study materials	10	Increase independence, complexity and difficulty of learning activities
6	Test and give feedback with the VLE	11	Design an optimal blend of F2F, IT and self-study	16	Select learning activities and content to motivate students
41	Stimulate student's motivation in the class	13	Describe the assignments pedagogically		
51	Possible educational methods in HE	43	Schedule the study activities effectively		

Design principle 2. Issues and problems from the professional field are central

– Introducing the professional, academic field or both make education more
   attractive and relevant. Students can develop professional attitudes and learn
   relevant content and competencies for starting professionals. The focus will be on
   complex learning;
– Students learn how to use the content in authentic professional problems, cases
   and issues. This will decrease the gap between theory and practice in the working/
   academic field;
– Transfer of knowledge is complex and requires a great deal of exercise in different
   contexts. Students will be prepared during their studies for lifelong learning;
– The university selects competencies in cooperation with the professional or
   academic field;
– Theory, skills, professional attitudes, and competencies are integrated into
   learning activities;
– Students are enabled to build a repertoire of solved cases. (Crucial in problem-
   based learning);
– Students should be involved in innovative projects and study relevant
   developments in the discipline.

Pedagogical options to realise design principle 2 (see remark Design principle 1)

nr	Basic		Advanced		More advanced
1	Provide many assignments related to the discipline	14	Select cases to be used in the course	16	Stimulate student motivation in the course (self-determination theory)
8	Organise practical sessions	40	Organise project work		
		30	Focus on complex learning or mastering (professional) competencies	48	Simulation of professional operation
		31	Strengthen relations with the working field	49	Serious games for learning complex skills

Design principle 3. Focus explicitly on knowledge

– Knowledge comprises facts from the discipline and procedural knowledge
  (= steps in analytical and systematic problem-solving strategies).
– Students study knowledge through active learning methods: for example, active
  lectures, self-study assignments, problem-based assignments, projects, internships,
  case studies, group discussions, or the internet.
– The student should be familiar with the context of a lecture or assignment.
  Students learn to relate their newly acquired theoretical insights to textbooks
  and professional literature theories. The teacher stimulates this deepening of
  knowledge in the F2F lessons. In tests, these higher-level theories are tested.
  Students build a body of knowledge necessary in the (future) professional field.
  Students will remember the knowledge better.
– To improve the functioning of the memory. Some concepts are complex and need
  a more extended period of study to really understand. Such threshold concepts
  have to be studied in several courses. The teachers should agree mutually on how
  they will teach such a concept.
– Cognitive load theory states that limited human working-memory capacity has far-
  reaching implications for teaching and learning. Well-designed training systems
  prevent cognitive overload, decrease the cognitive load irrelevant to learning, and
  optimise cognitive load relevant to learning (van Merriënboer & Kirschner, 2013).

Pedagogical options to realise design principle 3 (see remark Design principle 1)

nr	Basic		Advanced		More advanced
5	Discuss and deepen the results of the self-study in F2F	40	Give students project work solving open problems	44	Offer extra explanations of complex subjects
19	Make a systematic analysis of necessary content and competencies	39	Prepare 'active' lectures	12	Explain course content, cases and problems using different media
		25	Facilitate students using the internet, books, articles, etc.	35	Organize projects in which students work with professionals
				50	Gamification stimulates the learning process

Design principle 4. Realise the necessary qualities of a nominal program

When you want the students to study the program nominally, you have to consider specific quality criteria:

– Social and academic integration have a stimulating place in the curriculum;
– There are enough possibilities for the student's personal development;
– The study choice and the transition from secondary to higher education are well supported before and during the first-year courses.
– The curriculum activities for the teachers and the supporting staff are practically feasible;
– The program has to be doable. The study time is used for functional and valued learning activities. There are no unnecessary obstacles;
– The program is coherent and well-described. Where possible and relevant learning lines can be introduced. In a learning line, students master a competence of a topic step by step to the necessary level;
– The summative tests align with the program's aims and the applied educational methods;
– The intern and external quality assurance documents are well-tuned with the curriculum documents;
– The curriculum is sustainable: it can be expected to remain successful shortly;
– The curriculum is scalable: it can be successfully used for small and large groups.

Pedagogical options to realise design principle 4 (see Remark Design principle 1)

nr	Basic		Advanced		More advanced
4	Decide on and describe the organisation of the program	9	Design a course or (advance) organiser	20	Ensure that the course fits in the learning tracks
		43	Schedule the study activities effectively	46	Check the curriculum on
		27	Develop learning tracks on how to master competencies	26	feasibility for different types of students
		52	Competency-based education	28	Follow the progress of the students with an online portfolio
					Provide unity in organisational matters

Design principle 5. Consider seriously collaborative learning and learning from fellow students

–   Social bonding is essential to keep the students committed, active and on track;
–   The students learn from each other by verbalizing and exchanging their knowledge, insights and approach. Peer learning is often applied in blended learning and MOOCS;
–   The students have to learn to work together with other professionals and clients;
–   Tutors (teacher, volunteer, senior student) support and guide the self-study and group assignments. (S)he should be available for help at specified hours.

Pedagogical options to realise design principle 5 (see Remark Design principle 1)

Basic		Advanced		More advanced
	4	Use the power of collaborative work	15	Encourage students and teachers to interact during the course
	40	Organise project work	23	Integrate students socially and professionally into the faculty
	47	Organise a form of peer feedback		

Design principle 6. Testing and feedback are the motor of students' learning

–   Through testing, the faculty can guarantee that the students have the desired level of competency;
–   Students' study behaviour is strongly influenced by the content and format of the tests (constructive alignment) and other forms of feedback. Students will be more motivated if they are informed regularly and timely about their study progress. Spending more time learning will lead to better study results (= time-on-task);
–   Spreading exams is more effective, and there is less 'competition' for the student's learning time when preparing for the exams. This spreading should also be considered for resits when the subsequent courses have already started. Students will focus on the resit and not on the regular courses;
–   The use of resits by the students can be prevented by enabling and motivating the students to study from the start of the course and spend more time studying. (Nominal study, see also Design principle 4).

Pedagogical options to realise design principle 6 (see Remark Design principle 1)

nr	Basic		Advanced		More advanced
24	Check the qualities of the summative tests.	32	Plan both summative and diagnostic tests	12	Prepare a self-test (with feedback) at the level of the final test
6	Test and give feedback with VLE	45	Organise a subtest with direct feedback	26	Follow the progress of students with a portfolio
		47	Organize a form of peer feedback		

Design principle 7. IT is a must!

– Improve accessibility of available information for the students. New possibilities to present course content and assignments (multimedia, up-to-date) and stimulate the students' independent work;
– Preparation for the future. Almost all professionals work with digital hardware and software, not using IT is no option and many students even expect IT in education;
– With IT, students can get more control (and responsibility) over their study activities. This is an essential element of modern higher education;
– IT is becoming more and more user-friendly. However, technical support for the teachers is still crucial;
– Teacher designers should have enough time to design and develop courses;
– The students should learn to use ITedu-tools and professional software and hardware effectively and efficiently in their studies;
– IT supports students when a teacher is not available but needs them;
– IT offers possibilities to improve the learning process of students. For example, catching up with learning delays, deepening the study on a conceptual level, exercising problem-solving skills, exercising standard calculations, giving feedback to the students and providing the availability of different explanations.

Pedagogical options to realise design principle 7 (zie remark Design principle 1)

nr	Basic		Advanced		More advanced
29	Use evaluation possibilities in the ITedu-tools	15	Encourage students and teachers to interact during the course	6	Provide more feedback through the IT
38	Ensure that ITedu-tools work properly	18	Present the assignments in the VLE	44	Offer extra explanations of complex subjects
		25	Facilitate students using the internet, books and article		

Design principle 8. Possibilities for personal development

– Most students need half a year or more to learn and work as a student. They must plan their study, study texts (written and digital), learn from video presentations and work systematically and learn to learn with all kinds of software and hardware;
– Tutoring/counselling students results in more social coherence in the faculty/ university, resulting in better study progress and less dropout. The tutor and counselling activities are planned carefully in a particular learning track in the program (curriculum);
– During the study, there is a need to support students in choosing their education and professional careers. Students are supported to formulate their interests and plans and decide on electives. Dialogue and a good relationship between the student and the tutors/counsellors/ teachers are essential;
– The primary feature of modern higher education is the greater own responsibility of the students for their studies, especially for students studying in MOOCS.
The teachers' necessary support and assignments decrease during the program (curriculum) (= scaffolding).

Pedagogical options to realise design principle 8 (zie remark Design principle 1)					
nr	Basic		Advanced		More advanced
36	Help students with academic and personal problems Offer electives for students	34	Support a good start to the study	22	Offer extra activities for excellent and motivated students.
		17	Create possibilities for personal development		
		33	Match prospective students to programs		

4   Summary

Available research evidence to be applied in MHE is summarised in this chapter, using eight main DPs. Of course, other people can make different summaries and use different formulations. However, these formulations give the same message about what you can achieve in HE.

My observation is that, in a successful course in HE, all eight DPs are appropriately applied in course design. There is coherence between the application of the eight DPs. However, thinking up options to use a specific DP is sometimes different.

Other evidence can be found in modern higher education's serious game Design Modern Higher Education (Nedermeijer, 2020). Around 52 educational options to realise the eight DP are presented. It summarises all the different educational projects and the advice I was involved in. I decided to publish a description of all these options in this game. Therefore, I designed a simple, serious game that the players can use as a mnemonic tool for remembering the pedagogical options when designing a blended learning or online course.

The number of pedagogical options will increase in the future. Think about the possibilities of artificial intelligence, 3D virtual animations, serious games and our growing insight into how students learn. The basic DD process in Chapter 6 is also meant to support the design of new and better IT options for HE.

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Description of Various Types of Tests

Tests have an essential role in a course. First, tests significantly affect the study behaviour of students. A well-known saying is *Students learn what you inspect, not what you expect.* In most situations, the students adapt their study efforts to what they expect from the teacher on the test. Another intriguing effect is finishing a test is more effective than repeatedly studying a book. Second, tests serve the civilian purpose of ensuring that successful students function at the intended level. Third, test results provide meaningful feedback to teachers and the curriculum team about the quality of the teaching-learning process and the possibilities to improve the course programme.

The chapter is a translation of the Chapter Tests in Nedermeijer and Pilot, 2000.

The main topics covered in the chapter are: Formative and Summative Testing, Quality of Tests, Safeguarding the Quality of the Tests and Different Types of Tests.

1 Formative and Summative Testing

The above functions of tests imply the following requirements to be fulfilled in your course:

1. The tests mirror the learning outcomes and education methods. To this end, you should formulate clear learning objectives;
2. Summative assessments are designed to assess both the program's effectiveness and the participants' learning. This is in contrast to formative assessment, which summarizes the participants' progress at a point in time to inform instructors and the students about the progress of the learning process;
3. In addition to summative tests, formative tests are a crucial part of a rich learning environment that supports students in mastering learning objectives. The formative test results show students (and teachers) what they already know and what topics must be studied. Digital tools offer different possibilities for formative testing;
4. The test programme of your course consists of a method mix. Knowledge, skills, professional behaviour and competencies are assessed via a combination of tests: multiple choice test (MC test), open test questions,

practical assignments, portfolio and evaluation of observed behaviour. Another test format can compensate for any limitations of a specific test format.

2   Quality of Tests

The quality of tests depends on the validity, reliability, feasibility and transparency.

2.1   *Validity*
Validity means that a test measures what you want to measure, namely, to what extent the student masters the learning objectives. The following two steps should be followed to reach this objective: Formulate clear learning objectives for your course and choose the appropriate test format. Use a test matrix for a balanced distribution of test questions over the studied topics and learning objectives.

There is a clear relationship between learning objectives, course content and the test format and content (constructive alignment).

2.2   *Reliability*
Reliability concerns the extent to which the test results are 'true' and there are no coincidences. Tests should be as reliable as possible. The reliability is never 100%. In practice, a reliability of 0.70 is achievable. The following procedures should be used to ensure the reliability of the tests in your course:
– Formulate the text and format very carefully. Then, the involved assessors should agree on applying the scoring rules;
– Formulate the questions and assignments together with colleagues;
– Make the test long enough to rule out chance hits;
– Take care that the difficulty level of the test is tuned in with the level of the students;
– Check if the test differentiates between 'good' and 'bad' students. (using statistical analysis).

2.3   *Feasibility*
The test is feasible if it can be done within a limited time and is not too complicated. The test must also be feasible for both the teacher and the educational organisation. Feasibility of the test can be achieved when you satisfy the following practical requirements:
– Formulate clear and concrete questions;
– Use a proper layout. The test design should not be too complicated;

– Use honest questions that contain sufficient information (do not apply any trick questions);
– Adapt the test length to the test time. The students should be able to complete the test in the available time;
– Prepare a test that the teacher and the organisation can apply;
– Do not organise a test that coincides in time with another test.

2.4 *Transparency*

Transparent means the students have insight into the necessary information about the test and the procedure. This is necessary so that the students can optimally prepare for the test. The students must know how and what will be assessed and which requirements they must meet to have a positive test result. Offering example tests or pretests are recommended.

3 Safeguarding the Quality of the Tests

The tests and the test programme should comply as much as possible with the reliability, validity, transparency and feasibility of quality aspects. The quality assurance of the test should be organised appropriately.
– Each test is provided with feedback by a colleague-teacher or test expert;
– The examination board also sets up a test committee, which includes feedback on individual tests;
– The education and examination regulations and the rules and guidelines are transparent;
– Monitor the quality of the test with student evaluations and test analyses in the VLE.

4 Different Types of Tests

The following tests will be described shortly.
1. Standard tests
    – Written test (open and closed questions);
    – Oral test.
2. Testing by the product prepared by the student;
3. Tests aimed at testing learning activities and learning results of individual students;
    – Journal Club;
    – Internship assessment;

    – Learning report;
    – Logbook;
    – Portfolio.
4. Assessment methods based on professional practice
    – Hands-on tests;
    – Simulation tests;
    – Hands-off tests;
    – Professional behaviour.
5. Assessment methods used in work and project groups
    – Oral presentations;
    – Process report;
    – Project product;
    – Peer, self and co-assessment.

4.1   Standard Tests

– *Tests with open-ended questions* are tests in which the students formulate their answers by themselves (written or orally). The answers to the test may vary from one word to several pages. Possible formats are the test with fill-in questions, short answer or essay questions, open-book exams and oral tests.
– *Multiple-choice with closed questions* are those in which students choose from various alternative answers. Possible formats are a test with multiple-choice, true or false, and extended matching questions.
– *Oral test.* Students answer questions put by one or more examinators orally alone or in a small group.

4.2   Testing of the Product Prepared by the Student

The product should meet the formulated criteria. Possible products are:
– Practical or internship assignment;
– Graduation assignment or thesis;
– An oral presentation;
– A take-home assignment;
– A project assignment. This can be a group product or an individual product;
– Research proposal for a scientific internship.

