PBL AND ENTREPRENEURSHIP

LINKING AND DEVELOPING CONCEPTS AND PRACTICES THAT PROMOTE ENTREPRENEURIAL SKILLS ACROSS AAU

AALBORG UNIVERSITET
AALBORG ESBJERG COPENHAGEN

THE DEVELOP-MENT GROUP BEHIND THE BOOKLET

This booklet has been prepared in connection with the project *'PBL and entrepreneurship — linking and developing concepts and practices that promote entrepreneurial skills across AAU'.* The project was completed in the period 2017-2019, in collaboration between Supporting Entrepreneurship at AAU Innovation and a development group consisting of a number of researchers from AAU, all experienced in teaching and research related to entrepreneurship.

THE DEVELOPMENT GROUP COMPRISES:

Anete Mikkala Camille Strand (Department of Communication and Psychology)

Ann Charlotte Thorsted (Department of Communication and Psychology)

Annemarie Østergaard (Department of Culture and Learning)

Birgitte Bak-Jensen (Department of Energy Technology)

Birthe Lund (Department of Culture and Learning)

Frank Gertsen (Department of Materials and Production)

Ivan Aaen (Department of Computer Science)

Jonna Langeland Christensen (Department of Business and Management)

Peter Vistisen (Department of Communication and Psychology)

EDITORIAL TEAM:

Jesper Vestergaard (Project Manager, Supporting Entrepreneurship, AAU Innovation)

Mette Bach Andreasen (Supporting Entrepreneurship, AAU Innovation)

GRAPHICS:

Novagraf
Illuminator.dk

The project, of which the preparation of this booklet is part, has been completed with financial support from the Danish Foundation for Entrepreneurship and the Spar Nord Foundation.

FONDEN FOR ENTREPRENØRSKAB
MEDLEM AF JA WORLDWIDE

spar Nord FONDEN

CONTENTS

PREFACE

"*The entrepreneurial mindset is focused on action, ideation and belief in one's own abilities*"

Innovative young people with creative ideas and the government's vision for a greener future are seen as natural parts of the solution to the world's greatest challenges. The government's current focus on innovation and entrepreneurship clearly indicates that skills in those exact areas continue to be in high demand in the teaching on Danish education programmes.

AAU has a strategic focus on supporting more entrepreneurial activities. Not just as an extra-curricular activity, but as an integrated approach that brings the students' core competencies into focus. The goal is to create entrepreneurial students and graduates who create value for the world they live in.

In this context, the definition of value creation relates not only to the creation of new businesses and the development of new products, but also the ability to create new processes, a new culture and economic value through cooperation with the world around us. In short, the development of a so-called entrepreneurial mindset; focus on action, ideation and trust in one's own abilities. In this light, entrepreneurship complements the other employability efforts at Aalborg University.

This book is the culmination of an internal development project as part of AAU's Knowledge for the World strategy, which has concerned methods of strengthening the students' skills in innovation and entrepreneurship. The aim has been to bring together existing teaching forms promoting entrepreneurship as an inspiration for the courses that aim to give more students at AAU the opportunity to develop entrepreneurial skills over the course of their education. An entrepreneurial mindset developed and entrepreneurial skills can be trained through consciously focused educational settings that enables students to act on opportunities and ideas and turning these into value for others.

In the booklet, we present a pedagogical model and a conceptual framework that links PBL and entrepreneurship. We also gather a number of specific tools that teachers at AAU can use to develop teaching methods that strengthen the students' entrepreneurial skills.

Just as PBL is implemented differently in each of the faculty's education programmes, our Entrepreneurship-PBL model encourages local adaptation in a form that fits the individual disciplines and teachers. This is not a fundamental change to the five original principles in the PBL model, but an enrichment of them.

Our hope is to inspire teachers to a higher level of conscious practice regarding entrepreneurship in teaching. The sum of even more practical experience with entrepreneurship-enriched PBL across AAU will form a strong basis for further development of the model.

We hope you will welcome the model and tools.

Dorte Stigaard
Innovation Director
Aalborg University

INTRODUCTION

The motivation for this booklet is a desire for more students at AAU to develop entrepreneurial skills. AAU's aim is to educate proactive, enterprising and ethically responsible individuals who can work with others to develop new knowledge and new ideas — and translate them into new value. Graduates from AAU must be equipped both to build new organisations and to enrich existing ones, while the development of entrepreneurial competencies should also increase their employability.

The booklet helps to achieve this goal by presenting a proposal for a conceptual framework, and thus a common language that can be used across the different study programmes and which makes it easier for everyone at AAU to talk about and work on developing the students' entrepreneurial skills.

The booklet is an expression of thoughts and practices from the cross-disciplinary group of AAU teachers (see booklet cover), who have jointly developed the conceptual framework, and it does not offer a definitive answer to how we develop entrepreneurial skills. Rather, the framework should be seen as a suggested starting point from which teachers can work on their own practice.

PBL AS THE CORE FOR DEVELOPING ENTREPRENEURIAL SKILLS

The overview on the right shows the conceptual framework which the booklet provides: a conceptual framework based on AAU's didactic core — problem and project-based learning (PBL). We believe that PBL offers a solid didactic base for entrepreneurship-promoting teaching, as the students on a PBL course undergo active, experiential learning processes, where they create new learning through new knowledge and action, and in collaboration with others. This is also the core for developing entrepreneurial skills.

In the booklet, we have three parts which, combined, offer a way for you as a teacher at AAU to work on integrating entrepreneurship elements into your teaching. In **Chapter 1,** we offer a suggestion as to how the PBL approach and entrepreneurship can be linked in a *definition of Entrepreneurship PBL.* In **Chapter 2,** we propose a *model for the Entrepreneurship PBL process*, in the form of a graphical presentation of an iterative process with the elements that make up an entrepreneurship course. In **Chapter 3,** we have collected a number of specific *tools and methods* that can inspire teachers and others at AAU

to develop and implement courses that develop students' entrepreneurial skills. In the overview on the right, you can read more about what you can learn from each of the three chapters in the booklet.

The definition and the model have been developed by teachers at AAU based on their existing practices, and the tools have been selected and tested on the teachers' own students. This also means that the tools reflect the diversity contained in the teaching methods at AAU.

HOW CAN YOU USE THIS BOOKLET?

The booklet can be used by teachers and others who have an interest in learning more about and/or delivering teaching which develops students' entrepreneurial skills. In the booklet, you will find inspiration for:

- gaining an understanding of what entrepreneurship is, and how it can be seen in the context of the PBL approach.
- starting a dialogue about how you can work in your department to develop students' entrepreneurial skills — or could do so in the future.
- add entrepreneurial elements to an existing course.
- develop new courses which connect academic competences with entrepreneurship.
- develop your practice as a supervisor with a deliberate entrepreneurial focus.

WOULD YOU LIKE TO KNOW MORE?

If you want to find out more about Entrepreneurship-PBL and how you can work to develop students' entrepreneurial skills, feel free to contact Supporting Entrepreneurship at AAU Innovation, or the teachers who helped develop the booklet (see booklet cover and a list of contacts under the individual tools in Chapter 3).

We invite anyone with more and different experience of entrepreneurial courses to provide input, so we can continue to share and develop our findings, and we encourage teachers to discuss the contents of the booklet and how it can be used in practice with colleagues and other interested parties.

ENTREPRENEURSHIP PBL

DEFINITION OF ENTRE-PRENEURSHIP-PBL

IN THIS CHAPTER, YOU CAN READ ABOUT ENTREPRENEURSHIP, PBL AND THE DEFINITI-ON OF ENTREPRENEURSHIP PBL DEVELOPED BY THE GROUP BEHIND THE BOOKLET. YOU CAN LEARN MORE ABOUT:

• How is entrepreneurship defined?
• How does PBL support teaching entrepreneurship and the development of entrepreneurial skills?
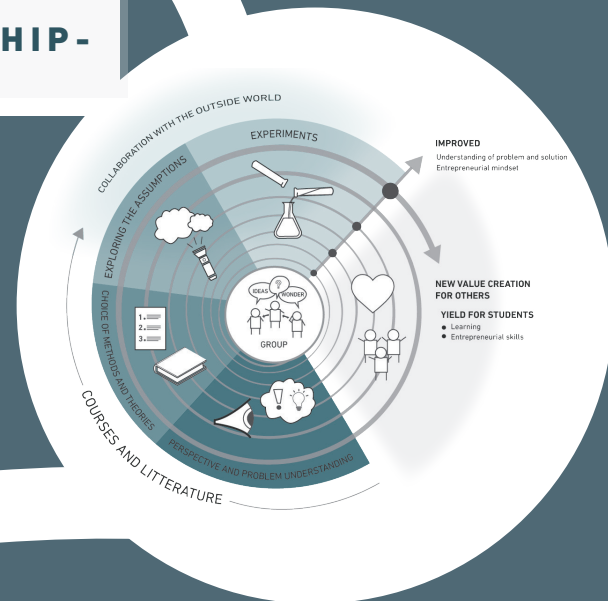• How can the two be linked and defined at AAU as Entrepreneurship-PBL?

p reads:

DEFINITION

Entrepreneurship is when you act upon opportunities and ideas and transform them into value for others. The value that is created can be financial, cultural or social

(The Danish Foundation for Entrepreneurship, 2016)

WHAT IS ENTREPRENEURSHIP?

There are big differences in the way entrepreneurship is under-stood in the various academic environments at AAU. For example, the concept is described using terms like enterprise, value crea-tion, creativity and innovation. This lack of clarification of the terminology can be an obstacle to collaboration and knowled-ge-sharing with colleagues about the importance of this kind of teaching.

Our wish is for entrepreneurship to be considered as an integral part of the studies — not in opposition to core academic concerns. consequently it is particularly important that everyone across AAU's five faculties should be able to relate to the understanding of entrepreneurship as a concept which makes sense in their own teaching context. To achieve this comprehensive approach. , we refer to the Danish Foundation for Entrepreneurship, which is the national knowledge centre and focal point for the develop-ment of teaching entrepreneurship at all educational levels. Ac-cording to definition of entrepreneurship from the Danish Fou-

Entrepreneurship is not just a matter of business development and the creation of new companies. It is about many different forms of value creation, which also include 'intrapreneurship' (innovation within existing organisations), social entrepreneurs-hip (e.g. making a positive difference to social groups), as well as the concepts of creativity and innovation. This approach thus sees entrepreneurship as a phenomenon that can be found in many different contexts, with a strong focus on value creation which is not simply understood in economic terms (Rasmussen & Moberg, 2016).

We believe that this definition allows everyone, regardless of academic background, the opportunity to integrate their subject into entrepreneurial courses, and we have therefore decided to make this definition the starting point for further development of a special AAU approach to entrepreneurship teaching.
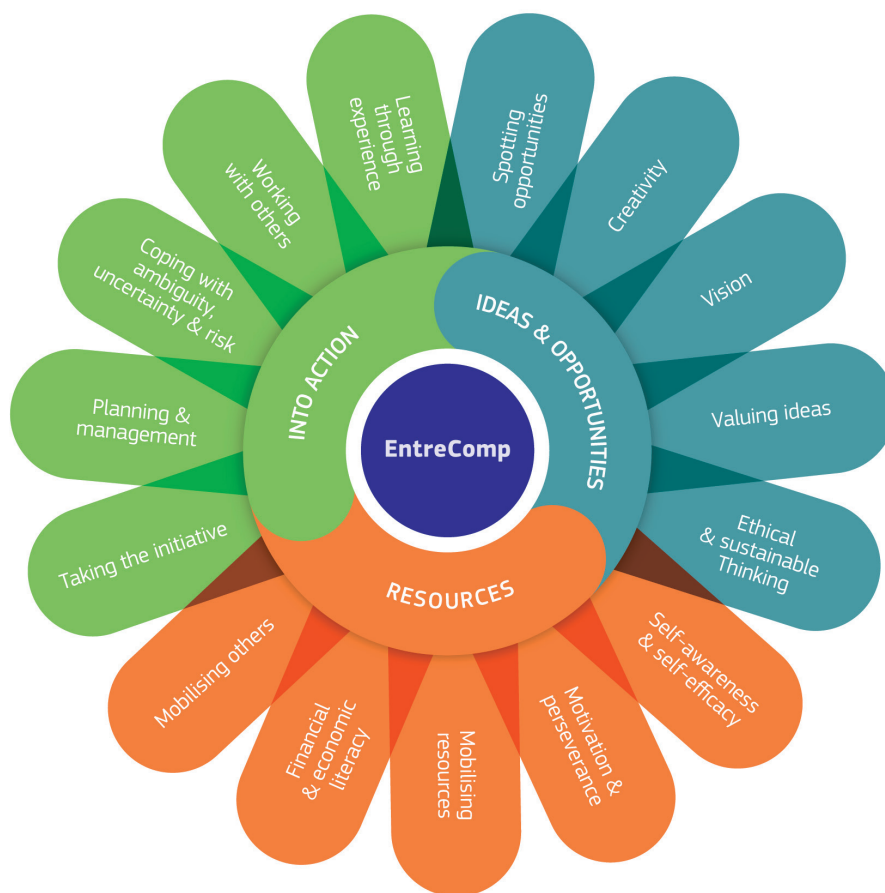
Figure 1: The EntreComp wheel (McCallum et al., 2018)

WHAT ARE ENTREPRENEURIAL SKILLS?

The objective of entrepreneurial education is to develop students' entrepreneurial skills. But what are entrepreneurial skills, and how can we describe and develop them in an educational context?

There is no one clear definition of entrepreneurial skills, but we believe that a strong, research-based suggestion comes from the European Commission, which has made the development of the entrepreneurial capacity of European citizens and organisations into a key policy objective.

Out of this goal comes the *Entrepreneurship Competence Framework (EntreComp)* (Bacigalupo et al., 2016), which is a common framework for entrepreneurial skills, developed in collaboration with researchers and teachers from all over Europe. EntreComp is well aligned with our understanding of entrepreneurship, as it also uses the Danish Foundation for Entrepreneurship's definition from the previous section.

In Figure 1, you can see an illustration of the EntreComp competence framework, which consists of three areas of competence that define *entrepreneurship as the ability to transform ideas and opportunities into action that creates value for other people.* The three competence areas are *Ideas and opportunities, Action and Resources,* which are broken down into 15 specific competences which, combined, create the elements of entrepreneurship. The three competence areas are not ranked and constitutes a unified whole. No single competence is more important than the others — they are all equally important.

EntreComp sees the development of entrepreneurial skills as a progression of learning objectives and not as something to be learned all at once, but rather through many programmes and processes where students acquire practical experience with entrepreneurial action. The action-oriented approach is therefore an essential element. In the booklet, we work with the same understanding of actions as the key. We explain this below in relation to an educational context.

FOCUS ON COMPETENCE TO TAKE ACTION/CAPACITY FOR APPROPRIATE ACTION

By competence, we mean that knowledge and skills can enable us to act in relation to situations and contexts that may be known or new and unpredictable. And that competence is particularly developed by the students feeling engaged, working with problems and having the opportunity to reflect on their actions and learning (Illeris, 2011). The action-oriented approach also applies in entrepreneurship research, where there is a broad agreement that a useful distinction can be made between three types of entrepreneurship education:

- Teaching **about** entrepreneurship, which typically involves theories about entrepreneurship.

- Teaching **for** entrepreneurship, which focuses on specific tools within entrepreneurship.

- Teaching **through** entrepreneurship processes, where students get the opportunity to display entrepreneurial behaviour by carrying out entrepreneurial processes in collaboration with relevant parties in the community and, together, create some form of value.

Of these three, **teaching through** entrepreneurship processes has the greatest potential to create more entrepreneurial students (Robinson et al., 2016). **'Teaching about'** and **'teaching for'** are still important in relation to the academic knowledge and competence, but to develop students' entrepreneurial mindset, it is absolutely essential to do more **'teaching through'** at universities. Here, AAU has a strong foundation with PBL as the central learning model.

PBL — THE EDUCATIONAL STARTING POINT AT AAU

As a form of study, PBL is based on project work and on authentic problems, a participant-driven approach and collaboration. The PBL approach gives students the tools to independently acquire knowledge, skills and competences at a high academic level, and during their studies many students get the opportunity to collaborate with external partners on solutions to academic problems. As a model for learning, PBL is based on the idea that students learn best by applying theory and research-based knowledge actively in their work on problems. PBL also supports the development of students' skills in communication and cooperation, and they learn to work in an analytical and results-oriented way (AAU.dk).

The PBL model is based on five fundamental principles that we believe are in line with what we have highlighted as conducive to the development of entrepreneurial skills:

- Project organisation provides the framework for Problem-Based Learning
- Courses support the project work
- Collaboration drives problem-based project work
- The group's problem-based project work must be exemplary
- The students are responsible for their own learning

The description of PBL as a didactic concept and the five principles make it clear that the strength of the PBL approach is that it gives students the opportunity to create experience-based learning processes in cooperation with the world around them, based on collaborative, student-driven and problem-based learning processes. Thus PBL provides for **'teaching about', 'teaching for'** and **'teaching through'**, and forms a foundation we can build on in our definition of Entrepreneurship PBL as a concept.

DEFINITION OF ENTREPRENEURSHIP PBL

As mentioned in the section on entrepreneurship, we believe that the Danish Foundation for Entrepreneurship's broad definition of entrepreneurship is relevant to establishing a common basis and starting point for developing a special AAU approach. In order to cover Entrepreneurship PBL, however, the definition must also contain a description of the practice which AAU educators are already practising.

We have arrived at a definition which we believe covers all disciplines and courses, and which can accommodate all possibilities and ideas that emerge from the students' knowledge and competences, regardless of study programme, and whether they want to be entrepreneurs or not, as long as the focus is on students creating new value for other people than themselves and their

---

DEFINITION

" **Entrepreneurship PBL is a form of study where students, through iterative learning processes, develop an entrepreneurial mindset in a problem-oriented project work. Wonder is the driving force, where theoretical, methodological and empirical knowledge are translated into new value creation through targeted action on an ethical basis and in cooperation with relevant stakeholders.** "

(The Development Group, 2019)

group. Our definition of Entrepreneurship PBL reads:
With this definition, we wish to highlight two special entrepreneurship-oriented focus areas that we believe can enrich the PBL approach:

- **New value creating collaboration with the world around us**
  When the project team work together to create new value for someone other than the group itself, we call it a value-creating collaboration. This implies a re-orientation towards the problems of the outside world, rather than merely the students' own interests. The term 'new value' therefore elaborates on PBL in the general sense, which always aims to create new knowledge which is valuable to the students' learning, e.g. through the creation of a theoretical model, but which does not necessarily create new value for a partner. The new value can be a new service or a new product, a new business model, a new social asset, a new process or a new concept that is recognised as valuable by the recipient(s). It may also be a new combination of existing things or something new combined with something existing.

- **The students develop an entrepreneurial mindset through their education**
  In line with the purpose of Entrepreneurship PBL to create new value, having an entrepreneurial mindset refers to being entrepreneurial, active, enterprising and value-creating.

Theoretically, the focus is on the individual's resources and on building competence to act, which we have previously mentioned. Therefore, an entrepreneurial mindset is identified as an 'I — can — do' mindset. Theoretically, we take inspiration from Albert Bandura (1997) and Carol Dweck (2006) and her theories about individuals' perceptions of their own abilities. The ideal is to develop a strong self-efficacy, as this is connected with the ability to set challenging goals for oneself, endure efforts and bring about the persistence associated with achieving the goal. Therefore, it is essential that teaching should allow the ability to act, even if the target is not met, as errors and the ability to both learn from and handle errors can strengthen the competence to act. Thus, an entrepreneurial mindset is characterised by the courage to embark on a task and the belief that it can be solved, and is closely linked to risk appetite.

There are allready many examples of teaching at AAU where students get to create value in cooperation with partners outside the university, and develope an entrepreneurial mindset. However, the aim of this booklet is to provide a foundation for a more *conscious* practice with these areas of focus. In Chapter 2, therefore, we look at how a project process might look in practice. This is done through the model of the Entrepreneurship PBL process developed by the group of teachers behind the booklet.

There may be a number of challenges in disseminating the framework for teaching through entrepreneurship-promoting processes, as this breaks with the traditional way of understanding education and calls for a fresh approach in the education sector. According to Torben Bager and Suna Nielsen, the major weaknesses in today's education system are found in what they term the entrepreneurial challenge:

POTENTIAL CHALLENGES
FOR ENTREPRENEURSHIP AT UNIVERSITIES

- **The division into academic 'silos':** Entrepreneurship requires an interdisciplinary approach, which is hampered by the rigid division into individual subjects. The teachers typically perceive themselves as bearers of single-subject expertise and are unfamiliar and uncomfortable with interdisciplinary teaching.

- **The dominance of traditional teacher-guide d teaching:** Entrepreneurship teaching requires students to be activated, and the teacher to step into the background and act as coach rather than instructor.

- **The dominance of passive learning:** In traditional teaching, reactive forms of learning are emphasised to pupils and students (read-listen-remember). Over time, these completely passive forms have been supplemented by more activating training in formulating, discussing, reflecting and analysing. However, proactive forms (rethink-initiate-act) which involve new challenges and train enterprise are still needed. This could be called project-oriented and problem-based learning, with added value orientation, i.e. the question of who the new learning creates value for, and how this value is created (Bager & Nielsen, 2008).

AAU has a special advantage in addressing these challenges, as PBL promotes interdisciplinary collaboration, commitment and independence among students, and because PBL offers a project and problem-oriented approach, focusing on action and reflection.

CHAPTER 2

THE ENTREPRENEURSHIP-PBL MODEL

IN THIS CHAPTER, YOU CAN READ ABOUT THE ENTREPRENEURSHIP PBL MODEL, WHICH ILLUSTRATES THE PROCESS IN AN ENTREPRENEURSHIP PBL PROJECT. YOU CAN LEARN MORE ABOUT:

- What are the elements of Entrepreneurship PBL?
- How are these elements included in an Entrepreneurship PBL project?

PBL — THE PROJECT-ORIENTED APPROACH

In order to provide the best understanding of the developed Entrepreneurship PBL model, we will start by detailing the background to it, including the reasons why we wanted 1) to retain the phases of a traditional PBL project process, and 2) to clarify the value creation in cooperation with the world around us and the impact it has on the process.

In a traditional PBL process, an important PBL principle is that a project orientation provides the framework for student work. The project represents a time-limited and targeted process in which a problem can be formulated, analysed and processed, so as to result in a tangible product, e.g. a project report. The project is goal-driven through the problem statement which, like the project's methods, is developed continuously over the course of the project (PBL — Problem-based learning, AAU: 2015). The below figure illustrates the working processes and phases students typically go through in problem-based project work.

The phases are usually not linear. Rather, students jump back and forth between them over the course of the project. In this process, they should learn how they can systematically acquire new knowledge and skills during the project.
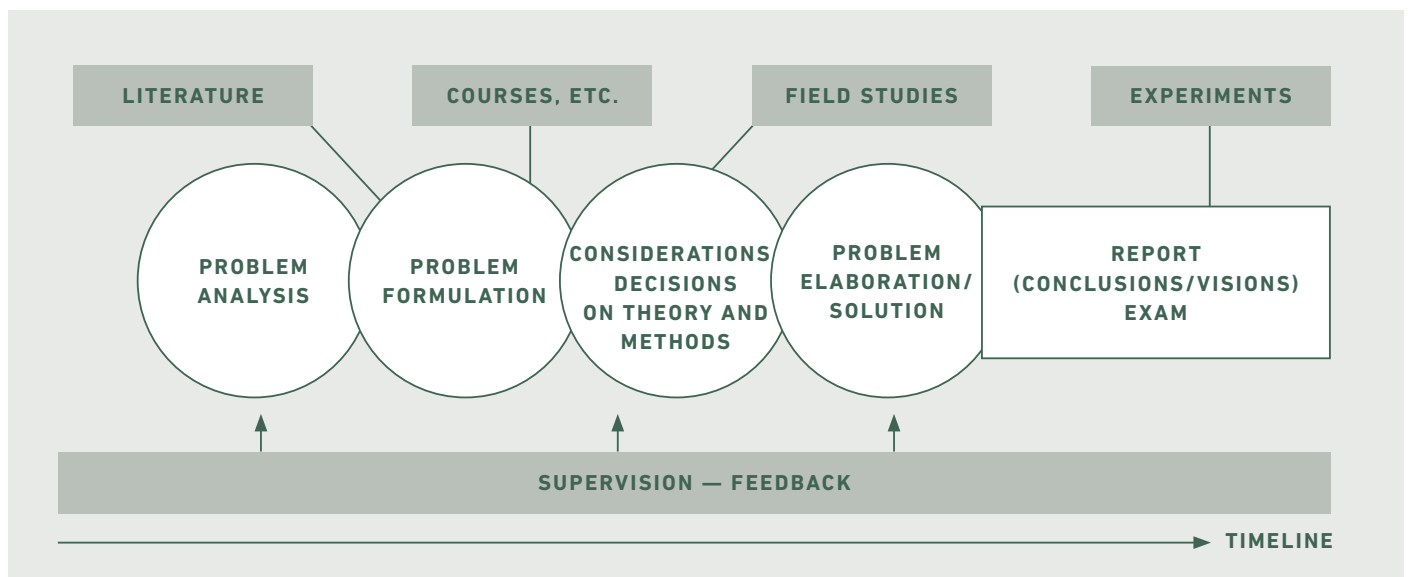

Figure 2: Group and project work phases (Krogh & Wiberg, 2013)