4.3   Tests Aimed at Testing Learning Activities and Learning Results of Individual Students

Journal clubs test the critical appraisal of a scientific article written by a student. Journal clubs test the following aspects: searching, selecting, interpreting and assessing scientific information and assessing it by value.

The internship assessment focuses on the performance of students in an authentic work situation. Therefore, internship assessment is the ultimate test of student competency. With this assessment and the results (e.g. reports, papers and posters), you try to assess the knowledge, practical tasks and professional behaviour during the internship as objectively as possible. This assessment might include test types such as short clinical assessments, papers, essays, posters, status assessments, technical skills and patient presentations.

The learning report asks students to write down what they have learnt. Each student writes down the follow-up to the following four sentences: 'I have learnt that …', 'I have learnt that it is not true that …', 'I have learnt that I …' and 'I learnt that it is not true that I …'

Another method is for students to score themselves using a questionnaire with three- or five-point scales with the possibility of explaining the given score. There is also a variant where nothing is prestructured and a half-open variant where sentences like 'I have learnt that …" are based on the objectives.

The logbook elaborates on the assignment of certain aspects of the learning processes. The logbook is a process report. The difference with the learning report is that the latter reflects a final situation, while the logbook reports during the learning process. The logbook is explicitly suitable for diagnosing the professional progress of students.

The portfolio shows documents explaining the student's progress in mastering the competencies in a portfolio. The information can consist of statements from teachers, supervisors, clients, self-assessments, student assignments on paper or using different media. The type of information is valid, as evidence must be provided in advance. It is possible to have this information partly determined by the teacher and the student. The teachers analyse the portfolio and give their opinions about mastering the critical competencies of the student.

The validity of the portfolio can be promoted by determining what is accepted as evidence in advance. The criteria for assessing the various pieces of evidence must be carefully defined. The requested criteria have to be appropriate for the competencies. The portfolio activates the desired learning activities with this.

4.4 *Assessment Methods Based on Professional Practice*

4.4.1 Hands-on Tests – The 360-Degree Feedback

According to the fixed form, each student is scored by the supervisor and fellow students of the teacher. Therefore, students score each other. This often involves collaboration skills. This is mainly used in problem-oriented education and project education. Still, this test can also be used in other group activities.

4.4.2 Simulation Tests

The *station exam* is designed to assess the student's professional competencies.

The *assessment centre* consists of a series of standardized assignments the students must perform. The assignments require a response from the student in terms of observable behaviour. Trained assessors observe the behaviour.

4.4.3 Hands-off Tests

In hands-off testing, the students do not perform the actual action but describe what they would do.

4.4.4 Case Test

The case test consists of a practical situation with or without a problem statement and specific information that may be relevant (or not) for the analysis and the assignment. The test assignment may consist of questions or a proposal to, for example, conduct problem analysis and present some alternative solutions to the problem outlined. IT is also used for these types of tests. The students sometimes receive the case description before the test or consult the literature during the test. Another option is for the students to take the case test at home.

4.4.5 Paper and Pencil Assignment

The students are asked to explain how they will react in these situations. The situations are less complex compared with the case in the case test.

4.5 *Assessment Methods Used in Work and Project Groups*

4.5.1 Process Report

The student or group describes how the process went in the past period. This is mainly used in education projects and may concern working on a product or task or the collaborative process in the group.

The project product provides insight into understanding and translating a client's wishes into a complicated professional-specific situation into a concrete outcome, such as a project plan and advisory report. Assessment criteria have been established to specify the expected level of the student up to that level.

The students are asked to write various papers related to the course content, the learning objectives and the assessment criteria. The students' group will present their products. The clients, other student groups, or the teacher assess the results. For the final test score, the individual students will give a short presentation in separate groups for their individual assessment.

Professional behaviour is a test focused on the commitment of the student to the learning and group process in the study group. The test assesses the

process, not the subject matter. The test focuses on the presence in the learning group, professional behaviour, interest and constructive work attitude.

4.6   *Peer, Self- and Co-assessment*

In self-assessment, students give opinions about themselves. In peer assessment, students provide their opinions about their colleagues based on self-selected criteria. This test form can mainly be used to determine the progress of students. In co-assessment, students and the teacher play a role in the assessment process. First, the assessment criteria are formulated or selected together, the students assess themselves and each other and the teacher gives the final verdict. Co-assessment is mainly used when the final grade is determined via assessment.

Some guidelines for the use of peer, co- and self-assessment:
– Students should be enabled to practice judging;
– Sufficient time must be available. This assessment takes time, both for the teacher and the students;
– Self-assessment is mainly intended as a tool for learning;
– The teachers should have the opportunity to familiarize themselves with these assessment methods;
– The assessment criteria for peer assessment are formulated in advance. Good experience has been gained in the joint preparation of the assessment criteria by teachers and students;
– The assessment criteria in peer assessment are presented in operational terms.

5   Summary

Chapter 17 explains possible test formats and the four test qualities you should consider. The chapter is meant to provide the teacher designers with insights into their possibilities to (in)formally test students. The selection of the test type should be coherent with the learning objectives. I advise the teacher designer to refer to available books about testing when selecting the test format

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PART 4

Accountability Sources of Features Used in the Basic DD Process

∵

Design Features Used in Design Models from Different Domains

In this book, I focused on design activities in course design and development. Compared with other disciplines, the role of design in existing course development models is underexposed. In Chapter 18, Sections 3 and 4, some engaging course design models are described. My idea was to combine the typical features of these course design models with design features applied in technical design, design thinking, complex problem-solving and creativity.

The following topics are discussed in this chapter: The Technical Design Features, Examples of Course Design and Development Models, Some Examples of Helpful Design Methods for Blended Learning Courses and Summary.

1 Introduction

For the topics discussed in the following sections and chapters, I have used the literature as described in the sections below.

1.1 *Technical Design (Chapter 18, Section 2)*

The discipline of Technical Design already has a long tradition of practical experiences and research activities. This is shown by the many products described in books and articles. Teacher designers might learn a lot from technical engineers. I used the books by Van Boeijen et al. (2014), Roozekrans (2020) and Hekkert and Van Dijk (2011). I also gratefully used the knowledge gained in the MOOC Delft Design Approach DelftX: code DDA1x (Delft University, The Netherlands).

1.2 *Course Development and Instructional Design in Higher Education (Chapter 18, Sections 3 and 4)*

Publications by Beenham and Sharpe (2013), Earl (1987), Dick and Carey (2009), Valcke (2007), Lodewijk (1993), the ADDIE model, the version of Bates (2019) from the ADDIE model, the version of Post et al. (2022) and examples of helpful design methods for blended learning courses presented through

several commonly used design methods in higher education for redesigning existing courses (SURF, 2023b).

1.3 *Design Thinking (Chapter 19)*

The importance of design thinking is explained for different professional domains. Several authors describe the main steps of the design process. However, the question of how to design is answered in general terms. Relevant articles are Costa (2017), Malamad (2017), Malamad and Sykoro (2020), Brouwer (2017), Morris and Waldman (2014) and Brown (2011).

1.4 *Complex Problem-Solving (Chapter 20)*

Design can be considered an example of a problem-solving process for complex problems. Relevant articles are Mayer and Wittrock (2009), Nokes and Schunn (2010) and Merriënboer and Kirschner (2013).

1.5 *Creativity (Chapter 21)*

Creativity is, of course, a crucial aspect of design. In various books and articles, creative techniques are presented. Most creativity techniques are helpful to use in course design. Relevant articles are Eyl and Pilot (2020), Reitsma (1995), Clinton and Hokanson (2011) and Runco (2010).

2 The Technical Design Features

The typical features of the technical design are described in this section. The technical design features relevant to me have been translated into course design and development terms in the Basic DD process description.

2.1 *The Snake Model of Design by Roozekrans*

Roozekrans described his design vision in his book 'How to create better ideas (2020). In his description, readers of my book will recognise many aspects of course design, but he also clarifies that important design activities are neglected in course design.

The Snake model, depicted in Figure 46, consists of six steps, which he explains in detail. The study of the model helped me define the possibilities for making course design for teacher designers more creative and robust.

Design learning is a process that starts with a thorough understanding of the relevant educational and disciplinary topics by conducting literature research about the design task or problem. The next step is to develop original ideas and

Create options   Make choices

Deep
research

Conclude,
design brief

Create
ideas

Fine-tune
designs

Deliver final
results
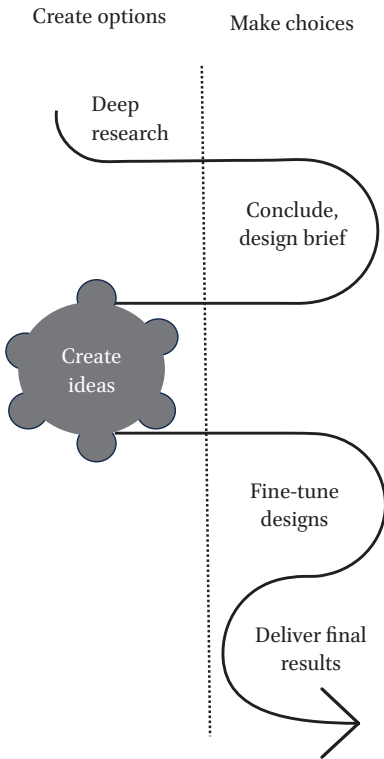
FIGURE 46
The Snake model of design by Roozekrans (2020,
reprinted with permission)

solutions for the course design that the teachers and students can value. The
process continues by refining or changing the ideas.

The teacher designers build an in-depth understanding of their problems
or wishes during the design process. They use sources with authority (e.g. sci-
entific evidence, the experiences of trusted colleagues or educational experts).
They should not stop thinking after their first (excellent) idea but should con-
sider possible alternatives and analyse whether these could be better solutions
for the original problem or wish.

Design creates value. Course design focuses on realising a proper student
learning process and a supportive learning environment based on the peda-
gogical concept. These 'products' are discussed with teachers or education
experts of their colleagues. Did their ideas have the necessary qualities? Did
the students and teachers appreciate the learning process and like the course
programme?

Like researchers, designers try to find elegant solutions to their problems. I
will not attempt to explain the term elegantly. Maybe also coherence, clever-
ness or foxiness are good terms. Indeed, a good design is recognised as elegant.

An excellent design process has two sites: divergence and convergence. In Figures 8 and 56, divergent thinking is understood as creating ideas and convergence to choose from these ideas. Divergent and convergent thinking are both essential aspects of course design.

According to Roozekrans:

> A good design solution is hardly ever a lucky shot, but more likely, the results of the thorough design process. Knowing the process gives you a foundation and structure to optimise the results. Just following the steps is not enough and it needs passion and full dedication to find goods and mixed solutions/results and create high-quality output.

Almost all design projects should start with your problem definition or your wish as a teacher designer. If possible, some critical extra-quality criteria should be formulated for the newly designed course. The first stage ends with the design brief explaining the problem, the wish and the process you like to follow to design and develop the right solution.

Visualising is testing. Visualising is a reality check to *see* what is working and what is missing. In course design, possible visualisations can be made of the learning process, the lesson plan and the pedagogical description of the course. Therefore, one of the things that must be done in design learning is to develop more possible visualisations that can be used in the design process. Some examples are the diamond diagram, the route map, the blueprint or a storyline. The teacher designer should be a good craftsperson, know how to analyse and describe education and understand learning methods and materials.

In Chapter 22, I discuss why teachers not always use the available evidence based pedagogic options for HE. One reason mentioned is that teachers are afraid to make mistakes. Making mistakes is typical in the design process; you analyse your fault, learn and formulate a new and better idea. Teacher designers should celebrate trial and error and critical thinking. Teacher designers need a certain eagerness or drive, a determination to solve an educational problem or special wish and an interest in finding relevant, maybe unexpected, solutions.

2.2   *Delft Design Guide*

Van Boeijen et al. (2020) describe the Basic Design Cycle in the Delft Design Guide as a model representing the trial-and-error process of design. The basic design cycle is primarily based on the design of tangible products. Still, it can also be used in other design processes, such as course design and development. The cycle describes the various stages a designer goes through when

Analyse

In this stage, you analyse aspects of your design goal or problem. The processed information will yield the design criteria.

Synthesise

In this stage, you generate or ideate concept ideas for solutions. This ideation results in concept designs. First, your thinking process is divergent: envision as many relevant ideas as possible. Second, your thinking process will converge: You select 1–3 best ideas. Often, you combine different ideas.

Simulate

In this stage, you draw and model your concept design to estimate and define the expected properties of your design. Your thinking process is mainly convergent.

Evaluation

You use your design criteria to evaluate your design. In this stage, the focus is on critical thinking about your design ideas.

Decision

In this stage, you decide whether your design or an element is acceptable. If not, you go back to one of the earlier stages.

Technical University Delft, the Netherlands (Van Boeijen et al., 2020).

solving a design problem. Theoretically, you can go through just one cycle, but you usually perform many iterations—ideally, you spiral from problem to solution, from a vague idea to a concrete course programme. In more detail, it is the process from formulating learning objectives to applying pedagogical principles to the learning process, the route map and a lesson plan. Usually, this is an iterative process in which you sometimes have to take a few steps back to go forward later.

In the Delft Design Guide, the authors show several design models, approaches and perspectives on design. For example, the design process for product innovation, agile design and development, integrated creative problem solving, user-centred design, co-design, co-creation and service design. In all these models, approaches and perspectives, the stages of the basic design model are combined by situational characteristics. As a matter of fact, also, the basic design cycle underlies the Snake model. Therefore, I will use this basic design cycle to construct my basic design and development process.

Van Boeijen et al. describe the many technical design features in their book. Below is a summary given of the design features which I think are relevant to course design. These features are described using terms from course design.

This gives a direct insight into how the basic design cycle can improve the course design and development process.

The design process for course development is focused on the design of a learning process and a supportive learning environment, which should elicit meaningful learning and it's feasible for the teacher.

Design thinking will be especially relevant when you want to make something you have no idea what it will look like. This means you have an open problem. In an open problem, you need a precise problem formulation and an approach to how you think you can solve the problem, as described in a design brief. The approach followed in the course and curriculum design will depend on the complexity and difficulty of the task. It should not be possible to deduce the design from the problem formulation. If this is possible, it's clear you don't need the design process.

The experiences of the teacher designer are vital to be able to formulate relevant design problems and to list requirements and possible solutions. The designer should try to get a firm grip on the relevant knowledge, conventions and assumptions, examples, good practices, relevant theories, etc. These insights should help to design to find new solutions for the problem.

A crucial mistake of designers is functional fixedness. Designers fixate on the initial, often the self-imposed structure of the problem representation. As a result, real solutions might be blocked.

A designer is primarily interested in and focused on possibilities. The constraints will be selected and described, but they don't play a role in the first part of the design process because this will hamper the formulation of new and unexpected ideas that you, at first glance, think are impossible. If you have formulated the ideas, it's time to think about how you can cope with the constraints. My experience is that, in many cases, formal constraints after an open discussion appear to be no constraints anymore. Tony Earl always said that as a designer, you must be a cunning fox'.