CHARACTERISTICS OF THE ENTREPRENEURIAL PROCESS

In an Entrepreneurship PBL project, these phases are also present, and it is important to emphasise that here, professional knowledge and skills are also the foundation for advanced learning. Academic core competences are thus central to both types of projects. In order for a traditional PBL project, as depicted in the model on the previous page, to become an Entrepreneurship PBL project, we believe it is helpful to clarify the following characteristics of the entrepreneurial process:

1. **Creating value for others and development of the entrepreneurial mindset**
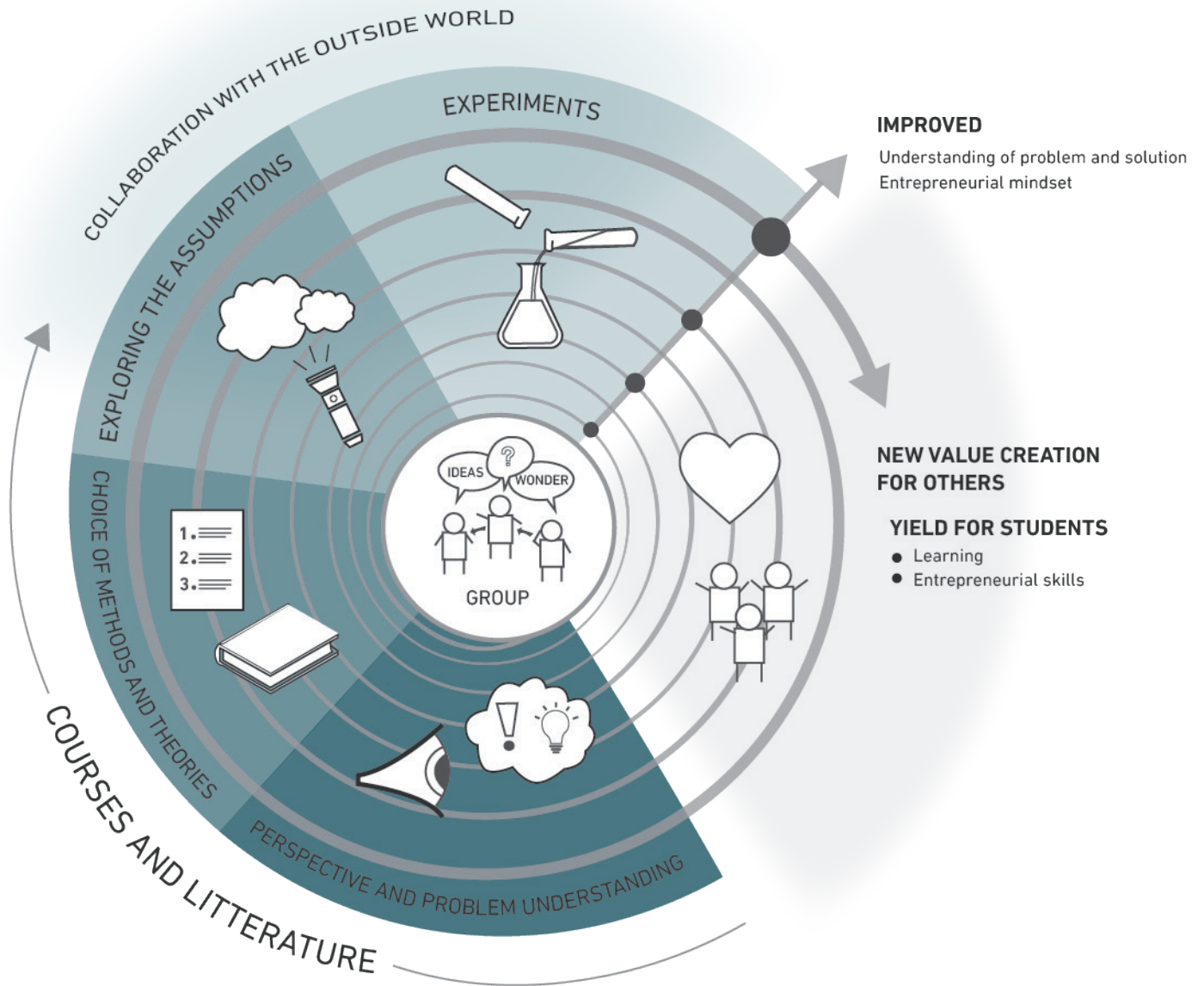In an Entrepreneurship PBL project, students work more consciously with the focal areas we highlighted in the previous chapter: Creating *new value* for others and thus developing an *entrepreneurial mindset.* These focal areas are essential to the development of entrepreneurial skills, and we have therefore sought to integrate them into an enhanced version of the model in Figure 2.

2. **Unpredictability and iteration**
In an Entrepreneurship PBL project, we see greater unpredictability than in a traditional PBL project — because the students are required to create new value. This means that they cannot necessarily find solutions to problems in something that already exists. The involvement of stakeholders and their perspective on what is valuable also make it harder to control the outcome of the PBL process. Here, we believe that it is important that 'mistakes' and unpredictability in the process can strengthen the students' learning. Their reflection on mistakes and unpredictability, as well as action taken on this basis, will get them to complete the phases of the model several times, thus strengthening their understanding of problems and contexts. The benefit from an Entrepreneurship PBL project is thus not only the product (value creation and possibly the project report/exam) but the learning process itself, as it provides the experience necessary to develop entrepreneurial skills. Based on the above, we have aimed to use the new model to make clear that it is necessary — and often unavoidable — to run the process repeatedly to achieve qualified learning and entrepreneurial skills.

On the next page, you will find the developed model of the process in an Entrepreneurship PBL project.

MODEL OF THE ENTREPRENEURSHIP PBL PROCESS

IMPROVED
Understanding of problem and solution
Entrepreneurial mindset

NEW VALUE CREATION FOR OTHERS

YIELD FOR STUDENTS
- Learning
- Entrepreneurial skills

HOW THE MODEL SHOULD BE READ
The model shows the overall process, and the phases which a group of students pass through in an entrepreneurship project in AAU's PBL context.

THE SPIRAL FROM THE INSIDE OUT
The spiral illustrates the overall process, which starts with the students going through a group formation process. Based on professional knowledge, curiosity and ideas, and in cooperation with the outside world, they gradually improve their problem understanding and solution development. At the end, the students will have acquired learning and created new value for others.

THE PHASES
The phases in the blue boxes indicate the work processes and main activities that the project group implements, in interaction with the environment and repeatedly over the course of the project. The phases are constantly supported by courses and literature. Next to the model, you can see a brief description of what happens in each phase.

THE ARROW WITH DOTS
The dotted arrow shows that for each cycle/iteration, the student develops a gradually improved understanding of the problem and the solution, and a more entrepreneurial mindset. This is illustrated by the way the dot grows each time the phases are completed.

PHASES IN THE MODEL WITH SPECIFIC EXAMPLES FROM THE MASTER'S PROGRAMME IN THE ENTREPRENEURIAL ENGINEERING

Group — wonder and ideas for problem areas
The process starts when the group is formed, after which the students look for project ideas, generally based on their own wonder, interests and experiences (e.g. sustainability, technology, health, everyday problems, study etc.). With this outset, the group generates a lot of different ideas. For example, one student had an arthritic grandmother who, the student had observed, found it hard to unscrew the lids on packaging. Solutions to this problem became a project idea.

Perspective and problem understanding
The many ideas must now be qualified as a basis for selection. This is typically done through repeated rounds of the cycle where the problem and possible solutions are explored through desktop research and involvement of the immediate network. For example, the perspective on the problem of screw caps was to develop a tool for this, and in the first cycles in the model, the group used their acquired knowledge of 'what solutions already exist?', and interviewed some actors in the network — friends, the DaneAge Association, the Danish Rheumatism Association, the grandmother, the supervisor, etc. (users, 'competitors', interest group).

Selection of methods and theories
Based on the chosen idea, the students discuss possible choices of theory, empirical data gathering and testing methods for qualifying and putting the problem into perspective. Courses and relevant literature are included as ongoing inspiration, and the matter is further qualified as new knowledge is acquired.

Exploring assumptions — cooperation with the world around
In this phase, the members of the group run through several iterations where they use multiple input types and dive deeper into them. This is done by the group in interaction with relevant stakeholders, analysing, creating, validating results which are gradually improved, modified and documented. Actors may be customers, users, supervisors, peers, competitors, investors, incubation facilitators, public actors, and other people with knowledge of the problem area. If the learning loop reveals too great problems with the creation of value or other setbacks, the group can make a 'pivot' — i.e. a shift in key parameters, e.g. market segment, or they can select a brand new idea (preferably related), so that established knowledge can be (re)used.

Experimenting — collaboration with the world around
Experimenting is about trying things out, observing the results they bring, learning from them and then trying again. It requires the Group to make many (creative) methodological choices as to how the most effective way to obtain data (observations, interviews, questionnaires, tests, etc.). Group members must also validate hypotheses (data, product and production solutions, etc.) and bring the results together in a prototype, which is a quick and unfinished version of the idea for a kind of physical version of a product or process. In the example of the DaneAge Association, a simple, physical prototype was made and tested by the DaneAge Association in Aalborg, along with a business model, which was partially tested by discussing production with a local manufacturer. The feedback that students get in the experiments sends the group forward or back through the phases.

OUTCOME

NEW VALUE CREATION FOR OTHERS
When the project time has passed, and many cycles have been completed, the group document their learning and value creation in a report and possibly a final prototype that can be presented to the partner and perhaps form the basis for examination.

YIELD FOR STUDENTS — LEARNING AND ENTREPRENEURIAL SKILLS
There will of course be cases where no tangible value for the outside world is created. But based on feedback and reflection on the project, learning and value creation process, the students increase their academic learning, and also get practical experiences and opportunities to develop their entrepreneurial skills.

PROGRESSION IN THE MODEL

The model below outlines the progression through an Entrepreneurship PBL process over one semester. Through a concrete example from a master's programme, we see how a group of students moves iteratively through the phases of the Entrepreneurship PBL model. The dotted lines and arrows at the bottom show how, towards the end of this project process, the students complete a lot of rapid cycles through the phases.

After offering a suggestion for how a model of an Entrepreneurship PBL project process might look, in the next chapter we move on to looking at specific tools and methods for working with such a process — or parts of it — in an educational context.

THE PBL GROUP'S PROGRESSION — WITH EXAMPLE FROM A SEMESTER PROJECT ON THE MASTER'S PROGRAMME IN ENTREPRENEURIAL ENGINEERING
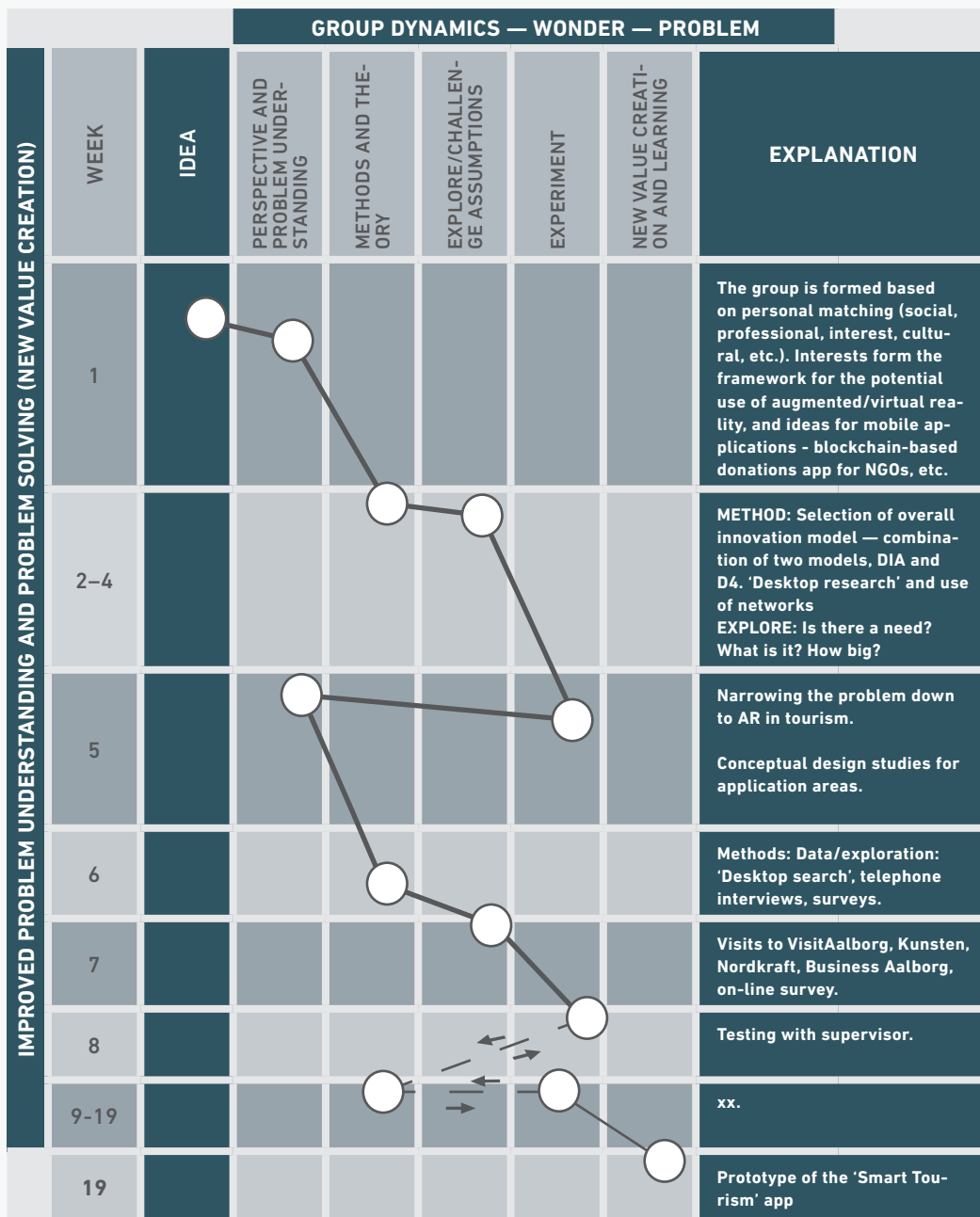