An essential part of the design is using the available scientific knowledge and relevant experiences from you and your colleagues as much as possible. The selected information will be used to support the various decision which has to be made to design and develop a course or curriculum. You will acquire more insight into the crucial quality criteria for your course during the design process.

During the design process, you formulate quality criteria and requirements which should be realised in the final product. One part of the quality criteria will reflect the didactical vision you and the faculty have about this course. Another part of the quality criteria will depend on the selected content and

didactical methods. During the project, the criteria will be formulated more clearly and detailed because the designer will develop better insight into the various aspects of the course design problem. You will evaluate the realised design products/ideas at certain moments to see if you are working in a good direction. The teacher designers follow an eclectic procedure, meaning they will derive ideas from a broad and diverse range of sources. Design processes are always iterative. Step-by-step, you will formulate, describe and evaluate your design idea or collect additional information to enable you to make better decisions about your design ideas. In technical design, the importance is stressed to formulate various design ideas and evaluate these ideas. The Datum method (see Van Boeijen et al., 2020) helps evaluate alternative pedagogical ideas qualitatively.

Creative thinking has a vital role in designing. There are diverging and converging moments of thinking during the design process. There are all kinds of creative approaches to stimulate creative and new ideas: spider-content web, nominal group, brainstorming group, etc. Useful visualisation products are a storybook, an outline of the main topics, a blueprint, the blended learning wave, etc. More suggestions are given in Figure 16 and Chapter 21, Section 5. The visualisation of your problem, the relevant information and the design ideas of the (final) product is a powerful method in design.

A design will be prepared in close cooperation with the persons using the solution, the students, yourself and maybe your colleagues. Communication with the target group (i.e. the students) is crucial because they should be willing to follow the course. In design terms, the course activities and materials should be designed so the students can use these to master the learning objectives.

2.3 *Chemical Engineering and Design: Some Characteristics*

Chemical engineers are responsible for designing and operating processes and products and applying them in chemical plants. They use a 'system' approach, predicting the behaviour of a process as a whole and the individual plant items.

The cornerstone of the process design of practising chemical engineers is developing mass and energy balances based on the simple conservation principle. A chemical engineer will add more detail to create a fully optimised flow sheet from such balances. The flowsheet provides the most efficient, safe and economical route to producing the specified chemicals within the constraints of thermodynamics, material properties and environmental regulations.

A chemical engineer should study the underlying principles of chemical processes, material flow (in huge quantities), powder handling and heat transfer. Also, they should be able to formulate laboratory and pilot-scale experiments.

2.3.1   What Can You Learn from This Description?

As is the case in educational development in chemical engineering, there are no standard solutions. You have to work with uncertainties. However, you can use all useful, proven knowledge to evaluate whether your design will work. The crucial elements in the chemical design process are the mass and energy balance principles. An essential component of course design is the learning process based on design principles and the experience of the teacher.

Furthermore, the company, science and society have formulated quality criteria for the final design result (the chemical process to make a specific product). The teacher designers should also meet the formulated quality criteria in course design. The teacher and the students, as users, should value your design. Finally, you must experiment with your design to check its fundamental qualities and problems. As in education, an adequate strategy is to experiment with new pedagogical options in a small student group. This gives you insights into the possibilities and requirements.

2.4   *Vision in Product Design* (*ViP*). *A Guidebook for Innovators*

ViP is a human-centred design method that makes you carefully examine and determine what meaning you will offer people in a future world (Hekkert & Dijk, 2011). ViP is an approach that helps define what to design and why. Designers should formulate their vision for their new course and designing is about exploring the future situation of the course. Personal values are always present in any design process. There is no ideal solution and you should be satisfied with a 90% solution. The beauty of the ViP approach is that your vision determines the kind of technology needed. There is no solid IT technology push. There is no recipe for success. The Basic DD and the pDD process help you structure your thinking and actions. The process description shows the essential stages and enables you to achieve your purpose without many detours. The course design and development process described below will support you in designing a new course following your ideas and experiences.

What pitfalls should you experience during this process?
– A narrow view;
– Compensating behaviour, for example, filling in lists or going on and on with collecting information;
– Select solutions from which you know that they will not work correctly;
– Clamping (stick to one solution);
– Waiting too long to kill your sweets. You will often have sections, chapters, or drawings which you like much. But they are not relevant to your course. They hinder your thinking;
– You will lose the details if you do not have a helicopter view. The result is that you use only short, not interesting texts in your course. This will take a

Step 1.	Deconstruction existing situation
Step 2.	Describe the instructional problem for which you design a new solution (problem statement)
Step 3.	Analyse constituents of your problem domain
Step 4.	Structure the context of your instructional problem
Step 5.	Design Challenge (statement)
Step 6.	Design meaningful interactions between teacher, students and course program
Step 7.	Define qualities of your course (product qualities)
Step 8.	Concepting, prepare and select the design concept
Step 9.	Develop the new course using the selected design concept
Step 10.	Implement the course

FIGURE 47   Course DD process following the ViP approach

lot of your time. It is better to work on other topics or assignments for your course.

The ViP process is described in Figure 47 by Hekkert and van Dijk (2011). The main features of the ViP process are described from the course design and development perspective. This gives a direct insight into how the basic design cycle can improve the course design and development process.

2.4.1   Step 1: The Deconstruction of the Existing Course

A typical ViP feature focuses on the deconstruction of the old situation. Why is this a helpful deconstruction?
– Deconstruction is enjoyable;
– You obtain insights into ideas and considerations of former teachers about the course design. Those ideas and considerations resulted in a good-functioning course. However, after some years, the teachers and the students are less satisfied. Why does that happen? What can you learn from the former teacher designer?
– Free your mind from any preconceptions concerning the new course;
– You can use this information to (re)formulate or (re)frame the original design goal or problem in defining the 'domain'.

How to describe the existing design?
– Prepare a systematic description of the current course using the learning environment elements;
– What is the didactical approach followed in the course? What are the affordances of the course activities?
– What are the experiences of the students and the teacher?

How do you see people interacting?
– How did the students and teachers interact with the course? Or, if the course
   is still functioning: How do you see people interacting with each other and
   the course programme? Find words to describe the interaction: smooth,
   playful, etc.

What was the context in which the designer was working?
– Which constituents induced the designer when designing the course? What
   were his considerations?
– What kinds of standards, opinions and values were influential at the time?

2.4.2   Step 2: Describe the Instructional Problem Domain for Which You
Design a New Solution

In Step 2, you define the instructional problem you want to solve. You must
decide what you want to achieve and how you plan the course and develop-
ment process for your new course. With this in mind, you define the problem
domain of your design activities. Hekkert and van Dijk explain that the prob-
lem domain is a lens through which you look at the world during the course
and development process.

    The problem domain should meet several requirements to support the
design activities properly. You should formulate the problem domain rather
broadly. If you make the domain minimal, there is a chance that you will miss
some interesting new possibilities for the design of the new course. However,
if you formulate the problem domain too broadly, you should study more con-
stituents, which will take more time that is not always available. Your formula-
tion of the problem domain should not suggest a solution and should not be
based on too limited information or preconceptions. If you can already formu-
late the solution, there is no need for a DD process.

2.4.3   Step 3: Analyse the Relevant Constituents of Your Problem Domain
(Context Factors)

Many constituents can characterise the problem domain in which you design
and develop your new course. In Step 3, you select the constituents to solve
your design or instructional problems.
– Constituents might be observations, thoughts, theories, laws, consid-
   erations, beliefs or opinions. In course design, the main constituents are
   described in the learning environment;
– Do not adopt a constituent too quickly and uncritically;
– Look beyond the typical constituents used to prepare a course in your insti-
   tute or discipline. You might see the potential of certain constituents or ideas;

– Constituents do not describe how the new course will appear. In Step 3, you do not decide on the final solutions;
– During the DD process, your insights into your design problem will increase. A possible consequence is that you choose to examine extra constituents.

2.4.4 Step 4: Structure the Context of Your Instructional Problem

The constituents will be structured according to the learning environment elements, the diamond diagram, the main stages in the learning process of students, course content, possible sequences for the course, DPs, requirements, examples of interesting course models, possible teaching and learning situations, etc. You build a coherent frame of reference for your new course based on selected constituents, their importance, appealingness and interrelations. The frame of reference explains the crucial characteristics of the new course.

ViP stresses the importance of aesthetics. A basic rule is a unity in variety, allowing for as much variety as possible while preserving unity or order.

The structured context helps you decide if (1) you have enough ideas for designing a course. If so, you can follow a less intensive course and development process. Or (2) you have clear ideas about the main lines of the design of your course but are still elements for which you do not have a clear solution. The design process will elaborate on the main lines in a complete course. If so, you can follow a less intensive procedure. Or (3) you do not have a clear idea about the main lines of your course. The design process will focus on solving this complex design problem. You are ready when you feel that you have developed a clear and consistent picture of the context for your course and the next steps in the DD process.

2.4.5 Step 5: Design a Challenge or Statement

In Step 5, you formulate the design challenge you want to address concerning the selected constituents and your problem description in Step 2. The design challenge is the first element of your design vision that will focus on your design and development process.

A possible formulation of the design challenge is:

> *I will that the students and the teachers* (describe here the results you want to achieve for both target groups) *because* (describe here the reasons why these results are relevant for the users).

It is a challenge if you do not know how to solve the design problem. This means that the challenge does not describe the final result of the course and

development process. It explains which design problem must be solved to real-ise a good-functioning new course.

When is your design challenge ready? You should check if the formulation of the design statement is not too open, too detailed or realistic. You check if the management and your colleagues understand and appreciate the challenge.

2.4.6 Step 6: Designing the Meaningful Interaction(s) between the Students, the Teacher and the Course (Human-Product Interaction)

Step 6 is the second crucial vision element in the course and development process. You define what kind of meaningful interactions you want to bring about between the new course and the students and teachers. By doing this, you envision the future use of your new course. The interactions are the 'bridge or hinge' between the frame of reference (Step 4) and your new course (Step 9).

The primary function of a course is to support students' learning process and support teachers' work in a meaningful way. You can describe the mean-ingful interactions with the help of the eight evidence-based DPs used in MHE, as described in Chapter 16. The selected interactions will be part of the peda-gogical concept for your course.

When are you ready for Step 6? This is when you have a good feeling about the interaction. Are you sure the interactions reflect your vision?

2.4.7 Step 7: Defining Product Qualities

The quality criteria are the third element of your design vision. The new course should meet specific characteristics or qualities to realise the selected interac-tions between the course, students and teachers. The quality criteria stimulate your thinking and help you evaluate your concept ideas and design in Step 8 and the final design of the new course in Step 9.

A course in HE is efficient, effective, valued, feasible and well-liked by stu-dents and teachers (see Table 1). As a teacher designer, you will formulate addi-tional quality criteria or requirements during the DD process.

The didactical DPs were used in Step 6 to formulate the interactions among the course, students and teachers. You should describe the quality criteria you use to assess whether the DPs were realised according to your ideas.

Other sources you use to formulate quality criteria are the requirements or constraints experienced in the course. The first version of the requirements (or constraints) was developed in Stages 3 and 4. The requirements will be adapted during the DD process using your growing insight into the design task. Examples of requirements are concerns of the teachers, constraints because of

the buildings, organisations, do-ability for students and teachers, characteristics of the field of discipline and the alignment between the course content, education methods and learning objectives.

The quality criteria are divided into *needed* or *wished* qualities. *Needed* means that the quality criteria cannot be changed (i.e. the number of study hours, availability of IT, the maximum number of students, etc.). *Wished* means that a specific quality criterion can be adapted within certain margins. The latter set of quality criteria in the Harris procedure, in Step 8, systematically assesses the formulated ideas and design concepts.

2.4.8   Step 8: Concepting or Preparing and Selecting the Design Concept
In Step 8, you translate your vision formulated in Steps 5, 6 and 7 with the help of the Frame of Reference (Step 4) into tangible products like the route map and the learning environment. These products describe the plan, structure and learning strategy of your new course. With this, you describe what type, of course, you want to design and how the teachers and students will use it. If you can visualise these ideas and concepts, you (and colleagues) have better insight into the product of the DD process. Hekkert and van Dijk stated that conceptualising synthesises the (vision-driven) features and the (outside world) constraints to create a coherent and realistic product.

In this ideating and conceptualising stage, the focus is on divergent, convergent and creative thinking. You create as many concept ideas as possible (divergent thinking). By making a shortlist and selecting the final design concept, you converge the possible solutions to the design problem. First, you must have three options and then one (the final design concept).

First, you *formulate possible concept ideas* for solving your design problem. An idea is a promising element of the final solution. Your vision (as described in Steps 5, 6 and 7) gives you a crucial context for generating meaningful ideas. To think up concept ideas within this context, you can follow idea-generating approaches, like a brainstorming group, nominal group or the Scamper procedure in Appendix B and find an analogy. Additional aspects of the creative process are described in Chapter 21.

Second, you shortlist *the clustered concept ideas* or *design concepts*. If you have collected enough concept ideas, you can cluster these concepts into the design concepts for your redesigned course. Possible elements are a unique and clear title, a written explanation and a visualisation with the help of an outline like the route map, the blueprint, a storyboard or other visualisation or illustration possibility. You decide which design concepts are the best solutions for your design task and problem. Choose two or three concepts from the most promising idea to be elaborated on in the design concept.

Third, you *elaborate* on the selected *design concepts*. In the selected design concepts for your course, you include the necessary teaching and learning activities and materials described in Step 4. My suggestion is to prepare route maps, as described in Chapter 6. A design concept should give you and your colleagues clear insight into the new format of the course and its use by the students and the teachers. Now is the moment in the process when you check how the design concept can meet all the formulated quality criteria. The design concepts are described at the same level of detail to compare the three design concepts.

Fourth, you *select the design concept* that best solves your design problem. There are two options: maybe one concept design is number one. This will be selected to elaborate on the final format of the new course. The other option is that two or three concept designs have different pros and cons. You can use the Harris approach (Appendix B) to compare the different options on a qualitative level. This approach helps you to be more objective in a subjective selection.

Fifth, make the blueprint (or design brief) for the best design concept.

When are you ready? Pose yourself questions like 'Does it fit all elements of your vision?', 'Is it the most useful concept for applying the minimum of means?', 'Does the concept make sense?' and 'Is it acceptable (or even desirable) to the people?'

2.4.9   Step 9: Develop the New Course Using the Selected Concept Design (Design and Detailing)

In Step 9, you transform the blueprint of the selected concept design into the final version of the course. You make the idea behind the design concept design tangible. The main 'driver' for decision-making in this stage remains your vision.

The necessary learning activities and materials will be prepared according to the requirements and quality criteria formulated during the course and development process and selecting the best design concept.

In this step, you might need new technologies or didactical methods. Often, more detailed suggestions for these missing elements should be developed. You should check whether the solutions fit your design vision. If not, you should go to Steps 2 or 5 of the course and development process.

The blueprints should allow you to see if you still like your design concept and evaluate if the learning process is realistic, motivational for the students and fits the needs of the different student groups. Determining if teaching activities are feasible for you and the students is also possible.

2.4.10   Step 10: Implementing the Course

Implementing your new course starts in Step 2 with a problem domain, which will be discussed with colleagues and management. Also, the various stakeholders will be informed and asked for their opinions during the process. Two important reasons for this are: (1) you can learn a lot from your colleagues and (2) your colleagues and the management obtain a possibility to discuss your new ideas. Specifically, it is possible to discuss 'Do these ideas fit into the curriculum?' and 'Is it possible to realise the concept/ideas because of the equipment or availability of classrooms?'. In this stage, you must plan what should be done by whom and when.

3   Examples of Course Design and Development Models

In the literature, you can find many course design models which are used successfully. This section describes the main design features followed in a selection of the course design models. These features will be combined with the technical design features, the relevant features of complex problem-solving, design thinking and creativity to compose the Basic Course Design and Development process described in Chapter 6.

Many systematic course design models are based on the original model formulated by Dick and Carey (2000). These models provide an excellent overview of necessary instructional tasks for building a course design. These tasks or features are indispensable input for composing the Basic DD approach in Chapter 6. The Dick and Carey model and an adapted version of the Dick and Carey model by Valcke (2010) are presented in Chapter 18, Sections 3.3 and 3.4. The popular ADDIE model (Analyses, Design, Development, Implementation and Evaluation model) is described by Kurt in Chapter 18, Section 3.5. Bates's version of the ADDIE model (Bates, 2019, is presented in Table 30).

The presented course design models do not focus firmly on the design aspect. Also, the actions necessary for implementing the new course are not always explained clearly, except in the Bates/ADDIE model. A negative aspect is that the models describe course development too much as a linear process. Course models should be far more flexible to provide enough opportunity for iterative design.

The models suggest that one person only is the designer. However, course design is increasingly a team-teaching activity. Bates (2015) explains that these models are typical of traditional education. Modern education means that the teacher pays more explicit attention to the interaction between the students

and the teacher and between students. IT implementation is also not supported in these models. Most importantly, this kind of model does not help in making decisions. There are no guidelines that help the teacher designer select pedagogical methods or testing methods.

In the article by Post et al. (2022), the ADDIE model is adapted and shows the necessary design activities of teacher design teams. This version of the ADDIE model is presented in Table 31. Teacher design teams create professional development interventions.

In some design models, the design activities focus primarily on the design of blended learning courses and have elaborated the design activities in more detail. Five course design models are described in Chapter 18, Section 4 using the five steps of the ADDIE model.

3.1   *Design for Learning by Beetham and Sharpe*

Beetham and Sharpe (2013) explained the importance and focus of course design. They stated that design is a significant aspect of professional educational practice and design is a term that bridges theory and practice. Design learning will result in lesson plans, validation documents and course handbooks. They describe the main stages of design as follows:

1.   Investigation: What are my users and what do they need? What principles and theories are relevant?
2.   Application: How should these principles be applied in this case?
3.   Representation or modelling: What solution will best meet the user's needs? How can this be communicated to developers and or directly to users?
4.   Iteration: How does the design stand up to the demands of development? How useful is it in practice? What changes are needed?

They describe the design for learning as follows:

> the process by which teachers (and others involved in support of learning) arrive at a plan or structure or designed artefact for a learning situation or setting'. Possibilities are learning resources and materials, the learning environment, tools and equipment, learning activities and the learning programme or curriculum.

For practitioners, the crucial questions in design are: 'How can I choose from, use, adapt and integrate the materials available to me to provide a coherent experience for my learners? I aim to focus on design and intentional, holistic processes based on the learning activity and design elements such as materials and environments must be considered'.

In their book, many suggestions for relevant learning designs are presented and they stress the importance of 'learning designs', which can be used in different situations. Agostinho (2011) overviews learning design presentations developed in several large-scale research and development projects. In her article, she focuses on one of these models: Learning Design Visual Sequence (LDVS). Essential elements to describe a learning design are the learning tasks, necessary learning resources and support. The main task in the learning design is ordered in a logical order (temporal sequencing strategy). This strategy will be designed with the help of scientific evidence and the experiences of the teacher designer. A systematic description in a best-practice format informs a colleague about the design details of the course. After the teacher has implemented and evaluated the new course, a course description is made. The crucial elements of the learning design must be explained and described thoroughly. One missing element in the description is the explanation of relevant scientific evidence. This could help teachers connect with scientific evidence and apply it in typical situations. Also, there are straightforward suggestions on how the teacher can support students during the learning process and helpful learning resources.

The same approach used by LDVS can also be used to design a course. The main design target is to think up a proper learning process or route map. The route map is elaborated in a blueprint that strongly resembles the systematic descriptions of a learning design but then focuses on a course for a specific context.

The conclusion of Agostinho (2011) is:

> this study showed evidence that the visual representation served as an aid to design because it provides a summary of pedagogical practice that could be easily understood. The presentation's relative simplicity, adaptability, and overall structure made the LDVS easy to use and enabled teachers to communicate and share their ideas and reflect their designs.

The idea of design learning by Beetham and Sharps (2015) reflects what is crucial in course design: finding an excellent learning process in terms of teaching and learning activities and supporting materials. Learning objectives are essential, but you do not design learning objectives. You design a learning process. You analyse whether the learning process will result in the official learning objectives or describe what you think the students will learn. This means that learning objectives play an essential role in the course design.

3.2 *The Design Approach by F. A. Earl (1987)*

The formal definition of 'design' 'is the plan, structure and strategy of instruction used and conceived to produce learning experiences that lead to

pre-specified learning goals (…). Although it is sometimes necessary to do ad hoc design in instruction and research (in response to unanticipated needs and circumstances), a design is created in advance.

Similar to the design of a shoe, a painting, a chair or a spaghetti fork, the design of a course, lesson or research is abstract.

We know it only by 'experiencing' it. It exists first as a concept in the mind of the designer and is then given a concrete form. Its quality will determine, to a significant degree, the quality of your experiences with it. The design generates and steers (sometimes explicitly and subtly) students' learning experiences in a course or lesson. Nevertheless, how the design will be experienced depends on how good it is!

3.2.1 Where Does the 'Design Process' Begin and End?

The activities involved in designing a course or lesson are illustrated in Figure 48. They will be quite familiar to those who have used the so-called 'systems approach' at the micro-level. However, activity four in the activity cycle (Figure 48) interests us the most in this book. This is the step at which the designer looks ahead, sets up and sequences the teaching-learning events. As a course or lesson, these events will satisfy the needs identified and specified under activities 1, 2 and 3.

Since it follows 'needs specification' (activity 3) and precedes the learning experience itself (activity 5), it is appropriate to label activity 4 as the learning experience design step. This is when all your creativity, intuition and logical thinking are challenged; therefore, it is close to the teaching-learning situation.
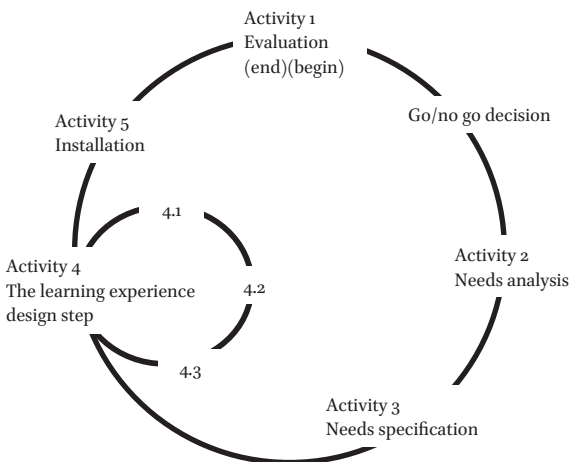
FIGURE 48   The place of the learning experience design step in the design process at the micro (course and lesson) level

SOURCE: EARL (1987, REPRINTED WITH PERMISSION)
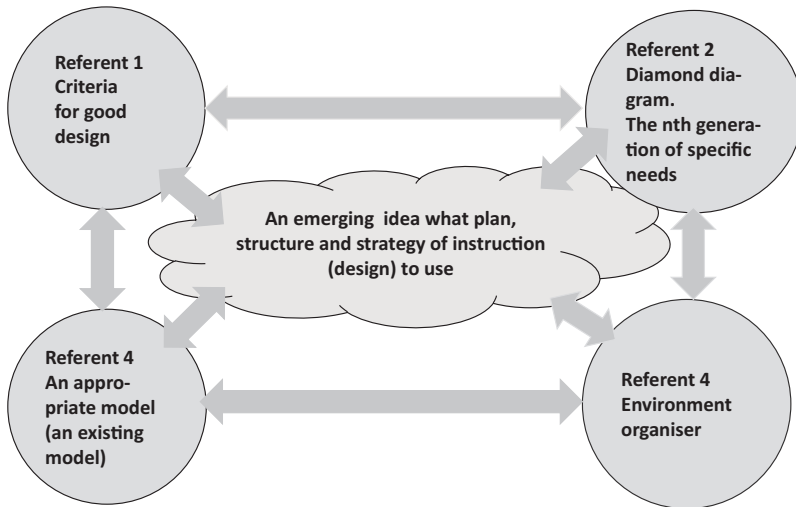
FIGURE 49   Four referents that help you think up a design
            SOURCE: EARL (1987, REPRINTED WITH PERMISSION)

This is helpful to distinguish three sub-activities of activity 4: Steps 4.1 Thinking up a design, 4.2 Working out a thought-up design and 4.3, Testing and revising a thought-up, a worked-out design (Figure 48).

A vital premise underlies the content of the activities named in Figure 49. A design per se, the 'plan, structure and strategy of instruction', is created after the needs have been analysed (activity 2) and specified (activity 3). The need for a specification (activity 3) is not the actual plan, structure and instruction strategy.

In Tony Earl's opinion, the learning experience design step demands specialist know-how and pedagogical cunning. You have to be a bit of a scientist, a magician and a bit of a fox to think up, work out and test and optimally revise a design. In Chapter 8, Section 4.8 Design Tools-3, under the heading 'look for an organiser for your course', the idea of a course environment organiser is explained.

The help offered to teachers and designers in the 'Think Tank Workshop' involves four decision-making aids. The aids or referents, as I would call them (because of how they function), are shown in Figure 49. In his book, he explains the stages in Figure 49.

A remark. Tony Earl makes use of several concepts from behavioural psychology. However, he uses these concepts not in the scientific meaning but in the 'English meaning', which he needs as a designer.

The two-way arrows in the diagram tell you that the process of thinking up the design for a piece of instruction with the help of these four referents is dynamic. The four referents and an emerging idea for a design constantly interact amongst themselves in the mind of the designer until a solution to

the problem—an appropriate design—is found. The numbers 1, 2, 3 and 4 do not imply a sequence for using the referents. Instead, the designer's mind darts back and forth within the content of each referent, between the referents and in and out of the 'emerging' idea for a design. Thus, thinking up a design is a heuristic, not a prescriptive process.

Earl was a designer and explained how he approached an instructional problem. The fascinating idea is to see how you can apply his thoughts in a course design approach in 2023. Many ideas from Earl will help by applying technical design ideas to course design ideas.

3.2.2   What Tells Designers That They Have Had Success? (Earl)

Four words can be used to rate the quality of the learning experience generated by the design of a course or lesson. These words are 'effective', 'valued', 'liked' and 'efficient'. A learning experience is:

– Effective when the learning goal is met;
– Valued when the learners found their learning time and activity worthwhile;
– Liked when the learning experience has been enjoyed and has motivated the learner for more knowledge;
– Efficient when the time and energy spent learning what has to be learnt is minimal.

To what degree a course or lesson is rated highly by the learners will depend upon the teacher's skills, materials quality and design quality.

3.2.3   Which Features from the Book by Earl Will Come Back?

The idea is that design is essential in course design. The three design stages agree with the ideas in technical design, but now educational terms are used.

Earl's most vital point was the visualisation of his ideas. This is also a vital point in the technical design: making prototypes and visualising the process and the course organisers.

Tony Earl's digital book is meant for teachers and course designers who like to think as an art and craft person, prepare systematic analyses, think up ideas, structure the information and ideas in meaningful results and evaluate the results against robust criteria.

3.3   *The 10 Components Model by Dick and Carey (1993)*

A short description is given in the Instructional designer's handbook (PSU, 2023).

1.   Conduct instructional analysis. Find out which steps the student must take to perform the formulated tasks;
2.   Write Performance objectives;
3.   Identify the necessary entry behaviour of the students;

4.   Develop criterion student tests. Types of tests are pre-test-post-test, practice items, etc.;
5.   Develop an instruction strategy;
6.   Develop and select instructional materials;
7.   Develop and conduct the formative evaluation.;
8.   Revise the instruction based on poor test items and poor or unsuccessful instructional methods;
9.   Develop and conduct the summative evaluation;
10.   Revise instruction based on the results of steps 3–9.

An explanation of the components is given on the website of Pennstate University (2023). These ten components cannot be missed in a course design process.

3.4   *The IDI-Model of Valcke*

The IDI model (Instructional Development Institute) of Valcke (2007) is a model for the instructional design used in secondary teaching education. The nine steps of the IDI model are:

Definition of design activities
1.   Formulate an instructional problem, including needs priorities. This is the starting point of the design process;
2.   Analyse the environment/context: involved persons, constraints, and sources of possible solutions;
3.   Organise the necessary design activities: responsibilities, and planning in time.

Developmental activities
1.   Formulate objectives (final and in-between objectives);
2.   Select learning strategies, media and testing activities;
3.   Construct prototypes for learning materials and an evaluation instrument to assess the prototype.

Evaluation activities
1.   Test prototypes in an authentic setting;
2.   Analyse the coherence of the learning objectives and educational and testing methods;

3.5   *ADDIE Model*

The ADDIE model is popular in the course and curriculum design (see Figure 50). Different authors describe the model (For example, Kurt, 2018).
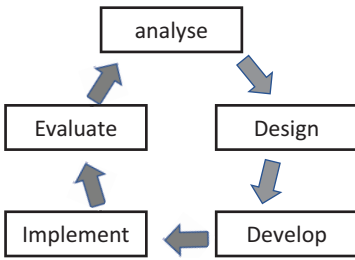
FIGURE 50
The ADDIE model

The basic cycle in the model is:

– *Analyses*: This is a need-analysis that should be discovered just what our participants need to learn, what they already know and the learning objectives for this training.
– *Design*: Decisions must be made about the training format, the content used, and the course prototype.
– *Development*: This topic concerns implementing the new qualities and requirements listed in the design stage. In the case of e-learning, it is also the stage Implementation: The model implementation will start when everything is set up to deliver the training.
– *Evaluation*: Evaluation represents the opportunity for designers to evaluate the training and make the participants provide feedback on where hardware and software should be improved.

Bates is critical of the ADDIE model and prefers more flexible models.

However, concerning the ADDIE model, Bates adds typical design activities (see Table 30) in his book, such as using a storyboard and prototypes.

3.5.1 What Are the Limitations of the ADDIE Model, According to Bates and Malamed?

The ADDIE approach can be used with any teaching project but works better with large and complex projects. It becomes expensive and possibly redundant when applied to courses with small student numbers and a deliberately traditional or straightforward classroom design.