IMPROVED PROBLEM UNDERSTANDING AND PROBLEM SOLVING (NEW VALUE CREATION)	WEEK	IDEA	GROUP DYNAMICS — WONDER — PROBLEM					EXPLANATION
			PERSPECTIVE AND PROBLEM UNDERSTANDING	METHODS AND THEORY	EXPLORE/CHALLENGE ASSUMPTIONS	EXPERIMENT	NEW VALUE CREATION AND LEARNING	
	1							The group is formed based on personal matching (social, professional, interest, cultural, etc.). Interests form the framework for the potential use of augmented/virtual reality, and ideas for mobile applications - blockchain-based donations app for NGOs, etc.
	2–4							METHOD: Selection of overall innovation model — combination of two models, DIA and D4. 'Desktop research' and use of networks EXPLORE: Is there a need? What is it? How big?
	5							Narrowing the problem down to AR in tourism. Conceptual design studies for application areas.
	6							Methods: Data/exploration: 'Desktop search', telephone interviews, surveys.
	7							Visits to VisitAalborg, Kunsten, Nordkraft, Business Aalborg, on-line survey.
	8							Testing with supervisor.
	9-19							xx.
	19							Prototype of the 'Smart Tourism' app

Figure 3: Example of the progression — the iterative process — in a semester project.

TOOLS AND METHODS

IN THIS CHAPTER, YOU CAN READ ABOUT THE SPECIFIC TOOLS AND METHODS THAT HAVE BEEN USED TO DEVELOP ENTREPRENEURS-HIP TEACHING AT AAU. YOU CAN LEARN MORE ABOUT:

- How can Entrepreneurship teaching be framed?
- Concrete examples of tools for each phase of the model

THE TOOLS REFLECT THE DIVERSITY

There are big differences in how teaching entrepreneurship is re-flected across AAU. This diversity is also reflected in the different tools and methods in this chapter.

With the variety of tools and methods, we want to show that there is no one correct way of teaching, but that it is important that, as a teacher, you take an active stance on how you want to create lessons that develop students' entrepreneurial skills. The tools and methods can be used to create entire entrepreneurship courses, but can also be seen as inspiration to rethink teaching or simply add elements to it.

The tools and methods on the following pages each have a small illustration of the Entrepreneurship PBL model to show what phases the tool focuses on. In the model to the right, you see a general overview of the tools and methods, as well as the phases they focus on. Many of the tools focus on several of the phases.

Beneath each tool/method, you will also find the name of the AAU teacher who has used it in their practice, and you are welcome to contact them for more knowledge about the tool/method.
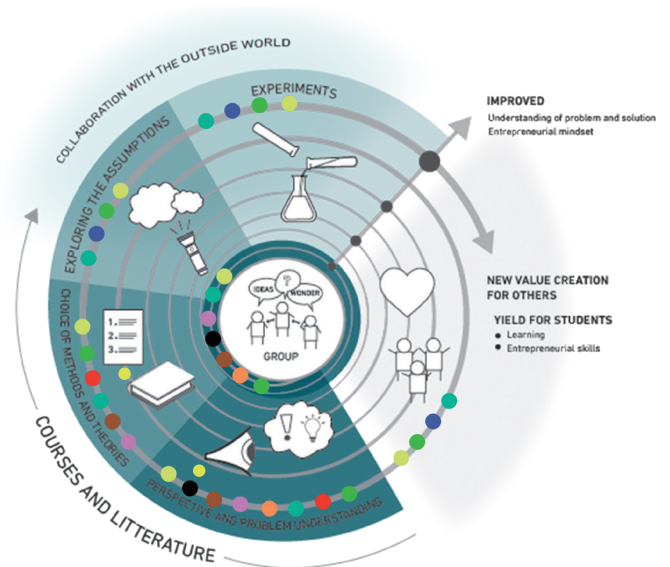
- ● TEAM KEY
- ● IMAGE PRODUCTION
- ● FUTURE WORKSHOP
- ● THE WONDERMENT WORKSHOP
- ● THE FIE MODEL
- ● MINI PROJECT
- ● OBJECT THEATRE
- ● METHOD FOR INTRODUCTION
- ● LEARNING PLAN

TOOL | 1-2-GROUP

How is the tool linked to Entrepreneurship PBL?
The method promotes the entrepreneurial mindset with room for creativity and innovation through the group formation process and group work throughout the project.

What is the tool?
'1-2-group' is a method for organising group work. It is a method to encourage the group to spend time generating many ideas, to ensure that everyone in a group gets the opportunity to contribute their creative ideas and that more ideas are developed before the group focuses on discussing and evaluating the ideas.

What is achieved by using '1-2-group'?
'1-2-group' means that everyone in the group is given a voice, and that everyone's ideas and input are listened to. This organisation counters the informal hierarchy in the group, which affects the individual group members' opportunity to participate actively in group work. The focus is then on the task and not on the social positioning.

'1-2-group' was developed based on the theory of 'creativity as the unlimited application of knowledge'. The method takes account of three of the fundamental principles behind the theory:

1) No perceived evaluation of people and ideas in the creative part of the process.
2) Parallel thinking, i.e. the process is divided into a series of steps in which the group has the same focus.
3) Task focus, i.e. the group concentrates on the task rather than on the organisation of the work or the social hierarchy.

How is it used?
1. *Individually:* In the '1-2-group' model, group members first work individually. This gives each individual an opportunity to think about the task and get ideas for working with it — without being affected by the others in the group. This makes it easier to stay focused on the task, and the diversity of the group's ideas becomes greater.
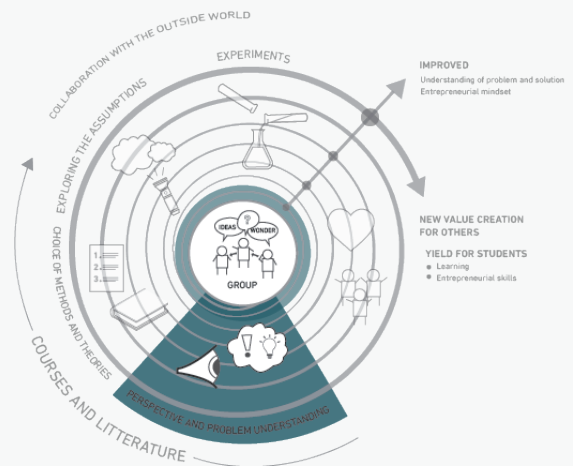

2. *In pairs:* After the individual work, the group members continue in pairs, sharing their ideas and building on them with 'YES AND'. In this step, there is no discussion or evaluation of ideas — instead, the ideas are developed. This step keeps more ideas alive for longer, and it gives the individual an opportunity to contribute their own ideas.

3. *In groups:* Next, work is done in groups, where there is more knowledge available. The group continues to work on developing ideas without any evaluations and discussion. One idea is developed at a time — the process facilitator decides when to work with the individual ideas.

4. *Discussion and evaluation:* The group takes one idea at a time, assessing its strengths and weaknesses.

5. *Decisions:* Based on discussions and evaluations, the group decides on a solution.

Creative collaboration (1-2-Group)
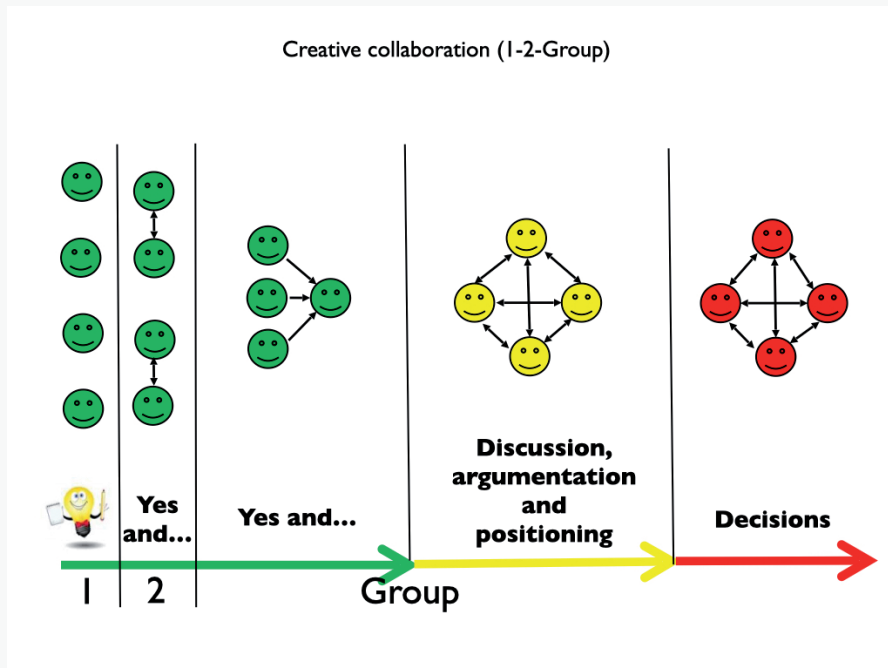
A lot of 'regular' group work starts at step 4: 'Discussion and evaluation'. Typically, one (strong) group member gets an idea which the group then discusses and evaluates. Other *weak* group members' ideas do not necessarily come into play. The form of discussion is likely to kill off ideas that fall outside the norm. What one gains by starting with steps 1, 2 and 3 is that more ideas have been 'heard' and given a chance to show their potential. The basis for decision-making has simply become greater than if you start the group work directly at step 4.

Sources
Hansen, S., and Byrge, C. (2013). Enhancing creativity for individuals, groups and organisations - creativity as the unlimited application of knowledge: the theory behind the 'Creative Platform' and the 'Training programme for innovation'. (1st ed.) Frydenlund Academic.

Contact
Jonna Langeland Christensen, Department of Business and Management

TOOL | IMAGE PRODUCTION

How is the tool linked to Entrepreneurship PBL?

The tool is related to conceptualisation (concept creation) in Entrepreneurship PBL in the initial phase, and also focuses on collaborative processes where students' contributions to a joint painting are analysed. The tool is intended to help students talk to each other and take an interest in each other's understandings of concrete, but abstract phenomena.

What is the tool?

Image Production links a form of artistic imagination to innovation and conceptual understanding by allowing students to draw a conceptual understanding individually, but in small groups, on the same sheet of paper — forming a single image.

What can be achieved by using 'Image Production'?

Through the aesthetic expression (the students' 'painting'), the imagination is stimulated, and a break is made from the 'normal' teaching practice where the teacher initially defines and introduces academic concepts with reference to relevant sources. With this tool, the student is 'thrown in at the deep end', as they are asked to conceptualise their own understanding, expressed in an aesthetic medium — a painting. This can create a personal interest in a theoretical and abstract concept. 'Picturing' understanding and subsequently communicating this expression as a narrative, provides for an emerging common understanding and interest in a concept and its importance for innovation processes relating to a common understanding of concepts and development.

Entrepreneurship PBL encourages the students to think about solutions to future challenges and develop professional and academic skills that allow them to solve the new tasks. The tool should therefore help the students to think creatively and independently, and it is intended to stimulate their interest in other people's understanding and their own cooperative approach.

How is it used?

Initially, students paint a figure/drawing of a phenomenon — e.g. 'innovation' — individually, but in groups and without talking. They then take turns at describing their figure/drawing and their understanding of the concept. The (unusual) form helps to put everyone in an unexpected, new and challenging situation, and create a shared experience of (creative) uncertainty. The teacher, who frames the experience, is therefore responsible for ensuring that the experience is assigned didactic significance through analysing and supporting the process and providing it with educational value.
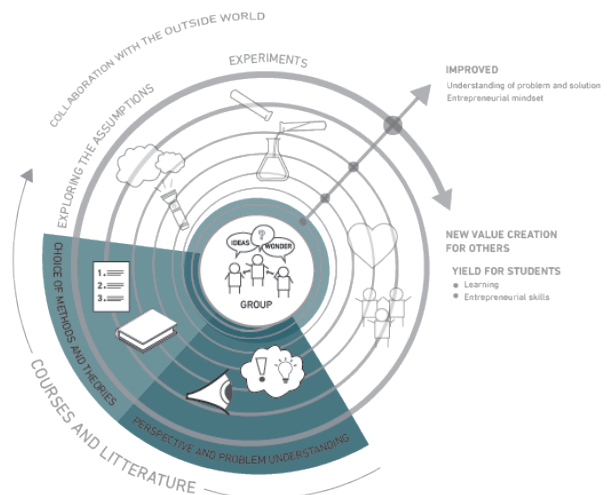
After the first round, which focuses on representing a concept in silence, comes a round which focuses on the process of collaboration itself: How is their figure placed? Does it contribute to a common understanding? What is the implication of other people's approaches? How quickly did they get started? What angle is the total product viewed from? etc.

The assumption behind the tool is that you can express something 'different' and express yourself in a different way with a brush and paper than through words. This allows you to mirror yourself and your understanding of the world in other people's aesthetic expression, and in the direct response you get to your own aesthetic expression, and in what others express. The aesthetic practice is a sub-element of the aesthetic activity, in which there is a perception of the experience and the practice of trying to get the senses and the intellect to connect.

Aesthetic learning processes can be defined as a creative activity in which one transforms impressions into an formal aesthetic expression. Here, the impression (what is to be transformed) is the students' practical and immediate perceptions/idea of a concept (e.g. innovation) and what it means to them. (This could be a different academic concept that is new to the students). Here, the expression is a joint painting that the students create together in small groups.

The idea is to promote students' concept development and cooperation through image production when producing new meaning.

The tool can act as a start in the first class session in groups where the students do not know each other, and the teacher has pre-divided them into teams.

Small 'painting groups'. Each student is given brushes and paint and they gather around tables with large sheets of paper (one for each group). They are asked to paint a concept like 'educational innovation', and then take turns to describe what their image conceptually refers to, which forms the basis for questions from their fellow students. In total, 10 minutes are allocated for them to paint their understanding of the concept.

During the process, the teacher observes the students' interaction process in order to analyse their collaboration and then put this into perspective. There is a point in not telling the students that there is an emphasis focus on the collaborative approach during the process.

The experiment will show that some students contribute very large images and get started quickly, leaving less room for others. Others actively help to pull the painting together by observing other peoples' drawings and trying to relate to them, in order to get a 'neat' expression. Students may see others' paintings/symbols reversed or mirrored, which will be reflected in subsequent questions. This will be expressed when the students by the end of the session are asked to present their painting,, as part of a group presentation. A discussion may then arise about what is up or down, particularly where the group has painted from different sides of the paper.

The process therefore gives rise to a subsequent meta-communication on cooperation and perspectives on phenomena which are dependent on perspective and realms of understanding, which are also important to the understanding of concepts on the meta level.

Thus, expressions are linked to impressions in the subsequent joint analysis of the concept, e.g. 'innovation', as a phenomenon whose realisation also includes the ability to interact with others and respond (constructively) to the other students input.

Evaluation:
Students find it interesting to participate in the workshop, and the process can provide good input for further cooperation in a new team, by creating an open and playful atmosphere, as well as an interest in the phenomenon of conceptual understanding and conceptualisation.

Sources
Austring B. D. and Sørensen M. (2006). Æstetik og læring – grundbog i æstetiske læreprocesser. Hans Reitzel

Janinka Greenwood (2011) Aesthetic Learning, and Learning Through the Aesthetic in Shifra Schonmann (ed.): Key Concepts in Theatre/Drama Education (pp 47-52)
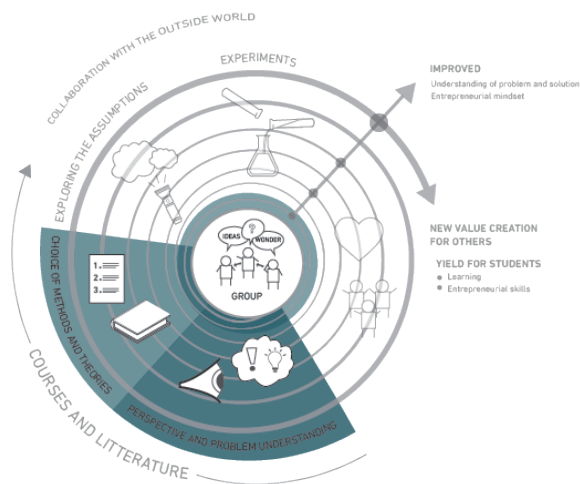
Contact
Birthe Lund, Department of Culture and Learning.

TOOL | FUTURE WORKSHOP

How is the tool linked to Entrepreneurship PBL?
The tool guides participants through the key dimensions of an innovation process, from problem identification to realisation through rules and structures for a democratically supported and collaborative innovation process.

What is the tool?
The Future Workshop is a kind of meeting or workshop where students can explore and exchange experiences and come up with concrete ideas for solving key challenges.

The Future Workshop is a very action-oriented approach to problems and solutions. The Future Workshop consists of three thematic phases: a critique phase, a utopia phase and a reality/realisation phase.

What can be achieved by using the 'Future Workshop'?
The tool can help to identify problems and find new and unexpected solutions through cooperation with various stakeholders, and can thus contribute to both Ideation and co-creation with users, as it is intended to promote a joint innovation process, where 'experts' and 'novices' meet with the same rights.

The Future Workshop can help to realise shared dreams based on personal visions and utopias. The tool can help create an entrepreneurial mindset with a focus on creating new solutions to key and relevant issues that actors contribute actively to solving.

How is it used?
The Future Workshop can be used for fairly large teams of up to approx. 50-60 people. The moderator (teacher) is a central figure, and must ensure that the various phases of the method are complied with closely, and that the different rules for each phase are observed, so analysis and prioritisation of participants' statements can be carried out in a democratic way.

Time required:
Usually a whole day, but can also be boiled down to 3 hours

Room requirements:
It must be possible to hang large posters on the walls and students must be able to walk around and write and make notes on the wall-mounted posters.

Theme:
First, a theme for the Future Workshop is chosen, and this should be a theme that is relevant to the participants (e.g. the students, if only students are participating). For example, this could be the study environment, environmental policy, the local area etc.

Phases:
The Future Workshop consists of three phases, and is run in this order: **critique phase, utopia phase, reality/realisation phase:**

1. Critique phase:
  - What constrains my options — e.g. to get a good study environment? (It is crucial that work is done on problems that are perceived as important by participants, and that means that the students do really need be critical before they become constructive).

2. Utopia phase:
  - If anything was possible, what would a good study environment look like?

3. Realisation phase:
  - How do we create a good study environment — who does what? The model is intended to be practical and problem-solving.

The critique phase focuses on what we are unhappy with, what we want to define as the problem(s) and what we want to criticise. In this phase, you are not allowed to take issue with other people's statements. Based on a brainstorming, individual keywords are then found. The points are written up on whiteboards, and the critique is formulated by the proposers and discussed. Afterwards, the participants award points. On this basis, specific critique-theme cycles are assembled and created which capture the critique on which there is agreement, as the voting indicates which themes they want to try to solve and work on further.

In the **utopia phase**, again on posters, all the suggestions for changes that participants can come up with in relation to the prioritised critique themes from the previous phase are noted, again un-censored.

It is not a requirement that proposals must be realistic — imagination is the most important thing.

The utopia phase turns the critique on its head. All criticisms, big or small, have come out, and the focus is now on: 'What if?' - e.g. what if we had enough time, no assessment criteria etc.

So no one is allowed to raise objections; only clarifying questions are allowed. In the fantasy phase, keywords are thus reformulated into positive statements. Again, the subsequent selection must be based on points collected in fantasy-theme cycles.

In **the reality or realisation phase**
Posters with fantasy results are hung up. New ideas are added, and the process focuses on idea selection: What ideas are particularly interesting? This is followed by critical discussion of the selected proposals for solutions, and then one or more ideas are selected, and the focus is on what practical steps can be taken towards realisation. A written record of statements, list of participants and names of persons responsible for following up is created. It is possible to make this a permanent workshop, where you can refine and discuss what can be added to the proposals (e.g. use elements from the fantasy phase), formulate project concepts etc.

Now the reality check begins: What is possible (expertise, rules, etc.), and project objectives are defined — stages before realisation of the project.

Sources
Jungk, Robert and Norbert R. Mûllert (1984): Håndbog i Fremtidsværksteder, Politisk Revy.

Horn, Finn and Sørensen, Jette Scoot (1984): Fremtidsværksteder for arbejdsløse lærere, Unge Pædagoger, no 5, 1984.

Horn, Finn and Sørensen, Jette Scoot (ed.) (1987): Fremtidsværksteder i Danmark - Teori og praksis, Politisk Revy.

Jungk, Robert (1988): Modets Princip, Stridskrift mod resignationen, Politisk Revy.

Horn, Finn (1993): Fremtidspædagogik, Danmarks Lærerhøjskole.

Contact
Birthe Lund, Department of Culture and Learning.

TOOL | TEAMKEY

How is the tool linked to Entrepreneurship PBL?

TeamKey is central and linked to the group in the model and the group's overall process. The group's capabilities consist of the individuals' personal capabilities that impact their understanding of and perspective on the task, the group's and their own decisions and choices, as well as the format in which exploration and experimentation will take place. Through cooperation with the outside world, the TeamKey tool also helps achieve increased self-awareness and learning about one's own and others' skills and entrepreneurial mindsets. For example, the 'entrepreneur' team role is a combination of proactive target setting, categorical communication and expansive problem solving.
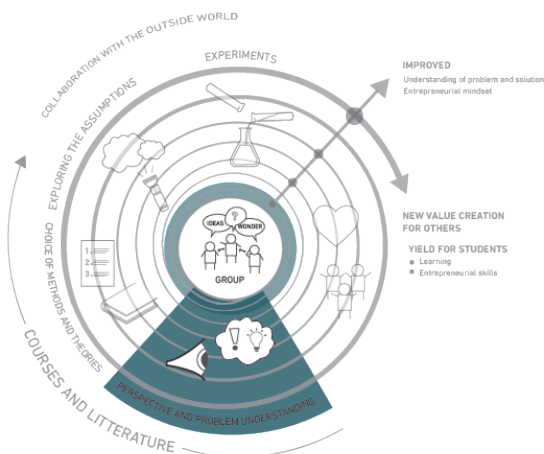

What is the tool?

TeamKey is a personal app, used as a tool to optimize the process of cooperation in a group. TeamKey shows an up-to-date and simultaneous focus on target setting, communication and problem solving at both the individual and the team level during the process, from group start to group end.

What can be achieved by using 'TeamKey®'?

Generally, the purpose of establishing a team is to be able to create more than just the sum of the input from the individuals who make up the team. Thus, there is a desire to create synergies between team members to reach the goal more effectively and faster in a constructive environment.

TeamKey is a shortcut to team management with a specific objective, useful communication and effective problem solving in a team. TeamKey also reveals whether the team collectively contains the widest range and largest amount of the particular behavioural types that are most important to the performance of the relevant task.
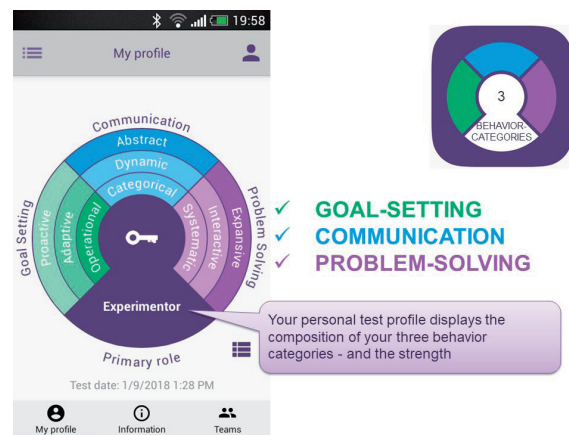
TeamKey complements most innovative tools by highlighting the personal inner strengths of a team and is suitable for teams with a maximum of nine people who self-manage without a formally designated leader. TeamKey supplements e.g. international innovation tools such as the Business Model Canvas, GrowthWheel and national tools like the SKUB method, the logical model and the tools presented in this booklet.

How is it used?

1. Individually

The TeamKey app can be downloaded to your own mobile phone, where you complete the personality test. The test forms a personal role profile, composed of the three categories of behaviour: Target setting, communication and problem solving.

2. The team

Any participant in the team can create a team, after which the team profile is visible on all team members' mobile phones.
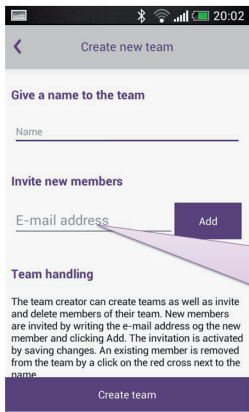
You can create an unlimited number of teams

♥ Find a good name that match your team☺

♥ Invite by means of mail adresses

♥ Your team members only need to set up themselves as users

3. Learning about yourself, others, and completing the task.

Anyone can repeat the test an unlimited number of times. Thereby, conscious or unconscious new self-images in new role profiles can be reflectedg and prioritised. When team members change their role profile, the team profile will automatically be updated and reflect the team's current overall behaviour.