A second criticism is that the ADDIE model might be called 'front-end loaded'. It focuses heavily on presenting knowledge. In modern higher education, you must also include the interaction between instructors and students during course delivery in the design process. The ADDIE model provides a good foundation for designing teaching and learning. But it can be too predetermined, linear and inflexible to handle more volatile learning contexts.'

Another criticism from him is that while the five stages are reasonably well described in most model descriptions, the model does not guide decision-making

TABLE 30   The version of ADDIE by Bates (2019)

Analyse	*Develop*
– Develop learner profiles;	– Decide to insource/outsource;
– Identify learning spaces and devices;	– Conduct testing;
– Research learning resources;	– Ensure security, backup and access requirements are met;
– Determine delivery and assessment strategies;	– Confirm licensing, copyright and accessibility;
Design	*Implement*
– Storyboard the design;	– Conduct delivery and assessment;
– Plan and test using prototypes;	– Provide an entry point for learners;
– Identify network capacity;	– Prepare teachers for e-learning;
– Designing online learning spaces;	*Evaluate*
– Explore and refine technology options;	– Share results;
– Consider using repositories.	– Collect, interpret and understand data;
	Revise design and or implement

in the instructional design process. For instance, it does not provide guidelines or procedures for choosing different media or *assessment strategies.*

The main criticism by Bates (2015) and Malamed and Sykora (2020) is that the model is too inflexible for the digital age. How does a teacher respond to rapidly developing new content, technologies or apps being launched daily to a constantly changing student base? I do agree with Bates.

3.6   *Teacher Design Teams Create Professional Development Interventions*

In the article by Post et al. (2022), a model for the design activities of teacher design teams is presented. Their model is aimed at the professional development of teachers in secondary education. They describe the goals, activities and guidelines from the collaborative learning literature ordered according to the ADDIE model stages. The main topics from the collaborative learning literature are facilitator guidance, group cohesion, individual accountability, positive interdependence, shared object, group cohesion, positive interdependence and individual accountability. Post et al. article explains these topics and should be considered when you want to work in teacher design teams in HE. When preparing the group work, checking which design tools are essential and valuable to conduct the design activities properly is still necessary.

TABLE 31   A short description of the main design activities of the teacher design teams in the blueprint

Analyse
– Activity between two sessions;
– Analyse the current situation;
– Activities in a session;
– Explain the design process;
– Set collaborative values and goals;
– Analyse the current situation;
– Analyse the desired situation;
– Analyse needed development;

Design
– Activities in a session;
– Determine the focus of the programme to be developed;
– Discuss intervention examples;
– Determine wording conditions;
– Create the initial timeline/design;
– Activity between two sessions;
– Receive and discuss peer feedback on the initial design.

Development
– Activities in a session;
– Refine design;
– Prepare an evaluation plan;
– Prepare a plan for the pilot phase;
– Activity between two sessions;
– Develop materials in detail;
– Implementation;
– Activity between two sessions;
– Implement part of the design on a small scale;

Evaluation
– Activities in a session;
– Evaluate the pilot phase;

Refine design
– Finalise implementation plan.

3.7   *Complex Learning*

In the various curriculum models described in Chapter 12, complex learning is considered an essential element. Issues and problems from the professional field and the related competencies should not be too easy or not too difficult. Merrienboer en Kirschner (2013) focus their four components of instructional design (4C/ID) on complex learning. In complex learning, the declarative, procedural and affective learning activities with the expectation that the students learn to apply this knowledge in professional settings (transfer). They develop a ten-step procedure about how this type of education can be designed and developed in higher education. The procedure is based on a moderate constructivist approach and is especially useful in designing education focussed on mastering professional competencies and tasks

The 10 steps are:

Learning tasks
1.   Design learning tasks;

2. Develop assessment instruments;
3. Sequence learning tasks;

Supportive information
4. Design supportive information;
5. Analyse cognitive strategies;
6. Analyse mental models;

Procedural information
7. design procedural information;
8. Analyse cognitive rules;
9. Analyse prerequisite knowledge;
10. Design part-task knowledge.

Their book and the website 4CID (Merrienboer, 2023) give many valuable suggestions for designing complex learning activities and materials.

Vink and Vermunt (1990) explain that the difficulty of a learning task is primarily determined by the students' necessary degree of independence and the assignment's complexity.

The degree of independence of the students varies from (1) teacher-centred, (2) teacher and students decide on the learning activities, to (3) student-centred. The independence of the students should increase during the program. The amount of independence is reflected in the learning objectives, the cases or problems, the degree of self-study and the sources of information.

The complexity of learning tasks ranges from simple to complex. It is reflected in the following aspects:
– The clearness and the amount of relevant information in the case or problem;
– The time available or necessary to finish the assignment;
– The level of the entry knowledge and skills;
– The number of disciplines involved in finding the right solution.

4 Some Examples of Helpful Design Methods for Blended Learning Courses

4.1 Introduction

SURF Particular Interest Group Blended Learning and the Teacher Professionalisation Zone of the Acceleration Plan for Educational Innovation with ICT have made an overview of several commonly used design methods in higher education for redesigning an existing course into a blended course. A description is given of Design Cycle for Education (DC4E) (Onderwijsontwikkeling

Zuijd, 2023), Carpe Diem, a team-based approach to learning design (Salmon, 2023), de Blended learning Wave (Zijltra 2023), Shuffle (Vernieuwenderwijs, 2023), Integrated course design (Fink, 2003), 4C/ID Expertise centre Open Universiteit the Netherlands, (Merrienboer and Kirschner, 2013), ABC Learning Design (Young, 2022), Design thinking (Brown, 2023).

The design methods, except 4CID, are often practised in short workshops in which teachers in small groups redesign a course in a blended learning course. These workshops aim to discuss the pedagogical concept of the curriculum and the possible consequences for the courses. But individual teachers could use support from a blended learning expert. The design situation is not complex; a description is given in Chapter 6, Section 2. Design situation one: the teacher already has some ideas about how they will apply IT in their education and how the learning objectives, subject matter and tests will not change much.

Below is a summary of the design method's essential features, following the ADDIE model's steps.

The Step *Analysis* is described in half of the design methodologies. One reason might be that the learning objectives, content, and tests are not changing. This design step is crucial to finding new and better design ideas.

The *Design* step is central to all models. The positive feature is visualisation. There are different possibilities for visualisation of the learning process: the Wave model (Figure 52), the Blueprint from Salmon (2023), the Storyboard or a Set of cards with educational methods. These visualisations can be compared with the Fishbone model from Earl (Figure 51), an Example of applying IT in higher education from Nedermeijer (2002) (Figure 54) and an Example flow chart of a course design from Van Eijl, Wagenaar & Peursen (2007) (Figure 53).

The relevant backgrounds from instructional science and learning psychology, like examples of learning activities, an overview of learning methods and pedagogical principles, are presented in specific, bite-sized parts directly applicable by the teachers. My book is focused on course design in more complex situations. The teacher designers are expected to have already insight into learning psychology and instructional science. Therefore, presenting the relevant backgrounds more comprehensively is possible, which gives them an important broader insight into the possibilities of IT options in higher education.

An essential visualisation is the prototype of a learning activity or course that can be evaluated and improved.

A crucial feature in all design methods is constructive alignment. The learning objectives, success criteria, test methods, course content, methods and media, as described in the diamond diagram, must always complement one another. The existing constraints in the design context will be sufficiently considered.

The step of Development is described in half of the design methodologies. For teacher designers, the step of Development is essential. A good idea is

crucial but must be developed in suitable educational and teaching activities to be helpful.

Most design methods do not address Steps 4 and 5, Implementation and Evaluation. A course design model should include both activities because they are essential in the course design process.

The above-described features of the course design methods should be part of all design processes. The elaboration of the features will depend on the specific context of the teacher designer. Chapters 6, 7, 8, 9 and 10 provide examples of course design and development processes in which these features for course design are given a meaningful place.

4.2 *Some Possibilities for Visualisation of a Learning Process*

4.2.1 Earl

The fishbone model is essentially straightforward. Each vertebra represents a specific teaching-learning event. The 'S' under each event is the input (stimulus) in the form of information, materials, criteria for decision-making, etc., needed for that event. The 'R' above each event is the response the materials, information, etc., must evoke. This 'R' could be a solution to a problem, a write-up of an observation made in practice, a diagnosis, a correctly set table or a correctly cooked egg. The small stars along the backbone of the model indicate interventions by a teacher or guide. During these interventions, the learners can get feedback on their performance in the completed event, ask questions, get more information, or learn what the following event involves.
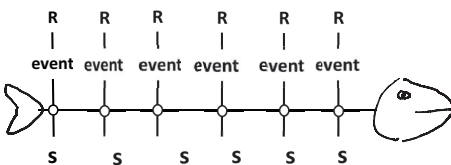
FIGURE 51
The fishbone model
SOURCE: EARL (1987, REPRINTED WITH PERMISSION)

4.2.2 Dijkstra

Dijkstra (2023) presents the design model Blended Learning Wave (based on the Grasple Open education website and a PowerPoint presentation by S. Wagenaar). By using a design model such as the Blended Learning Wave, you guarantee the conscious choice and the integration between online and F2F-learning activities.

Students prepare through a pre-lecture video (and sometimes an activity). In the Face-2-Face time, clicker questions are asked about the pre-lecture video, there is a lecture and the students work on assignments (with the teacher walking around and providing support). At home (or online), the students continue with assignments and work on assignments in the online learning environment.

Railway Engineering
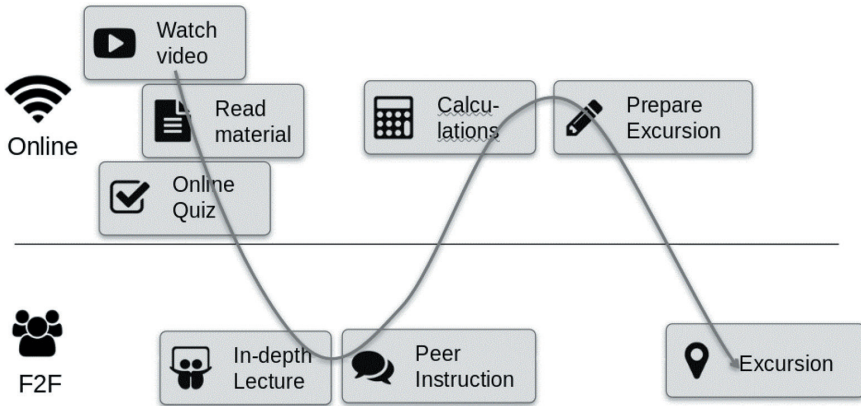
4.2.3   Van Eyl et al. (2007)

During the first activity in this example, students meet with the teacher during a class meeting. The teacher offers information, gives instructions and questions can be posed. Students meet each other and small groups are formed for the group assignments in the course. This introductory activity can result in an overview of what makes this course with the VLE interesting, an understanding of assignment one and a first appointment for the teams. The next activity is a self-study activity where students study the content, do the self-test with immediate feedback, carry out assignment one, check their results with the feedback criterion given in the VLE, and send their assignment by the VLE to the teacher and prepare themselves for the next classroom session, etc. (see Figure 53).

4.2.4   Nedermeijer

The students are offered the subject matter via the lectures, the VLE and additional study material. They receive self-study assignments that help them to provide insight into the subject matter and experience with the application of the knowledge. The students receive feedback on their self-study results via the VLE and can enter into discussions with fellow students or the lecturer. The students can give each other feedback through the VLE. They can also F2F work together on a self-study assignment, which can be stimulating for many students. Students can work more specifically on the desired test criteria by including examples of test questions or example tests. Often, this will improve the exam results (see Figure 54).

OFFER

• Explain subject matter (F2F)
• Illustrate working procedure (F2F)
• Ask questions (F2F)

• Written study material
• Hyperlinks (IT)
• Assignments (IT)
• Discussion (IT)

• Minilecture (IT)
• Teacher support (F2F)
• Self-test (IT)
• Test (IT)
• Feedback assignment (IT)
• individual and group assignments (ZS)

• Deadline assignment (ZS)

Weekly program 18th-century literature

Lecture

Self- and group study

Tutorial

Mail

RESULTS

• Obtain new information (ZS)

• Contribution to the discussions (IT and F2F)
• Prepare tutorial or seminar (ZS)

• Assessment test (IT)
• Contribution discussions (IT)
• Working out assignment (IT)

• Assessment test

F2F= contact between teacher and students
ZS = Self-study
IT = use IT options

FIGURE 53   Example flow chart of a course design. An explanation is given in Chapter 7, Section 4

Present learning material through VLE

Give information about the course

Present PowerPoint

Course activities

Expected learning result

Introduction

Lectures

Overview subject matter

Explain subject matter

Offer series of self-study assignments focussed on understanding subjects

Self-study

Insight in subject matter and learning objectives

Provide feedback by fellow students

Provide feed-back by teacher

Intensify self-study for better understanding

Answer students questions through digital consultation hour

Self-study

Exercise scientific discussions

Offer series assignments focussed on applying subject matter

Consolidate deep learning and transfer to achieve

Offer hyperlinks for additional information/subject matter

Self-study

Have more opportunities to exercise academic competencies

Test

FIGURE 54   Example of applying IT in higher education

4.2.5 Houx

On the website, the learning scientist L. Houx presents three basic activity sequences for online lessons.

The purpose of the design for each lesson has been to incorporate into online teaching as many of the following six evidence-based educational practices – as identified by The Learning Scientists (2023) as possible:

1. Concrete examples: illustrate ideas with examples that students can quickly grasp;
2. Dual coding: integrate words with images;
3. Elaborative questions: ask questions that help students connect new learning with prior learning;
4. Retrieval practice: have students practice with test questions on what they remember;
5. Interleave practice: mixed practice test questions from a variety of lessons;
6. I refer to the Learning Scientist blog (2023) for more detail on each online activity element and more lesson examples;
7. Practice: delay interval periods between practice tests;
8. Summary.

I refer to the Learning Scientist blog (2023) for more information (see Figure 55).