Each can continuously check how the personal role profile matches the team profile. This is knowledge which makes potential conflicts visible before they escalate.

A team profile = the discipline, is more than just the roles of the members put together

The synergy is included☺

CLICK and read the definition

4. The process

Continuously discuss in the group how well or poorly the team profile matches the current situation and the challenges in play. Through the definitions of actual team profiles, learning about the behavioural nuances that are most appropriate for the next phase is achieved. With the TeamKey tool, team management is optimized by adding a management superstructure to the team's collaborative potential which ensures the necessary cohesion and synergy in the team as a target-seeking organism throughout the process.

CLICK and evaluate your development
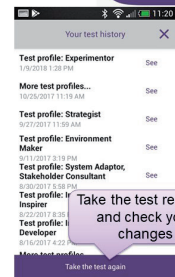
Take the test regulary and check your changes

Sources

Østergaard, A., & Østergaard, P. (2019). Team Key Theory https://www.teamkey.dk
See more at www.teamkey.dk

Contact

Annemarie Østergaard, Department of Culture and Learning.

TOOL | THE FIE MODEL

How is the tool linked to Entrepreneurship PBL?
FIE can function both as a creativity-supporting process tool, a learning/formation process for students and a competence-building tool for entrepreneurship among students.

In other words, it can support the development of a new PBL project, where FIE becomes a preliminary study for the project itself. FIE may also be used in the project itself, where it can increase the likelihood that the project will create value for students as well as for the partners involved in the project through its innovative focus.

FIE is thus an innovation tool where a group, in close cooperation with others, experiment and explore a given problem or wonderment to find new ideas, new knowledge and new learning, which can be both economic, cultural and social in nature.

The group element is a key factor to FIE, which is based on the fundamental understanding that the success of a project, and hence the process as a whole, depends on the group's ability to collaborate and navigate in complexity and unpredictability circumstances, and on a groups willingness and ability collaborate and innovate.

What is the tool?
The name FIE is made up of the three initial letters of the Danish terms for the three phases of Connection (Forbindelse), Impression (Indtryk) and Emergence (Emergens), which are the three steps which particularly make FIE stand out from other innovative processes. FIE is a process framework — a social technology — that helps designers, educators and facilitators of unpredictable, non-linear and innovative processes navigate in creative, learning and/or transformational processes. This may be in an organisation or a teaching context, in which a group of people must work together to get a given task across the line.

In FIE, playing, experimenting, exploring and reflecting are done within an agreed framework or existing problem understanding. Through the process, traditional ideas, existing understandings and assumptions are challenged. The process always ends with a 'harvest', where the values the process has created are made explicit.

What can be achieved by using the 'FIE' model?
In the first instance, FIE is intended as a preject, i.e. a framework for exploration of an area or an issue before it becomes a project. Therefore, one can also speak of FIE as an innovation-supporting tool that can help a group
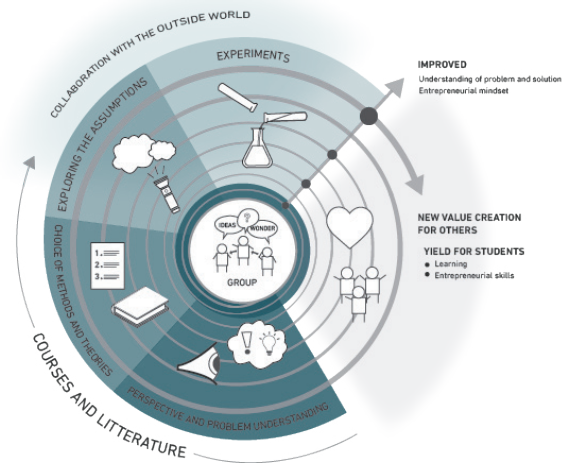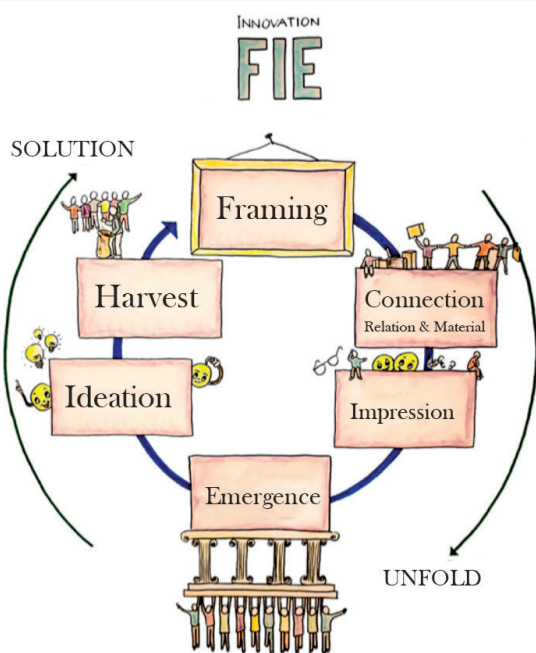

to create new ideas, thoughts and understandings. Thus, it makes up the scaffolding necessary to ensure that you get from a challenge (a learning objective) to new ideas or understandings.

Originally, playing and phenomenology were specified as two essential factors in the FIE, but the use of FIE can also be based on other scientific traditions. When play is singled out specifically, it is because play is an excellent way of breaking up our habitual ways of seeing and approaching the world, which is essential to thinking new, being innovative and getting a group to work together on a common solution.

You can read much more about play and FIE in the book Den Legende Organisation (The Playful Organisation) by Ann Charlotte Thorsted, who developed the FIE model. Ann Charlotte Thorsted is an associate professor at Aalborg University and head of Play Lab. The model is based on three years of research at LEGO, where Thorsted studied the significance of play. Here, it became apparent that in order for people to be able to navigate playfully and creatively in processes, a clear framework is required which they can lean on both during 1) the design of a process and 2) in relation to navigating in these often complex and highly unpredictable, creative and innovative processes.

How is it used?
The FIE model is shown below. The philosophy behind FIE is that in order for us to be able to solve anything at all, an unfolding is first needed, which is what we see marked on the right and left side of the model. In other words, before we start focusing more specifically on

INNOVATION
FIE

feel comfortable with each other and thus become able to move into an unpredictable, creative and not clearly goal-driven process.

Next, it is also important to take the time to understand the problem from different perspectives and have an eye for our own and others' preconceptions that may hinder the emergence of the new. Therefore, the right side of the FIE model constitutes another form of slowness than that which typically characterises the majority of innovation processes, where attention is primarily aimed at developing a solution from the start. This part — idea generation — comes later in a FIE process and is located on the left side of the model.

The six different steps of the FIE must be considered as guiding steps to plan and navigate by at a general level in a FIE process. Often, there will be overlaps and jumps which in no way match a linear process. Linearity is not the intention of FIE.

Under the **Framework,** the direction is set for the process and practical matters are agreed on. It is important to the take the time to reach a common understanding of the challenge before you embark on the process. In practice, it has often been found that this may be the critical point, which is unfolded in much more detail in the book The Playful Organisation.

In the **Connection phase,** the focus is on the establishment of the necessary collaboration between group members, and to create a contact to the problem that is to be worked with.

During the **Impression phase**, the challenge is expanded and explored in more depth and different creative tools are used to open the way to a more attuned (vocative) and nuanced understanding. New impressions are added on, and the complexity increases as the different perspectives are unfolded.

The **Emergence phase** is 'the turning point' where something new emerges. Here, you are midway between the unfolding and the solution, which is also referred to as a last moment of deliberation. Here, more philosophical methods are often employed to question the assumptions underlying the impression and the first emerging ideas that have arisen along the way. Has something been overlooked, or is there something driving the group that may be problematic?

Ideation, as in other innovative processes, is where ideas gain altitude.

In the **Harvest** stage, it is ensured that something concrete comes out of the process which can be taken forward. This may be a concrete idea which is now brought into a project plan, a new problem formulation or a learning process for the development of entrepreneurship skills. But it may also be that this was just the first step in a project maturation process or a way to establish a new angle on a given issue.

Sources
Thorsted, A. C. (2013). Den legende organisation: Når livet leger med os. Copenhagen: LandR Business.

Thorsted, A. C. (2014). How play enhances creativity in problem-based learning. Academic Quarter, volume 09.

Thorsted, A. C and Schumann, K. (2018). Faciliteringskompasset. in: H. Alrø and F. T. Hansen (ed.), Dialogisk procesfacilitering. Aalborg: Aalborg University Press.

Contact
Ann Charlotte Thorsted, Department of Communication and Psychology.

TOOL | PROFESSIONAL WONDERMENT AND THE WONDERMENT WORKSHOP

How is the tool linked to Entrepreneurship PBL?

As in the FIE model (see previous tool), Professional Wonder as a method can act as a supportive process tool for students in the development of problem understanding, learning, formation and entrepreneurial skills. An existential and ethical awareness, which is intrinsic to both FIE and the Wonderment Workshop can promote both humanistic and meaning-seeking innovation approach and ethical responsibility.

However, Professional Wonder can also help create value for external partners. In relation to Entrepreneurship PBL, Professional Wonder can help to establish engagement and inquiry in the group, the group's overall workflow and continuous reflections.
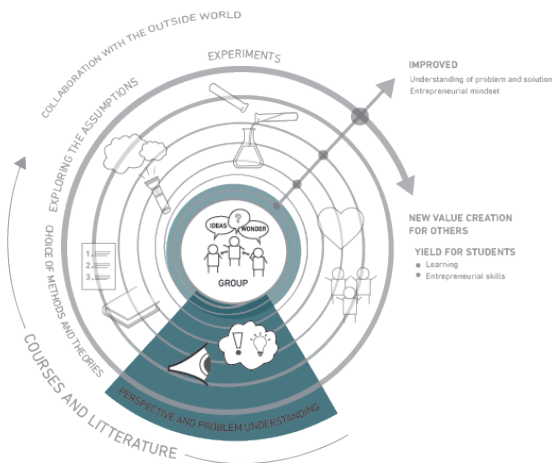
What is the tool?

Professional Wonder and the Wonderment Workshop are a name and a process description of an innovative project maturation process (preject). The focus is on the key factor or 'driving force' in Entrepreneurship PBL, which is the dimension of wonder. Within entrepreneurship and innovation research, this method is linked to meaning and wonderment-driven innovation and entrepreneurship (Verganti, 2017; Hansen, 2018a,b) and to 'responsible innovation' (Owen et al., 2013; Philbeck et al. 2018).

What can be achieved by using 'Professional Wonder' and the 'Wonderment Workshop'?

In Professional Wonder, the student or professional learns the difference between wondering in a pragmatic and knowledge and explanation-seeking way , on the one hand, and wondering in an existential, phenomenological and philosophical way on the other. The latter kind of wonder can be significant when, in creative and value-based innovation and entrepreneurship processes, one wants to work with radical innovation and 'wicked problems' and the so-called 'delicate problems' (Hansen, 2018a).

Behind common problems and 'wicked problems' are often 'delicate problems', which are delicate because they suggest or are rooted in the more existential and ethical requirements, basic conditions and questions that human life and the human vision of the good life is based on. These 'delicate problems' can be easily overlooked or treated superficially if one applies a primarily explanation-seeking and pragmatic cost/benefit and problem-solving approach to a project.

However, in the face of great existential and ethical questions and fundamental experiences (e.g. 'what is trust, courage, community' etc.), we often find the strength for innovation, radical innovation and 'responsible innovation', especially in the companies and organisations that work with people, creativity and the meaningfulness of (working) life.

In Professional Wonder, the aim is to maintain a sense of wonder — which is often more like curiosity initially — towards an existential and ethical awareness (i.e. emphasis on humanistic formation). This is inspired by research in the humanities, particularly in existential phenomenology and philosophical hermeneutics.

In practice, Professional Wonder is designed as a wonderment workshop consisting of five elements (Hansen, 2008, 2014, 2015).

The first element is the **phenomenological moment** when the group starts with a concrete, lived experience that has made an impression on them. In this phenomenological moment, they 'immerse themselves' in what they have experienced, so to speak, and then describe the life world and what they experienced as a sensory way that leads to a expressed wonder at a particular phenomenon (e.g. community).

In the **hermeneutical moment,** participants must examine in a Socratic, critical and wondering way the tacit values and basic assumptions that are taken for granted in lived experience. Together, they examine a selected narrative and are slowly led (by 'slow thinking') towards the beginnings of a philosophical wonderment at the chosen value and phenomenon ('what essentially is community?')

In the **aesthetic and philosophical moment,** the participants' own narrative, and thus their own personal philosophical wonderment, is placed in dialogue with the great wisdom narratives and wonderments of humanity. Here, art, fiction, philosophy, myths, fairy tales, music and so on are brought into the room for a further qualification of the group's wonderment.

In the **existential moment,** the created wonderment is brought back into the participants' own lives again. What did I learn? How can it be relevant and interesting to think of in relation to my own discipline, study or professional practice? How can it shed a new and innovative light on previous thinking or what is going on in a specific practice?

The fifth and final element is that of **phronesis.** Phronesis is the Greek concept of practical wisdom. Here, participants must reflect on why and how the process can be used in their professional practice. Or, as the process is illustrated by Eva Sommer, an innovation consultant from Vejle, and presented in Hansen (2018a): See below.

How is it used?

At Aalborg University, Professional Wonder has been used as a project qualification and project development tool. Professional Wonder adds an important humanistic formation to PBL and Entrepreneurship PBL processes, as the participants are trained to also include an existential and ethical awareness and learn to take a philosophically wondering approach to their own preconceptions and problem definitions.

Professional Wonder and the Wonderment Workshop are now also used in professional organisations, as an innovative tool in design thinking and design education (Hansen, 2014), creative enterprises and municipal organisational development (Hansen, 2018a,b), wonderment-based entrepreneurship teaching at university colleges (Hansen et al., 2017) and in the health sector (Hansen, 2016).

Sources

Hansen, F.T. (2008). At stå i det åbne. Dannelse gennem filosofisk undren og nærvær. Copenhagen: Hans Reitzels Forlag.Hansen, F.T. (2014). Kan man undre sig uden ord? Design- og universitets- pædagogik på kreative videregående uddannelser. Aalborg: Aalborg University Press.

Hansen, F.T. (2015a). The Call and Practices of Wonder. in: Weiss, M.N. (ed.), The Socratic Handbook.Wien: LIT Verlag, pp. 217-244.

Hansen, F.T. (2016). At undre sig ved livets afslutning. Om brug af filosofisk samtale i palliativt arbejde. Copenhagen: Akademisk Forlag.

Hansen, F.T. et al. (2017). At innovere med hjertet: Undervisning i undringsdrevet innovation og entreprenørskab i professionsuddannelser – Report from an action research project at Via University College (2013-2015). Research report downloadable from: https://vbn.aau.dk/ws/portalfiles/portal/266898496/At_innovere_med_hjertet._En_forskningsrapport._ISB N_978_87_996260_7_6.pdf

Hansen, F.T. (2018a). At møde verden med undren: Dannelse, innovation og organisatorisk udvikling i et værensfilosofisk perspektiv. Copenhagen: Hans Reitzels forlag.

Hansen, F.T. (2018b). Undringsdreven innovation i Vejle Kommune. En empirisk rapport. Downloadable from: https://vbn.aau.dk/ws/portalfiles/portal/285396171/UndringsRapport.pdf

Owen, Richard, Bessant, John and Heintz, Maggy (2013). Responsible Innovation. London: Wiley and Sons;

Philbeck, Thomas., Davis, Nikolai. and Anne Marie Engtoft Larsen (2018). Values, Ethics and Innovation: Rethinking Technological Development in the Fourth Industrial Revolution. (White Paper from World Economic Forum, August 2018:http://www3.weforum.org/docs/WEF_WP_Values_Ethics_Innovation_2018.pdf

Verganti, R. (2017). Overcrowded. Designing Meaningful Products in a World Awash with Ideas.Massachusetts: MIT Press.

Contact

Ann Charlotte Thorsted, Department of Communication and Psychology. Finn Thorbjørn Hansen, Department of Communication and Psychology.

THE BUBBLE BATH - the phenomenological moment

To dive into a lived experience from (work)life. What is my call? What do I long for?

THE DARK CHAMBER - the hermeneutical moment

To interpret the lived. What values are behind? Could it be any different?

THE CATHEDRAL - the dialectical moment

To see my own little story in the light of bigger narratives of art and culture.

MY WAY - the existential moment

To find myself in thoughts and words. Who am I in all this?

LANDING - the phronesis moment

To land in own practice again. What practical wisdom have we achieved? How to make the world better from here? What is the first step?

Finn Thorbjørn Hansen (2017) and his 5-phase model for the Wonderment Workshop, with illustrations by Eva Sommer.

TOOL | MINI PROJECT

How is the tool linked to Entrepreneurship PBL?
The Mini Project belongs to the Entrepreneurship PBL model's problem orientation phase. The method aims to combine and apply theories, methods and techniques to solve a complex idea of entrepreneurship.

What is the tool?
The Mini Project aims to develop a coherent presentation of an idea into entrepreneurship using selected theories, methods and techniques.

What can be achieved by using a 'Mini Project'?
The Mini Project integrates individual notes, models, sketches, etc. into a description of the idea, where individual contributions are seen in
context.

Thus, the Mini Project encourages critical reflection on the application of theories, methods and techniques. What is their contribution? Can they be meaningfully combined? Do they overlap? Do they complement each other? And so on.

The Mini Project helps create an overview and see connections and also increases the ability to give constructive criticism of theories, methods and techniques.

In relation to practical entrepreneurship, the Mini Project can be used as a first proposal for how an idea can be put into practice.

In relation to a potential exam in entrepreneurship, the Mini Project helps create an overview and provide a critical and constructive understanding of the theoretical and conceptual elements of the subject. The Mini Project is not included in the assessment, and students can prioritise the parts of the project they find most relevant.
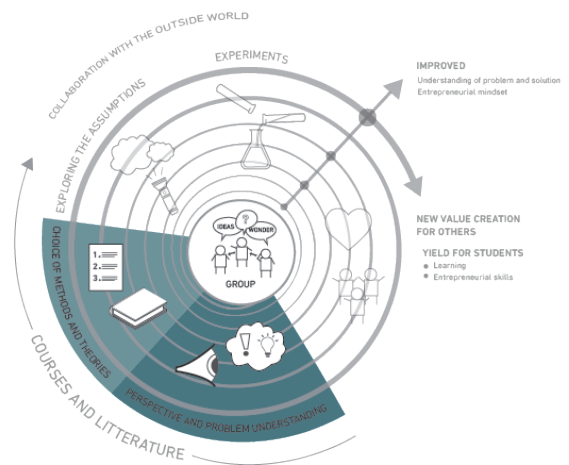
How is it used?
The Mini Project is used by individual students or project teams working on a business idea. This idea should preferably be rooted in the students' professionalism.

The Mini Project can very well be related to their ordinary project work in the same semester.
The Mini Project is facilitated by teachers who provide feedback and coach as required.

The Mini Project can be completed by individual students or groups of students. The project is conducted continuously through the course, as a tool to develop an understanding of the individual elements in relation to a single idea.

A typical Mini Project can be found on pages 15-25.
The teachers offer feedback on drafts along the way.

The Mini Project must meet a number of substantive requirements:

- Describe a business idea using the central literature for the course.
- Choose whether to describe an idea for entrepreneurship or intrapreneurship. How can your particular expertise support the idea?
- Develop a business model based on the concepts, tools, techniques and theories behind the course.
- Describe and explain the phases or activities you will use in the realisation of your idea. How would you go about it in practical terms? What recommendations from the course literature do you follow?
- Characterise and discuss your idea based on models or theories like Porter's five forces, Porter's value chain, resource-based theory, knowledge-based theory, change management or similar.

- Describe the key elements of your business model. For example, your expertise, value propositions, partners, customer segments, etc.
- Discuss strengths and weaknesses of the business model. Do you expect the model to change over time?
- Discuss the use or relevance of possible patterns for business models.
- Discuss key elements in your choice of strategy — e.g. whether you are following a Red vs. Blue Ocean strategy or Lean Startup.
- Will you follow a plan-driven or agile process during the realisation?
- Describe the theoretical paradigm your Mini Project rests on. Justify the choice of paradigm.

Sources
Osterwalder, A., Pigneur, Y., In Clark, T., and Smith, A. (2010). Business model generation: A handbook for visionaries, game changers, and challengers.

Contact
Ivan Aaen, Department of Computer Science

TOOL | OBJECT THEATRE AND SANDBOXING

How is the tool linked to Entrepreneurship PBL?
The Object Theatre (OT) method relates to all elements of the Entrepreneurship PBL model, although with the greatest contribution to 'Exploration of assumptions', 'Experiments', and 'Value creation for others/learning for students', and can be a tool for communication between the project team and its partners, including the supervisor.

What is the tool?
OT is a dialogue-based and tactile approach to adding new perspectives to situations and seeing opportunities for action in challenges. The name 'Object Theatre' refers to the use in the method of small narrative figures that are placed within a framework with sand (Sandboxing) or on a large sheet of cardboard.

***What can be achieved by using
'Object Theatre and Sandboxing'?***
The method provides a communication platform which enables new reflections through the use of the chains of association evoked by different selected figures around a given issue, task or theme. Against this background — and through the joint investigative dialogue — participants create a reframing of the issue, including a new narrative and a renewed clarity thereof. The risk of misunderstandings is minimised significantly when the group creates this overview together.

As a communication platform, it supports the students in the group work and in the case work as regards bringing the different perspectives and ideas to light, so they can be shared, recognised, talked about, developed further, etc.

How is it used?
Through selection and placement of figures on sheets or on the sandbox table, a miniature 'scenography' of the complex circumstances — the terrain — which the given problem is set in is created. Therefore, the layout is also referred to as a 'terrain table', which an operational unit sets up for a quick and clear overview of the circumstances they must navigate. Anything the group deems relevant is included.
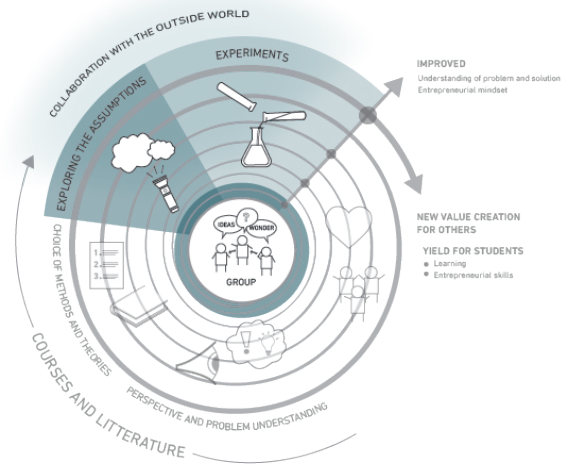
The process is controlled through six phases and via six guidelines:
The six phases:
Phase 1:   Introduce the method, sandbox
work table/sheet and figures

Silent phases
Phase 2:   Choose figures — take your time
Phase 3:   Start placing artefacts in the sandbox, e.g.:
A) Everyone silently places 'their' artefacts
   in the sandbox
B) One starts by creating the sandbox wordlessly, the others add/change.
C) They each make their own suggestions in turn.
The dialogue begins
Phase 4:   Talk about the layout — use the grammar
of the idiom as a guide
Phase 5:   The terrain table is finished and retained
as photos/note sheets
Phase 6:   Further processing on boards

The six guidelines:
1. Switch off the 'brain' and let the figures choose you, or let your hand/eye choose.
2. Also applies to the placement in the sandbox
3. Do not — at first — analyse the meaning
4. Accept the premises of the idiom — narrate in relation to the figures
5. Progress slowly, slow the pace, linger, ask, examine more closely: 'What else could it be?'
6. Listen to your gut feeling, it will tell you when the configuration is 'finished'

Sources

Poulsen, S. B. and Strand, A. M. C. (2014). A creative designerly touch. Nurturing transformation through creativity in the meaning-mattering of design processes. In Academic Quarter (Vol. 8) 2014.

Strand, A. M. C. (2012). Enacting the Between. 2-book. PhD. Dissertation at Department of Communication, AAU

Strand, A.M.C. (2014). Material Storytelling. Resituating Language and Matter in Organisational Storytelling. In K. M. Jørgensen and C. Largarcha-Martinez (Eds.). Critical Narrative Inquiry – Storytelling, Sustainability and Power in Organizations. New York: Nova Science Publishers.

Strand, A. M. C. (2014). Grandma's Dress(code): Practices diffracted through the apparatus of material storytelling. In Boje, D. M. and Henderson, T. Being Quantum. Storytelling and Ontology in the Age of Antenarratives. Newcastle: Cambridge Scholar Publishing

Strand, A. M. C. (2018). Entangling Organizations: Intra-active ways of reworking the organizational scenography for the processes of becoming of the changed relationalities of (dis)ability. In: D. M. Boje, and M. Sanchez (ed.), The Emerald Handbook of Quantum Storytelling Consulting (s. 187-210). Emerald Group Publishing.

Strand, A. M. C., and Sparholt, U. (2017). Intra-Aktionsforskning: - en dialogisk slowfox med materialiteten. I H. Alrø, and F. T. Hansen (ed.), Dialogisk aktionsforskning: i et praksisnært perspektiv (1st ed., pp 177-212). Aalborg: Aalborg University Press. Interpersonel Kommunikation i Organisationer, Vol. 12

Strand, A. M. C. (2018). The Break: Work-life balance and leadership anno 2016 - Reconfiguring contemporary leadership through 2400 years old coaching concept of Protreptic, Walking and Material Storytelling. In: D. M. Boje, and M. Sanchez (ed.), The Emerald Handbook of Quantum Storytelling Consulting (s. 35-50). Emerald Group Publishing.