Video + Quiz	Forum	Non-auto quiz	Webinar	Follow-up email
Concrete examples	Elaborative retrieval	Retrieval practice	Concrete examples	Concrete examples
Dual coding		Spaced practice	Dual coding	
		Interleaved practice	Elaborative retieval	
			Retrieval practice	
			Spaced practice	
			Interleaved practice	
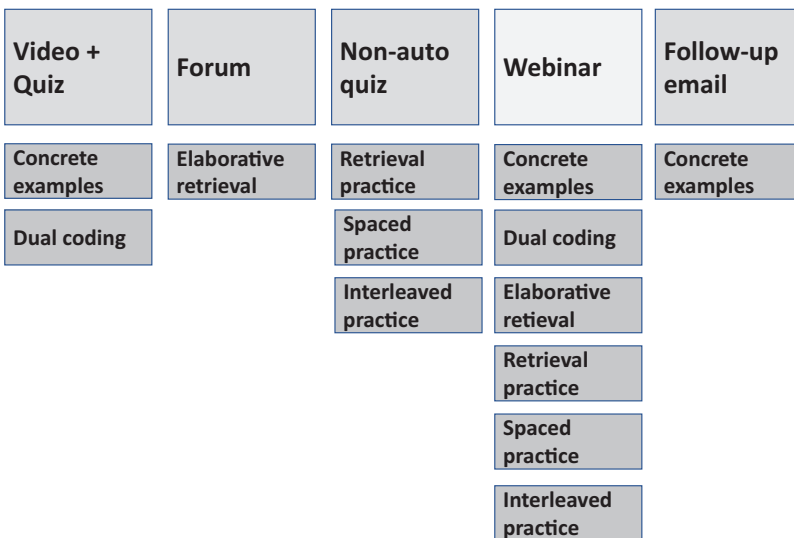
FIGURE 55   Lesson 3: Video + automated quiz, forum, non-automated quiz, webinar and follow-up e-mail
SOURCE: HOUX (2020, REPRINTED WITH PERMISSION)

5 Summary

Many interesting design features are found in the descriptions of the design and development activities in different disciplines. A number of these characteristics will be used in Chapter 6 to give further shape to the design component in course design. As expected, the technical design gives a much deeper insight into the design approach. The formulated features should be translated into the course design process.

The various course design processes give a helpful overview of the necessary design activities needed in the basic DD process. Some design models offer visualisation opportunities. However, compared with technical design, the course design approach needs more explanations of the necessary and possible design activities.

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Design Thinking

In this chapter, I give a summary of the description of design thinking by Costa (2017), Wikipedia (2023), Educause (2013), Educause (2017), Malamed (2020), Morris and Warman (2014), Brown (2023) and De Brouwer (2017). Design thinking can be seen as a problem-solving process.

The main topics discussed in this chapter are The Importance of Design Thinking, Design Thinking as a Process for Problem-solving and The Process of Design Thinking.

1   The Importance of Design Thinking

Educause (2017) describes design thinking as a creative problem-solving process conducted by participants in small groups. In other words, the ideas and experiences of design thinking are relevant in formulating the Basic DD process. Applying the design thinking approach to a team is a new and innovative option to solve problems.

Malamed and Sykora (2020) criticise the existing instructional design models based on system thinking, such as ADDIE and Dick and Carey (1996), as described in Chapter 18, Section 3.5. Malamed stresses the importance of having an approach to help the course designer synthesise information and be innovative and creative in course design. Morris and Warman (2014) stated that 'design thinkers strive to balance what is desirable from the user's point of view with what is feasible with technology and viable from a business factors perspective'.

2   Design Thinking as a Process for Problem-Solving

There are different versions of the design thinking process:
– A process with seven stages: define, research, ideate, prototype, test, implement and learn. Within these seven stages, problems can be framed, the right questions can be asked, more ideas can be created and the best answers can be assured. The stages are not always followed in a linear process. The stages can coincide and might be repeated until a proper design is realised;
– The five principles of design thinking are to empathise, define, ideate, prototype and test (Morris and Warman, 2014; Malamed, 2020);

– The four-step design thinking process for problem-solving is plan, do, study and act.

The reader might recognise the basic (technical) design cycle in these approaches. In the design thinking method, a standard set of traits are shared: creativity, thinking from two sites, teamwork, user-centredness (empathy), curiosity and optimism.

Design thinking challenges participants to reframe a problem. For example: reframe the problem of your education institute from the viewpoint of students instead of IT experts or the management viewpoint. Design thinking is beneficial when addressing a wicked problem. A wicked problem is difficult to formulate because the involved people can differ strongly on how to tackle the problem. Often, the organisation has tried to solve the problem without success. You need a group of involved persons willing to think outside the box when defining the problem and thinking up new solutions.

Visualisation is often used to develop an understanding of the obscure or ill-defined elements of the situation. Symbols, signs and metaphors are used through sketching, diagrams, mind maps and technical drawings to translate abstract requirements into concrete objects.

Technical developments strongly stimulate the application of IT in Higher Education. New options like serious games, 3D virtual animations and Artificial Intelligence offer attractive options. Design thinking might help find a feasible, effective, efficient application valued and well-liked by the teachers and the students. Even better, I think HE should formulate challenges for the IT experts or firms which are necessary and worthwhile for HE instead of following the IT applications offered by the IT experts.

3   The Process of Design Thinking

The process of design thinking the Design thinking is intended for participants to learn their way to a solution.

The five steps of the design thinking process are as follows:

3.1   *Empathise*

The first step is to listen and try to understand the design problem of yourself, your organisation or a colleague. Generally, the design process starts with an inspiration phase, in which the previous step defines the design brief or assignment. The brief is a set of constraints that gives the project team a framework to begin and the benchmarks by which they can measure progress;

3.2   *Define*

The designers collect enough background material they consider necessary. In this step, the information is used to define the design problem;

3.3   *Ideate*

Think outside the box: Ideate is the step in the design process in which you concentrate on idea generation. Participants create ideas to solve the design problem with the help of techniques like brainstorming, sketching and visualisation. Chapter 18, Section 2.4.8, Chapter 21, Sections 4 and 5 and Chapter 6, Section 9, Table 16 describe various options to help you develop ideas and concepts while designing.

Plattner (2023) describes the five steps of his version of the design thinking approach systematically. He explains: 'The goal of ideation is to explore a wide solution space – both a large number of ideas and a diversity among those ideas. You can build prototypes to test with users from this vast depository of ideas.

3.4   *Prototype*

A prototype is a preliminary model of the final product. A prototype provides a simple possibility of rapidly trying ideas (rapid prototyping). Prototypes for one or more solutions were built and tested. The prototypes can be visualised in various formats: A drawing on paper, a simple 3D construction, a digital format, a storyline or a course route map, etc.

The best ideas generated during ideating will be converted into action plans. The core of the implementation process is prototyping or turning ideas into actual products and services. You should try to find a prototype that helps gather feedback and improve the idea behind the prototype.

3.5   *Test*

The prototype is then tested, improved, tested and so on. Prototypes speed up the innovation process because they help to understand the strengths and weaknesses of new solutions.

The participants can repeat the cycle until they agree on which prototype is helpful for the design problem.

4   Summary

The articles about design thinking provide a handy overview of the importance of design features. Some features of design thinking have not been sufficiently

elaborated in the existing course design processes. However, its importance is made clear. For example, the prototype, ideating (being creative) and testing the solution quality need to be translated more seriously in course design activities and products. Features relevant to design thinking and creativity should be recognised and considered meaningful in the course design and development processes.

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Problem-Solving Features Relevant to Course Design

You can think of course design as a problem-solving process. Therefore, examining whether problem-solving characteristics are recognisable in existent course development models is helpful. This chapter provides a brief description of the features of problem-solving.

My main concern is to assess whether problem-solving characteristics are sufficiently reflected in course design models. If specific characteristics do not recur sufficiently, you have to formulate suggestions on how the problem-solving nature of course design can be sharpened. The DD process is expected to give you more and better ideas.

The main topics comprised in this chapter are Some Characteristics of Problem-Solving and Description of the Problem-Solving Process.

1 Some Problem-Solving Characteristics

1. A problem exists when the teacher designers want to achieve something but cannot realise it;
2. You can distinguish among the types of problems. Globally well-defined problems versus ill-defined problems and routine versus nonroutine problems. There are no standard solutions for course design. Most design tasks or problems are open and non-routine. Still, deciding to make small, specific changes in a well-functioning course is less complicated than developing a new course;
3. A relevant conclusion from Nokes and Schunn (2010) is that experts have more conceptual and procedural knowledge than novices. This knowledge is also organised in a way that facilitates practical problem-solving. The difference between routine and non-routine problems depends on the knowledge of the teacher designers. If they are experienced, some problems can be solved in part routinely. These differences are relevant because most teachers have much teaching experience but less experience and insights in course design and learning psychology. Much relevant and valuable information about learning psychology and instructional design is meant for experts, so you can expect that the teacher designers

TABLE 32 Types of knowledge

- *Declarative knowledge* consists of world descriptions, including facts, strategies and principles. It is commonly referred to as knowing that.
- *Knowledge of the professional situation or situational knowledge* consists of knowledge of the work area, including a repertoire of solved problems.
- *Procedural knowledge* consists of information for performing particular actions to accomplish task goals. This is commonly referred to as knowing-how.
- *Strategic knowledge* consists of knowledge of general strategies for solution processes. It concerns general applicability, regardless of the specific course content.

SOURCE: TEN DAM ET AL., 1997 AND NEDERMEIJER AND PILOT, 2000

will have problems understanding these texts and are not able to apply the presented evidence based options in a course design.

4. One distinguishes intuitive and implicit knowledge and four types of explicit knowledge (Table 32). Besides disciplinary knowledge, teacher designers need insight into the different types of knowledge of instructional science, learning psychology and pedagogy.

2 Description of the Problem-Solving Process

Teacher designers may have to deal with various course design tasks. Their most common design and development tasks are briefly described in Chapter 6, Section 1, Tables 5–9. Design situation level 1, 'Redesigning a course', is usually less complex than level 5, 'Designing a completely new course'. The pDD processes to be followed for the levels with different complexities will differ correspondingly.

Several authors have described the steps involved in a problem-solving process. Depending on the context, the authors describe the problem-solving steps differently. However, in most cases, one follows Nokes and Schunn (2010) description. The five steps and their characteristic features can be seen in the Basic DD process.

2.1 *Problem Categorisation*

You start by making a clear problem description: What do you want to achieve and why? The problem description should not be too narrow or too broad. If it is too narrow, you have a good chance of missing more deviating solutions.

If you do it too broadly, you will have a lot of unnecessary extra work. You also indicate how you want to tackle the problem task. Differentiate facts from opinions and specify underlying causes. With the answers, you have defined the context of the problem-solving process.

Problem formulation depends directly on the prior knowledge of the teacher designers. If they have little prior knowledge, there is a good chance that the problem definition will remain too limited. Additional study or advice is then necessary. Relevant instructional knowledge has been demonstrated in Part 3 of the book.

2.2   *Construction of a Mental Representation of the Problem*

Design tasks are, too often, poorly structured. Formulating a mental representation requires an iterative process that requires extra time. A better mental representation usually produces better results.

You should check whether you actually focus on the design problem(s) that needs to be solved to realize your design idea; maybe you focus on an exciting side problem or on a problem you can solve quickly without reaching your design idea.

There is still time to adjust the problem description. In the problem-solving literature, much emphasis is placed on gathering the relevant information needed to understand the problem and acting as a source of inspiration for devising solutions. This is often forgotten in the practice of developing new courses. Another problem is that the available literature is clear for the researcher but not always understandable and helpful for the teacher designer. Therefore, the teacher designer will have to pay extra attention to this.

A helpful step is structuring the collected information in a scheme, a visual reorganisation or reformulating the problem. This makes the coherence of the information visible, which might help you obtain more insight into the problem and the missing information. Based on the institution's wishes, your views and the information already collected, you formulate the quality criteria the solutions should meet.

A beneficial activity is writing down your decisions and their backgrounds. Later in the process, you can easily find out why you have made certain decisions. There may be sufficient reasons to reconsider the decision. You can also use the decision list to inform your colleagues and management.

2.3   *Search for Appropriate Problem-Solving Operators (Strategies or Procedures)*

In this step, the teacher designer decides which design tools, knowledge and skills are necessary to solve the problem. In Parts 1, 2 and 3 of the book, relevant

design tools were presented. Sometimes, other theories and practical instructional science techniques have to be studied.

2.4 *Retrieval and Application of These Operators to the Problem*

A problem-solving process involves divergent thinking (ideation) and convergent thinking (ordering and reducing the number of valuable ideas). It is crucial to apply both types of thinking in this step. This step is undoubtedly a moment to use creative techniques.

You start with divergent thinking. After selecting various strategies and procedures, you apply them to solve the problem. In this step, you should not prejudge any potential solutions and treat each idea as a new one worthy of consideration. Conversely, it is not helpful to consider bad ideas for too long because this gives you unnecessary extra work.

A wrong act is 'jumping to conclusions'. Is it the best solution? Take some extra time to look for alternative solutions. But write down this early idea. The designer often forgets beautiful ideas. Rethinking an idea might be disheartening.

When you are sure that you have enough interesting solutions, you stop ideating (divergent thinking) and start with convergent thinking. You select two to five best solutions. In step one, you use the problem description and the expected end products or results with the formulated quality criteria to select the best solutions. Sometimes, the best solution is obvious; sometimes, it is more of a feeling you have. You can also use a semi-quantitative selection procedure, such as by Scamper (2021). After selecting the best solution, you might still want an in-depth analysis and offer better solutions.

The design of a renewed course is not always critically assessed. There often is a lack of explicit quality criteria to promote critical thinking or too little time
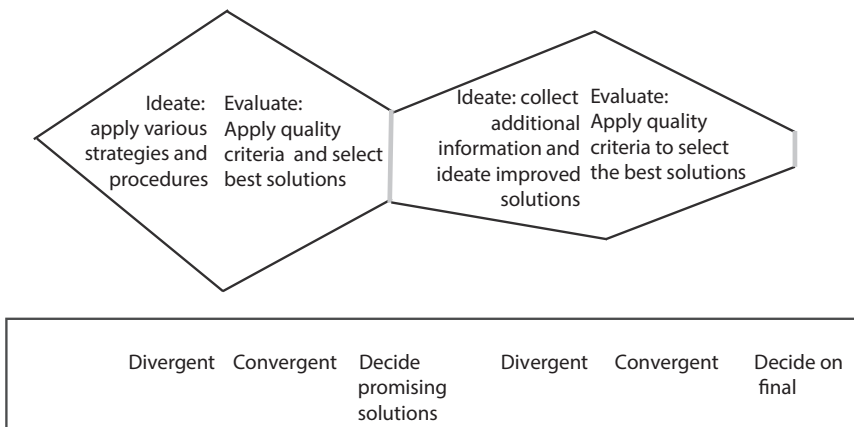
FIGURE 56   Divergence and convergence thinking in the design and development process

to critically evaluate a new course design. This is not a sensible situation. After all, the purpose of critical thinking is to adjust the design's weaknesses, which can sometimes take more time unexpectedly. In doing that, the quality of your solution will improve. You prevent introducing new problems or just missing the right solution for the problem you want to solve.

2.4.1 Iterate Steps 1–4 If You Are Not Satisfied with the Progress of the Solution

The problem-solving process is regarded as iterative. When you finally see your first course design, there is a fair chance you will recognise weaknesses or opportunities to improve the course. You should decide if you go back to one of the steps and adjust your design. The DD process is iterating, and I suggest planning enough time in your pDD process to iterate.

2.5 *Finally, Storage of the Solution*

There are two reasons for properly archiving your problem-solving process. First, you can use the results and background information to explain your ideas and decisions to your manager and colleagues. Also, you can use your materials to prepare your course's official quality assurance documents.

3 Summary

The literature on problem-solving is instrumental in developing the Basic DD process. Crucial evidence about problem-solving should have a place in the Basic DD model.

The problem-solving process will start with two questions: What do you want to achieve and why? The problem description should not be too narrow or too broad. Emphasis should be placed on gathering, structuring and visualising the relevant information needed to understand the problem.

Besides their disciplinary knowledge, teacher designers need insights into the different knowledge types of instructional science, learning psychology and pedagogy. There are no standard solutions for course design. Most design tasks or problems are open and nonroutine. Deciding to make small, specific changes in a well-functioning course is less complicated than developing a new course.

In most problem-solving process descriptions, the contextual relationships are elaborated. This means I had to build a pedagogical-oriented problem-solving process as a basis for the Basic DD process. A problem-solving process involves divergent thinking (ideation) and convergent thinking (ordering and reducing the number of valuable ideas). It is crucial to apply both types of

thinking in this step consciously. This step is undoubtedly a moment to use creative techniques. Possible creativity techniques will be discussed in Chapter 21.

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Creativity Is Indispensable in the DD Process

I do not intend to provide a systematic overview of creative thinking. My main concern is to assess whether the characteristics of creativity are sufficiently reflected in course design and find possibilities for sharpening its creative nature. The main topics discussed in this chapter are 21.1 What Creativity Means, The Creative Process and Your Creative Process Can Be Enhanced Summary: Suggestions on How You Can Stimulate Your Creative Process.

1 Why Pay Particular Attention to Creativity?

In the course design and development process, creativity plays an important role. During the DD process, you will meet all kinds of problems that cannot be solved by using your expertise, studying the literature or asking your colleagues. These problems can be minor or complex and you will meet problems in all design activities. Here you need your creativity.

Although the concept of design and creative thinking has been included in instructional models in recent years, what is still missing are straightforward suggestions on how to be creative. Only mentioning that there is a creative step but not giving enough suggestions on how to do this makes it difficult for teacher designers to apply them consciously. The teacher designer can find helpful suggestions for creativity in the literature. However, a more practical and systematic explanation of applying the concepts as a teacher designer is still missing.

My main concern in this chapter is assessing whether creativity's characteristics are sufficiently reflected in course design. In this book, I try to formulate more recognisable and practical suggestions using typical characteristics to give creativity a more suitable place in course design.

2 What Is Meant by Creativity?

Different authors have described the concept of creativity. Clinton and Hokanson (2011) described creativity as generating novel and valuable ideas, usually in response to a problem that needs to be solved. Reitsma (1995) stated that creative thinking increases the number of possibilities. Generating criteria
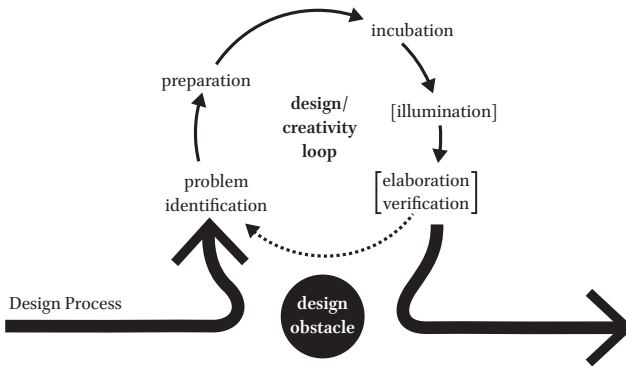
FIGURE 57   Design and creativity loop
SOURCE: CLINTON & HOKANSON (2012, REPRINTED WITH PERMISSION)

and alternatives in decision-making and devising possible causes in problem analysis. Creativity is a divergent thinking process. Runco (2010) explains that creative behaviour requires both originality and effectiveness. Originality can be defined in terms of novelty, uniqueness or unusualness and effectiveness in terms of fit, appropriateness and value. When creative behaviour is problem-oriented and thus part of the problem-solving process, effectiveness can be defined in terms of the quality of the solution(s).

3   The Creative Process

The course design and development process offers many situations where you need creativity. For example, preparing learning objectives, ideas for route maps, assignments, learning materials and test questions. Clinton and Hokanson (Figure 57) define the five stages in the creative process. The creative process starts with designing a clear and detailed problem description. You combine all relevant information into your problem description. This gives you the context for looking for possible solutions. You have a clear and valuable design assignment with this process. The following design step is incubation. Place the problem and the context aside and allow them to simmer in your head. Some people will say I will sleep a night on it, while others will have a stroll or shower. Your brain can now structure the collected information in the subconscious mind. If you are lucky, you will have a Eureka moment that helps you solve the problem. This step is called illumination. Your new idea(s) is(are) now part of your pDD process. You evaluate whether the thought-up ideas are workable solutions. If so, you have made a step toward the desired design. If unsatisfied, you might reformulate the problem and repeat the creative process.

4   Your Creative Process Can Be Enhanced

Creativity can be evoked in a structured and systematic way. On the one hand, you can somewhat structure the creative process to limit the thinking field. On the other hand, there is no room for creativity when there are too many limitations.

Recognising a problem is not enough to come to creation and motivation is needed to tackle the problem and dive into it. Intrinsic motivation from within is especially desirable for achieving creative achievements. It would help if you felt the urge to find a solution to complete the design process.

All people have the skills to be creative; maybe some people are more naturally creative. All people can use suggestions on how to be more creative. The Delft Design Guide van Van Boeijen (2020) and Roozekrans (2020) give valuable suggestions for being creative yourself or with a group.

5   Summary: Suggestions on How You Can Stimulate Your Creative Process

This chapter shows all kinds of possibilities for stimulating divergent thinking. In developing the Basic DD process, various suggestions from this chapter were placed in the design activities. Here are some tips formulated in the mentioned literature to stimulate your creative process:

– Look for a situation where the focus is not on your problem: go for a walk, sleep, a party, a shower etc. Creative thinking will go into the subconscious;
– Describe and organise your problem in a short document. What are your challenges? Your design obstacle(s)?;
– Visualise your problem on the whiteboard with small cards or paper. Look for new relations and ideas to make the problem and possible solutions visible;
– Try lateral thinking or thinking outside the box. Many technical problems have been solved by looking at animals or plants. Check Edward de Bono (2023) for lateral thinking ideas;
– Explain and discuss your problem with a trusted colleague. Often, you will find new connections and possible solutions. Colleagues can help you look at the problem from different angles or stimulate you to check the coherence and correctness of your ideas. Maybe you did not think of the additional information;
– Organise a brainstorming group, nominal group or use Synectic to think and discuss your well-formulated problem. There should be an open atmosphere

in the group. Mistakes of participants are not a problem but a reason to think again. Sometimes, at first, it is necessary to make a problem diagnosis because the problem description offers the participants insufficient guidance;

– Follow the structured approach proposed by Scamper (2019) to think divergent. This approach uses seven heuristics to formulate additional ideas: substitute, combine, modify, consider another use, eliminate and reverse;

– Stimulate your thinking with the help of analogies, metaphors or examples from other teachers. For example, technical designers search in the world of animals and plants for analogies. Many examples can inspire you in training and education;

– Another option to open your mind is to imagine the relationship of your design problem with a random word in your dictionary (one of the ideas by de Edward de Bono, 2023).

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Why Do Faculty Hesitate to Adopt Evidence-Based Teaching Methods?

The introduction of evidence-based teaching methods meets with problems or opposition. To deal with this, it is essential to know what these problems are and where the opposition stems from. When introducing educational change, you must understand the 'roadblocks' and the enablers of meaningful innovation. The main topics discussed in this chapter are Introduction, Are There Other Reasons? And Suggestions to Support and Motivate Faculty to Apply Research Evidence.

1　　Introduction

Herckis (2018) conducted ethnographic survey research on the question. Why do faculty hesitate to adopt evidence-based teaching methods? Herckis followed the progress of projects to improve teaching at her university. She observed academic bureaucracy in meetings and e-mails for over a year and inventoried faculty attitudes through surveys and interviews. Her conclusions, which can be easily recognised by other universities, are:

– Many academics cling to the robust idea of good teaching, even if other evidence is available. The idea of academics about education was often inherited from former professors or even parents;
– When our intuition tells us to do one thing and an article tells us another, it is challenging to change behaviour as a university teacher;
– Many academics dislike changing their education because they are afraid of being recognised as weak teachers in the official student evaluation;
– Students are positive about my teaching. Why should I change?;
– Teachers who 'care about their teaching' are sceptical of education research.
– Another issue is that faculty members were more likely to change if they had come up with the ideas themselves rather than adopting something tried and tested by others.

According to Herckis, there is a growing call for faculties to adopt evidence-based teaching methods. This urge has to deal with the conflict between faculty values and adopting these evidence-based teaching methods. The conclusion

is that when you want to introduce educational change, 'you have to understand the "roadblocks" and enablers of meaningful innovation'.

2   Are There Other Reasons?

The relevance of evidence-based teaching methods depends on the characteristics of the teaching-learning situation. The faculty members must decide if specific evidence is relevant to their courses. However, selecting and applying relevant evidence is not simple.

Often, research evidence is formulated a bit vaguely, i.e. too general and too far away from the practice of teachers. Because of this, it isn't easy to convince teachers about the positive effects of applying the evidence. Luckily enough, there are some websites of researchers where you can find more practical evidence-based knowledge.

Another helpful design tool is the description of the best practices of courses in HE. Best practices illustrate how you can apply the evidence in courses. However, there are only a few best-practice descriptions in a proper format, as described in Chapter 7, Section 5. Defining best practices for colleagues inside and outside your institute is difficult and takes time. Often, the course content is described clearly, but the (evidence-based) pedagogical considerations are missing. These explanations are necessary to help interested teachers understand and translate the best design idea in their courses.

Some examples of best practices in the literature are somewhat complicated to follow.

3   Suggestions to Support and Motivate Faculty to Apply Research Evidence

Herckis stressed the importance of understanding the roadblocks mentioned. In her article, she gives three suggestions on how to solve these problems:
1.   Train the Master and PhD students;
2.   Hire new teachers with the required experience;
3.   Support teachers in such a way during the (re)design process to allow them to use their already-acquired experiences. Additional training is proper or necessary.

In Chapter 3, Section 3.2, you can find exciting ideas about how general partitioners use the evidence-based approach in their daily medical practice.

Some additional suggestions from my side, which find support in experiences in evidence-based medicine, are:

a. Introducing new pedagogical ideas means that the teacher designers should adapt their learning materials and- assignments. For this, teachers need time, expertise and the willingness to do it;

b. Improving the quality of the evidence description. Use enough time in the course design and development process to understand, discuss and describe possible applications;

c. The concept of design principles has been researched for various pedagogical situations and is explained in Chapter 16, Section 3;

d. The design principles are less specific than the scientific results. Teachers from different disciplines should be able to use the design principle. Design principles are not ready-to-use recipes (Theelen & van Breukelen, 2021). The essential quality of a design principle is that it should be appealing, understandable and valuable for university teachers in general and the teachers should be able to translate these design principles into ideas for their courses;

e. The design principles can effectively support teacher designers in designing their courses. This could be combined with teacher training activities on what these design principles mean and how you can use these design principles. In the training, the participants discuss understanding and applying them with a researcher or a teacher designer with experience. An interesting side product might be a more helpful description when applying the teachers' experiences. The various authors report that discussing the possible application of the design principles has given crucial support to teachers in educational development projects;

f. Also, practical examples of intermediates in the course design and developing process are the learning objectives, the diamond diagram, the pedagogical concepts, the learning process, the route map, the blueprint, the lesson plan, etc., which are particularly useful when you want to explain what you want teachers to do.

Interesting ideas from Janssen (2014) are 'fast and frugal heuristics' that the teachers can use directly and easily without much explanation. These procedures allow people to ignore information and make quick, more accurate decisions in complex situations. Janssen focuses his advice on teachers and professional designers in secondary education. However, his idea is also relevant for HE because pedagogical training in HE is much less comprehensive than in secondary education.

This idea of fast and frugal heuristics has been used in my course and workshop Blended Learning and Moodle (see Part 2, Chapters 8, 9 and 10. For example, in the schemes used in Steps 1 and 2, the diamond diagram, the route map, the blueprint, and the checklist in Figure 14 in Chapter 6.

4   Summary

Herckis (2018) clearly described some fundamental reasons why university teachers have difficulties with the pedagogical elements of modern higher education. Her analysis has motivated me to prepare design tools that make transitioning from existing to modern education more acceptable. Too many pedagogical texts are too abstract and complex to translate into concrete course activities. Other valuable suggestions I have followed in designing the courses and writing this book are: (1) support teachers in such a way during the (re)design process that teachers can use their already acquired experiences; (2) improve the quality of the evidence descriptions; (3) best practices are beneficial to understand why using available evidence should be considered; (4) formulate design principles and other design tools and (5) give ideas about applying them in a course. Also, good examples of intermediates in the DD process, such as learning objectives, the diamond diagram, the pedagogical concept, the learning process, the route map, the blueprint and the lesson plan, are beneficial when you want to explain what you want teachers to do.

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Eight Design Principles and Their Consequences for MHE

The description of the eight design principles in chapter 16 is meant to help you prepare a simple pedagogical concept for courses in a modern higher education curriculum. It is meant to give the teachers support in preparing their courses.

Task-Oriented Learning/Active Learning

1. Learning should be active instead of just listening. Students must learn to use the content in authentic professional problems, cases and issues. Students will be prepared for lifelong learning. There is less theory and more skill training in nursing/midwives' interventions;
2. In the program, the teachers offer (connected) study assignments;
3. The complexity and size of the assignments increase during the study years;
4. There is transparency in the expectations towards the students. The courses are described clearly in the module books;
5. Learning objectives and aims/competencies are logically related in and between the courses;
6. Teachers and tutors support the self-study of the students. During the study program, the students will have to study increasingly independently;
7. The education will be more en more using IT. Students have to learn to study using the IT options.

Consequences
1. The students work on different study assignments related to the discipline;
2. The assignments have clear learning objectives: the learning tasks, the expected results, the assessment criteria and the mode of discussing the results are clear and feasible;
3. The assignments are presented through Moodle;
4. The feedback is given by the teacher, the tutor or fellow students (often through the VLE);
5. There is an optimal blend of F2F, online and self-study learning activities. The program stimulates the students to study regularly;

6.   In the assignment, the entry level of the students is considered. Remedial study
     materials are available through Moodle;
7.   For excellent and very motivated students, extra activities are possible.

Issues and Problems from the Professional Field Are Central

1.   Knowledge is learned and applied in the context of professional issues and prob-
     lems. This is possible to reduce the gap between education and the working field.
     Competencies are based on the official curriculum planning and the university's
     additional content and learning activities;
2.   Students are enabled to build a repertoire of solved patient cases. Students learn
     to solve health problems or tasks systematically;
3.   Also, students will be involved in innovative subjects or projects.