Thomassen, A. O., Jørgensen, K. M. and Klee, N. (2014). Strategic storytelling and Identity (re)configuration in a small start-up company. In. In K. M. Jørgensen and C. Largarcha-Martinez (Eds.). Critical Narrative Inquiry – Storytelling, Sustainability and Power in Organizations. New York: Nova Science Publishers.

Contact

Anete M. Camille Strand, Department of Communication and Psychology.

TOOL | METHOD FOR INTRODUCING BUSINESS CASES INTO PROJECTS

How is the tool linked to Entrepreneurship PBL?
Given that it is a project, you run through the whole Entrepreneurship PBL model in relation to this tool, but it provides examples of how to get through the whole process.

What is the tool?
A way of ensuring value creation in a project by introducing learning objectives around business cases and cost/benefit analysis.

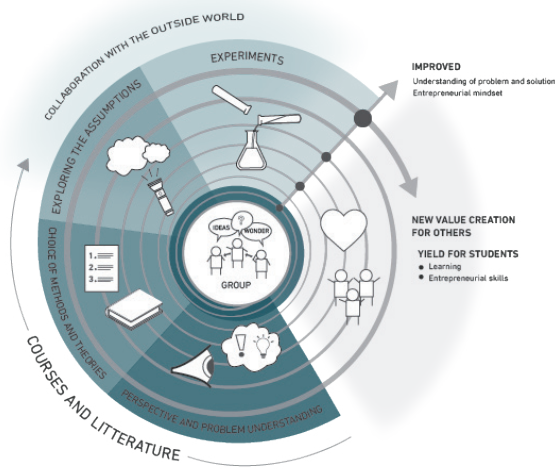### What can be achieved by using 'Business cases in projects'?
The students get a realistic understanding of Entrepreneurship PBL through focused, but realistic, project work. They see how businesses look at value creation/business cases in practice, and that the technical solution is not always the only thing to consider, but that it is important to put it into context, and that optimisation may not create value in itself if the costs of implementing it are higher than what could ultimately be recouped.

How is it used?
Throughout the project an existing system or apparatus is optimised, or a new one is built to cover a new feature. The product's value creation is checked by setting up a cost/benefit analysis. Updates/iterations of the concept can be made, based on both the technical value but also the economic value, according to the figure below.
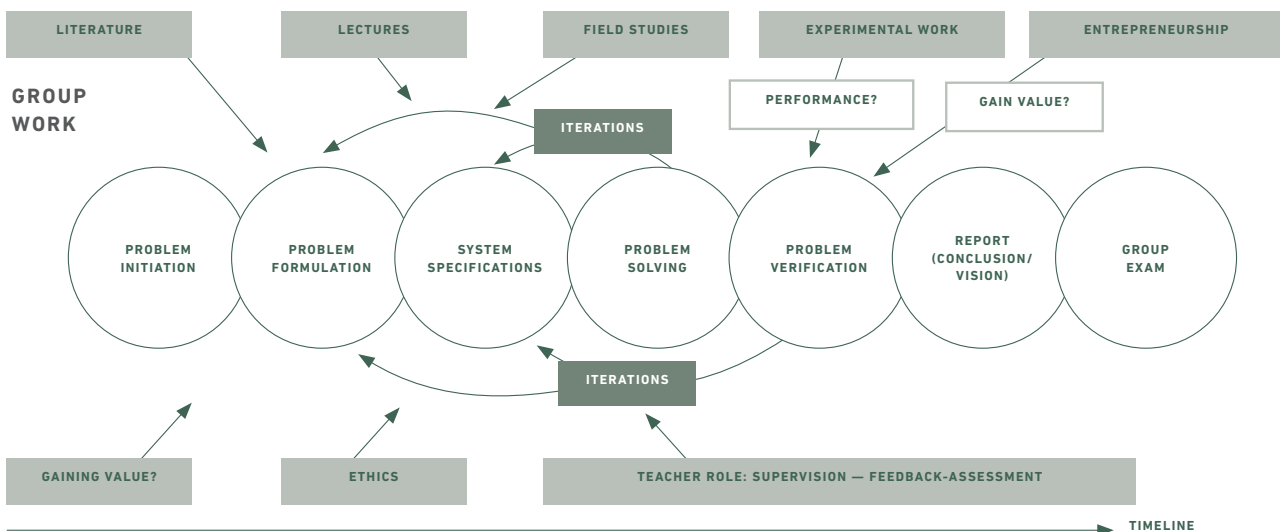
The business case and cost/benefit part are introduced through visits from three companies which give talks on how they evaluate a business case and make a cost-benefit analysis. Relevant firms are selected within the main area of the study for the presentations.

The project is evaluated by normal project examination and the entrepreneurial level is evaluated through the learning objectives for business cases and cost benefit analysis. Here, exemplified in the thermal direction of energy:

LEARNING OBJECTIVES:

Knowledge
- Have knowledge and understanding of the functioning of thermal machines and systems
- Have knowledge about methods for the design of thermal energy systems
- Have knowledge of the interaction between the components included in thermal machines and energy systems
- Be able to understand scientific methods and theories in relation to the semester's theme
- Be able to understand how to set up a business case for the thermal machines or systems

Skills
- Be able to develop and use stationary models of thermal systems under full and partial load
- Have basic skills to design the optimal system configurations and determine the operating parameters for thermal systems
- Be able to analyse results from simulations and possible laboratory work, and assemble them to give an overall impression of the system's performance
- Be able to make a cost/benefit analysis for the thermal machines or systems

Competences
- Have achieved the ability to translate academic knowledge and skills in the field of thermal systems into processing of a practical problem
- Have the ability to engage in professional and interdisciplinary cooperation within thermal systems
- Have the ability to evaluate the basic economic conditions for the development and commissioning of systems or devices

Sources
Learning objectives and thematic descriptions can be seen as model descriptions for projects in the 5th semester in the curriculum for energy: https://studieordninger.aau.dk/2019/14/798.

Contact
Birgitte Bak-Jensen, Department of Energy Technology.

TOOL | LEARNING PLAN

How is the tool linked to Entrepreneurship PBL?

Learning Plan can serve as a progression tool for an entrepreneurship or innovation team during project development. It is useful in all phases of the Entrepreneurship PBL model. Value-added cooperation, e.g., with users/customers and other partners; group-based project work, e.g., guiding the team's workflow and reflections etc.; Entrepreneurial Mindset, e.g. the action aspect via experiments and trial-and-error learning.

What is the tool?

Learning Plan is a tool that systematically helps the team focus on reducing the most critical uncertainties through experimentation and learning.

It is expensive to fail late in the development process, so the earlier you can reduce uncertainty by learning from experiments, the higher the chances to get through successfully.
Learning Plan helps to:
• reduce uncertainties
• validate the market
• discover new areas of application
• raise awareness and form the basis for communication about progression ('what have we learned since the last time?')

What can be achieved by using 'Learning Plan'?

Briefly, it is about identifying uncertainties in relation to the market, technology, organisation and resources. Then you choose the most critical uncertainty. There is a way ('experiment') to learn about this uncertainty, so that it can be reduced. Work is done according to the principle: Maximise learning per sum/time spent to create learning for reducing uncertainty.

The tool was originally developed for use in radical innovation teams in established companies in the USA; in Denmark it has been used, e.g., in Grundfos and Sintex.

How is it used?

The tool is shown below. The column to the left describes the steps that the group must go through to complete a 'learning loop' in order to reduce a selected uncertainty.
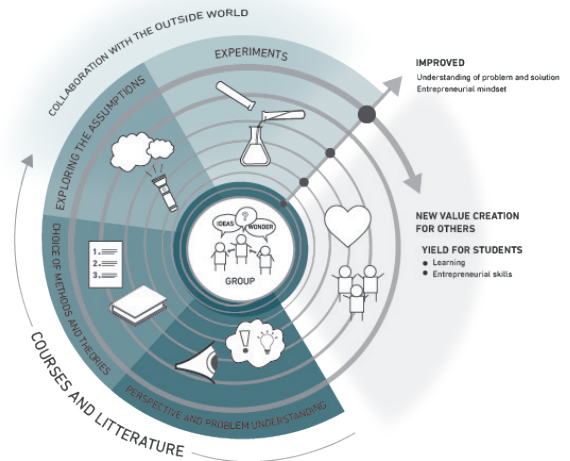
First, describe what is known and especially not known about the technology, market, organisation and resources. Examples of typical uncertainties that the group may have could be; **Technical:** That the technology is based on accurate and complete knowledge, that the technical specifications can be implemented etc. **Market:** That you properly understand the customer's needs and wants, that the group understands the product relative to competitors' products. **Organisational:** Primary uncertainties for startups will be in relation to society's support (users, customers, interest groups, family, etc.) **Resources:** That you can continuously create funding opportunities to attract the necessary resources internally and externally in the group, and create sustained interest in the project from stakeholders and sponsors.

The group always selects the most critical uncertainty. Determine what assumptions the group has about the uncertainty and generate alternative methods to test these assumptions. Define success criteria for the testing and a plan for implementation. Following the implementation, analyse and reach a conclusion. The impact of the result on the other three areas and the progression of the project is assessed, as well as what must be done subsequently.

Then the next critical uncertainty is selected for a new learning loop.

Compared to use in established companies, the (internal) organisational dimension will be less prominent, and the resource dimension more prominent.

(note: Learning Plan was originally made for radical innovation in companies, and the examples reflect this, particularly regarding 'organisational uncertainties'. In entrepreneurship, the three others feature are more importan, and the organisation is primarily in relation to outside organisations and individuals):

Learning Plan:

PROCEDURE	UNCERTAINTIES			
	Technology	Market	Organisation	Resources
1. What things are unknown (and known) in each area				
2. How critical are they (high/medium/low)				
3. What are your assumption(s) concerning the uncertainties				
4. Are there cheap/simple ways to test these assumptions				
5. Choose the most effective testing method/experiment (maximum learning per DKK)				
6. Define criteria for assessing test results				
7. Create plan for testing and implement it				
8 . Evaluate and draw some conclusions about the testing (has the uncertainty been reduced? Does it create new assumptions about uncertainty?				
9. How does the result affect the uncertainties in other areas? The project's overall progression?				
10. What further action may be needed?				
Which uncertainty is now the greatest — choose the next learning loop.				

Sources

Rice et al. (2008) Implementing a Learning Plan to counter uncertainty, Sloan Management Review 49/2. O'Connor et al. (2008) 'Grabbing Lightning', Wiley.

Arteaga and Hyland (2013) Pivot. Wiley.

Contact

Frank Gertsen, Department of Materials and Production

NOTES AND IDEAS

BIBLIOGRAPHY

THE BIBLIOGRAPHY BELOW REFERS TO CHAPTERS 1 AND 2.

Literature for tools and methods in Chapter 3 can be found under each tool.

- AAU.dk (2015). Principper for problem- og projektbaseret læring - PBL-Aalborgmodellen. Aalborg University, Rector's Secretariat https://www.aau.dk/digitalAssets/148/148026_pbl-aalborg-model-len_dk.pdf.

- Bacigalupo, M., Kampylis, P., Punie, Y., Van den Brande, G. (2016). EntreComp: The Entrepreneurship Competence Framework. Luxembourg: Publication Office of the European Union.

- Bager, T. and Nielsen, S. L. (2008). GEM anthology, Entrepreneurship and skills. Børsens Forlag.

- Bandura, A. (1997). Self-efficacy: The exercise of control. W H Freeman/Times Books/ Henry Holt and Co.

- Dweck, C. S. (2006). Mindset: The new psychology of success. New York: Random House.

- Illeris, K. (2011). Kompetence: hvad, hvorfor, hvordan? Samfundslitteratur.

- Krogh, L. and Wiberg, M. (2013). Problemorienteret og projektorganiseret undervisning. In Rienecker, L. Stray Jørgensen, P. Dolin, J and Ingerslev, G.H. (ed.) Universitetspædagogik.

- McCallum E., Weicht R., McMullan L., Price A., (2018) EntreComp into Action: get inspired, make it happen (M. Bacigalupo and W. O'Keeffe eds.), Publications Office of the European Union, Luxembourg.

- Rasmussen, A and Moberg, K. (2016) Taksonomi i Entreprenørskabsuddannelse - Perspektiver på mål, undervisning og evaluering (2nd ed.). The Danish Foundation for Entrepreneurship

- Robinson, S., Neergaard, H.,Tanggaard, L., Krueger, N. F. (2016) "New horizons in entrepreneurship education: from teacher-led to student-centered learning", Education + Training, Vol. 58th issue: 7/8, pp. 661-683. doi.org/10.1108/ET-03-2016-0048