Consequences

1.   Cases, problems or issues from the field are illustrated with the help of different
     media (pictures, video, simulations, and animation in Moodle);
2.   Cases are studied in the classroom, small workgroups, practical work in the skills
     lab, projects and internships. The learning activities are growing in complexity
     and difficulty;
3.   The teachers prepare their lessons. The pedagogical approach is theory – video –
     demonstration – and practice;
4.   Students learn systematically to analyse a client's problem, issue or question.
     Possible methods: problem-based education, project education, case method;
5.   They learn to use the internet, books and articles to understand and use the evi-
     dence-based method to solve practical problems and experience organising an
     innovation project;
6.   The internships (short and long) are prepared systematically in the regular study
     program. The experiences of the students are discussed.

Explicitly Focus on Knowledge

1.   Students study knowledge through active learning methods like assignments,
     problem-based projects, internships and case study methods through online
     discussion, peer feedback and group discussion;
2.   Students will, during their study, enlarge, deepen and structure the knowledge
     they gained;
3.   A MOOC could be an important source of up-to-date knowledge.

Consequences

1. Students study the main topics, concepts and developments relevant to the professional field;
2. Moodle indicates the learning objectives, relevant knowledge, literature, book, websites and videos to be studied.;
3. After the self-study, project work and practical work, the subject matter is discussed, applied and deepened during the classroom meetings.

Learning Tracks Support the Learning Process in the Program

1. The teachers and management should agree on the various learning tracks in the study program. In a learning track, the students learn to master the competencies;
2. Competencies are learned step by step in professional situations with growing complexity. The course content and skills are presented in Moodle and the books;
3. The development of the students is described with the help of rubrics;
4. All courses build on previous courses and prepare for the following courses;
5. Students develop themselves first as students and then as professionals.

Consequences

1. The teachers formulate the learning objectives, rubrics per study year, the subjects and the learning activities of the various learning tracks. The teacher decides on the contribution of the relevant courses;
2. When designing the course, the teacher ensures the correct learning objectives, course content and (sub) competencies can be studied and exercised;
3. The teacher ensures whether the course fits in the learning tracks in the program;
4. The student's progress is followed and discussed with the help of a portfolio.

Collaborative Learning/Learning from Fellow Students

1. Social bonding is essential to keeping the students committed, active and on track;
2. The students learn from each other by verbalizing and exchanging their knowledge, insights and approach;
3. The students have to learn to collaborate with other professionals and with clients.

Consequences

1. Organize group activities that bring shared success to the students;

2. Use the power of collaborative work in the F2F activities by organizing small groups and the use peer feedback;
3. Social and professional integration can be achieved by organizing a student club, mentor groups and easy availability of teachers and through Moodle, a discussion forum, chat and other social media.

Testing and Feedback Are the Motor of Students' Learning

Testing has three crucial functions:
1. The tests' content and format strongly influence the students' study behaviour;
2. With the testing, the faculty guarantees that students can function at the desired level of competency;
3. The students (faculty and teachers) receive feedback about the study results and progress.

Consequences
1. The test format, content and criteria are transparent and connected with the learning objectives and activities.;
2. There are summative and formative (or diagnostic) tests, primarily through the VLE. For example, students prepare a portfolio to reflex on their 'professional' progress;
3. Students' knowledge is tested during and after the course through the VLE and in the classroom.

IT Is a Must!

1. Improve accessibility of available information for the students. New possibilities to present content, assignments, multimedia and up-to-date learning material should stimulate the students' independent work;
2. Preparation for the future. Almost all professionals work with digital hardware and software; not using IT is no option. Also, many students expect IT in their education;
3. With IT, students can get more control (and responsibility) over their study activities. This is a crucial element of modern higher education;
4. The students should learn to use ITedu-tools and professional software and hardware effectively and efficiently in their studies;
5. IT supports students when a teacher is not available but needs them.

Consequences

1. Ensure that ITedu-tools work correctly;
2. Offer extra explanations of difficult subjects;
3. Encourage students and teachers to interact during the course;
4. Provide more feedback through IT;
5. Facilitate students using the internet, books and articles.

Possibilities for Personal Development

1. Most students have to learn to plan their studies, study texts (written and digital), learn from video presentations and work systematically and learn with all kinds of software and hardware;
2. The primary feature of modern higher education is the greater own responsibility of the students for their studies. The teachers' support and assignments decrease during the program (curriculum) (= scaffolding);
3. During the study, there is a need to support students in choosing their education and professional careers. Students are supported to formulate their interests and plans and decide on electives.

Consequences

1. Support the start of the courses;
2. Match prospective students to the course programs;

The Harris Profile

What

A Harris profile (Van Boeijen et al., 2020, p. 139) is a visual representation of the strengths and weaknesses of an idea or concept solution.

Why

A Harris profile tests ideas or concept solutions based on several criteria and visually displays this. Drawing up a Harris profile for several ideas or concept solutions can quickly be evaluated and compared.

How

Identify the 5–10 most important criteria for evaluating the design concepts you have formulated for your route map. You can apply the qualities and requirements you have selected. It would help if you differentiated between the hard and soft criteria. The hard criteria cannot be changed easily. For example, criteria like the number of students, classroom size, or available laptops. Soft criteria are softer. You realise the soft criteria by adapting the selected learning activities and materials until you, the management, the teachers' team, or both are satisfied.

Create a Harris profile for each design concept you want to review. Rate the design concept according to their expected performance on each criterion, with very good performance: +2, with very poor performance: –2, or in between. Colour the cells of your score to make the assessment visually clear.

You can add the scores for each design concept to arrive at a total score. Which design concept comes out to be the strongest?

Select the top-rated design concept to develop further. Are you satisfied with the result? Evaluate the results for the other design concepts. How can weaknesses in the most vital design concept be remedied?

Harris Profile
Design concept 1

Criterion 1	-2	-1	+1	+2
Criterion 2				
Criterion 3				
Criterion 4				
Criterion 5				
Criterion 6				
Criterion 7				

Design concept 2

Criterion 1	-2	-1	+1	+2
Criterion 2				
Criterion 3				
Criterion 4				
Criterion 5				
Criterion 6				
Criterion 7				

Glossary

Advanced organiser   an instructional tool that links previously learned or known material to a new lesson. Usually, the new material is at a more advanced level in the same subject. Familiar terms and concepts are re-introduced and applied by the students at a higher level.

Basic DD process   the basic version of the course design and development process. All possible design activities in a course DD process are described: 1 Prepare and discuss the design brief (design assignment and DD process), 2 Collect, analyse and structure the information needed in your design task, 3 Design the route map for the course programme, 4 Develop the best route map in the blueprint format, 5 Deliver the redesigned blended or online learning course and 6 Evaluate and assess the quality of the design results and decide on consequences for the DD process.

Blueprint   a description of your classroom teaching-learning schedule and an explanation of your pedagogical vision of supporting the learning process of students. The blueprint includes the following items: (1) the necessary learning activities and materials for the students; (2) the expected learning results; (3) the teaching activities; (4) the use of IT and practical exercises.

Competence   A competence is the ability of a student to display adequate behaviour and, therefore, function excellently as a researcher or professional, for example. A competence is a combination of critical professional skills, knowledge, professional attitudes, norms and values.

Constraints   factors limiting you in achieving your quality criteria. You have to find an answer to how to get around the possible adverse effects of these limits by looking for a clever solution. It is an element of the diamond diagram.

Diamond diagram   a systematic pedagogical description of the course using five essential instructional elements: learning objectives, course content, methods/media, testing criteria and constraints

Design Brief   describes the design problem, task or desire you will tackle, some pedagogical ideas, the qualities of the final design and the planning of your design approach (the PDD process). The design brief or assignment is the starting point of the design process. The text should be clear, realistic and convincing for you and your colleagues. It would be best to consider discussing this design brief with your colleagues and management. Does the course fit into the formal curriculum? Do your manager and colleagues expect the students to be willing to finish the assignments and master the learning objectives?

Design principle (DP)   an abstract description of a suitable combination of results from educational research. A DP describes the pedagogical qualities that should be realised in the design of your course or can be omitted with good arguments.

Design tools   tools that help you generate or assess design ideas about teaching and learning activities or materials. The design tools presented in this book are evidence-based, meaning that educational research results are summarised and incorporated into these tools.

E-merge   consortium of the Leiden University, Technical University Delft, Erasmus University, Maastricht University, Leiden University of applied sciences, and Zuyd University of applied sciences. The purpose of E-merge was to stimulate cooperation in implementing IT. I was four years Program Manager Education.

Evidence-based   the conscious, explicit and judicious use of the current best evidence in making decisions about teaching and learning. Another word used is information-based course design. In Chapter 3, the evidence-based approach is discussed.

F2F   an instructional method where the teacher teaches the course content and learning material to a group of students in person. This allows for live interaction between a learner and an instructor. It is the most traditional type of learning instruction. Learners benefit from a greater level of interaction with their fellow students as well as students.

HE   an abbreviation for higher education, (private) universities and higher professional education.

Instructional course planning and building principles   planning and building principles to be considered when designing the learning process.

ICLON   an abbreviation for Leiden University Graduate School of Teaching.

IT   an abbreviation for Information Technology, refers to anything related to computing technology, such as networking, hardware, software, the Internet, or the people that work with these technologies.

ICT   an abbreviation for Information Communication Technology most commonly used in the academic arena to refer to the branch of IT related to digital devices used to communicate or interact with digital information.

IT versus ICT   IT and ICT are often confused with each other. The terms mean two different areas of study or industry. Most simply put, ICT falls under the umbrella of IT and refers to the specific area of IT that has to do with communication.

ITedu tools   information technology educational tools or types of software used in HE.

IT option   possible pedagogical IT options in HE.

Learning environment   a strong foundation for the course design and development process. Elements of a learning environment are (1) the diamond diagram with the elements of learning objectives, (2) course content, (3) methods/media, (4) the formal and informal methods,(5) criteria of testing and constraints, (6) the pedagogical concept, (7) the programme sequence, (8) quality,(9) necessary learning spaces, (10) a well-functioning IT infrastructure (staff, software and hardware) and (11) students and teachers are prepared to work with the (IT) educational methods.

Learning objectives   learning objectives define the learning outcomes and help focus teaching. They help clarify, organise, and prioritise learning activities in the DD process.

MHE   an abbreviation for Modern Higher Education. MHE can be characterised in various ways. I decided to describe the MHE based on eight Design Principles (DPS) and some 55 pedagogical IT options.

MOOC   an abbreviation for Massive Online Open Course. These courses are available to everyone interested. There are (often) no costs or application requirements. A MOOC is meant to be a massive course. Thus, sometimes 5,000–100,000 students might attend a MOOC. The duration of a MOOC is usually between 4 and 12 weeks. They are excellent sources of free, high-quality information concerning many different topics. The learning activities and materials are available online. The students are responsible for their (self-)study.

OER   an abbreviation for Open Educational Resources. OER are teaching, learning, and research materials in the public domain or have been released under an open license that allows no-cost access, use adaptation or redistribution by others with limited or no restrictions. Materials are available through SURF, the Open Education Consortium, Open Educational Resources and Merlot. Additionally, colleagues in your network of teachers may serve as important sources.

Organiser   a 'bit of content' that organises your course's learning process. Two unique properties for the teacher-designers. (1) It enables the teacher-designers to 'see' how they will set up the student's learning experiences in the course; (2) It gives the students clear and correct insight into what they will learn and why. See also: advanced organiser.

pDD process   a personal version of the course DD process, adapted from the basic DD process. You select the design activities necessary in your DD process. During the pDD process, an idea for your course emerges.

Pedagogical concept   explains the pedagogical vision of the teacher or faculty used in the course (or curriculum) design. Part of the pedagogical concept is a description of the design principles followed in the curriculum or for a course. The possible teaching and learning methods and materials that match these DPS are described understandably for the involved teachers.

PUM   an abbreviation for PUM Netherlands Senior Experts (a volunteer organisation). PUM provides entrepreneurs in small and medium-sized enterprises in emerging markets or developing countries with advice for their business's sustainable and inclusive development.

Quality criteria   support you in keeping in mind the desired goals of the DD process as formulated in the design brief. During the DD process, you select and detail the elements and functions to make your design successful. The quality criteria are divided into needed or wished qualities. Needed means that the quality criteria

cannot be changed (number of study hours, availability of IT, etc.). These qualities can be compared with requirements. Wished means that a specific quality criterion can be adapted within certain margins. The specific elements or functions are selected, tested and measured to confirm that the learning objectives have been met. Quality criteria are used by your institute or the government in the quality assurance procedure.

Requirements   elements or activities which are needed in your course design. There are two types of requirements. Compulsory requirements of your organisation or government and requirements you have formulated for your redesigned course.

Route map   the outline of a course containing the following topics: (1) Main topics and learning activities; (2) The sequence of the topic; (3) Where on the route map do you introduce your ideas for IT options? The route map reflects the learning process(es) and is thought up by the teacher. It would be best to ensure a strong alignment of the ITedu-tool, F2F and self-study. The route map helps the teacher designers decide whether their course design can succeed.

SEC   an abbreviation for the Senior Expert Contact (Suisse). SEC provides, through retired experts, hands-on, cost-effective support towards the sustainable development of companies and institutions.

Sequence (of topics)   an essential element in course design. The topic sequence follows the learning process.

SPOC   an abbreviation for Small Private Online Course. SPOCs are meant for a limited group of participants (30–60 students). For example, students work with the teacher/researcher on a research assignment. In contrast to a MOOC, a SPOC is not necessarily free. SPOCs provide more discussion and personal attention opportunities because they are more exclusive.

VLE   an abbreviation for Virtual Learning Environment. A VLE offers lecturers a web-based platform for the digital components of courses. IT presents resources, activities, and interactions within a course structure and provides for the various assessment stages.

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Evidence-Based Blended and Online Learning

Course Design for University Teachers

Jan Nedermeijer

Universities and their teachers are more than ever required to (re)design their courses considering online environments. Although face-to-face teaching remains fundamental, exploring online alternatives is becoming increasingly necessary. Still, how can university teacher designers proceed with such a change in their courses? What is the most effective way to design an online course? How can university teacher designers attract the attention of students and make teaching interesting and compelling? *Evidence-Based Blended and Online Learning: Course Design for University Teachers* answers these questions. It provides a thorough evidence-based overview of each step required to make an effective course redesign.

The book is aimed at teachers and, more significantly, teacher designers committed to redesigning their courses based on solid principles. The book's design approach makes it much easier to translate the results of educational research on applying blended learning in educational practice.

Jan Nedermeijer has worked as an educational expert for several universities and as a senior expert for PUM Netherlands in several countries. The book synthesises the results of the numerous course- and curriculum-development projects he has conducted over many years. His approach can help university teachers implement IT in feasible, practical and interesting ways.

Evidence-Based Blended and Online Learning gives lecturers tailor-made pedagogical suggestions for designing modern higher education. Course design tasks are re-described, using features from technical design, problem solving, and design thinking, where creative design has a unique and essential role.

Jan Nedermeijer, M.Sc. (1947), was head Department Higher Education, ICLON, Leiden University and was active in numerous course and curriculum design projects. He is a volunteer for PUM Netherlands and has organised workshops on Blended Learning in Indonesia, Ghana and Nepal.

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