

Sirpa Hänti, Meiju Keinänen, Maria Välivirta Havia,
Hazem Al-Bermanei, Mari Ketola & Jonna Heikkilä.

Facilitate for the future

**Educators' Guide for Designing Hybrid Learning
Environments for the VUCA World**

Co-funded by the
Erasmus+ Programme
of the European Union



ERHVERVSAKADEMI AARHUS
BUSINESS ACADEMY AARHUS



UNIVERSITAT
POLITÈCNICA
DE VALÈNCIA

Course Material from Turku University of Applied Sciences 140

Turku University of Applied Sciences Turku 2021

Action Type: KA203 - Strategic Partnerships for Higher Education

Project number: 2020-1-PL01-KA203-081940

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

ISBN 978-952-216-789-7 (printed)

ISSN 1457-7933 (printed)

Printed by: Printworks, Turku 2023

ISBN 978-952-216-788-0 (pdf)

ISSN 1796-9972 (electronic)

<http://julkaisut.turkuamk.fi/isbn9789522167880.pdf>

Turku UAS' publication series: turkuamk.fi/julkaisut



This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

Contents

| | |
|--|----|
| 1 Introduction..... | 4 |
| 2 VUCA world | 6 |
| 2.1 VUCA components | 7 |
| 2.2 VUCA in the educational context | 8 |
| 3 Embedding VUCA in learning environment design | 15 |
| 3.1 Innovation Pedagogy as a pedagogical approach for learning environment design | 16 |
| 3.2 Hybrid learning environments and design elements | 18 |
| 3.3 Design elements including VUCA aspects | 20 |
| 4 Experiences of educators in VUCA embedded learning environments | 24 |
| 5 Nine cases of hybrid learning environments simulating the VUCA world | 28 |
| 5.1 Type 1: Case designs based on hybrid learning environment | 28 |
| 5.1.1 Character Skills, BAAA - Business Academy Aarhus | 28 |
| 5.1.2 Research Project Course, UG - University of Gdansk | 33 |
| 5.1.3 Building Startups, UPV - Universitat Politècnica de València | 37 |
| 5.2 Type 2: Case designs based on hybrid learning environment..... | 40 |
| 5.2.1 Project Hatchery, Turku UAS - Turku University of Applied Sciences..... | 40 |
| 5.2.2 Experts in Teams, BAAA - Business Academy Aarhus..... | 44 |
| 5.2.3 Learning Teams, HU - University of Applied Sciences Utrecht..... | 49 |
| 5.2.4 Innovation Camp - INNOCAMP PL..... | 53 |
| 5.3 Type 3: Case designs based on hybrid learning environment | 57 |
| 5.3.1 DARE!, HU - University of Applied Sciences Utrecht..... | 57 |
| 5.3.2 Project-based Learning Environments, Turku UAS - Turku University of Applied Sciences | 61 |
| 6 Conclusions..... | 65 |
| References | 68 |

Introduction



1

Working and living in a world that has been described as Volatile, Uncertain, Complex, and Ambiguous, (VUCA) is something that none of us can avoid and thus we need to learn to transform its threats to opportunities. Employees who are creative, resilient, and innovative problem solvers who show professional abilities and skills in coping with the rapid change, high-risk choice making and high-speed reaction, are needed in all sectors and industries. In addition to learning the specific subjects and field-based competences, students need to develop their character skills, innovation competences and high motivation. All this also requires not only toleration of uncertainty but also the ability to handle uncertainty in a productive manner. The ability to handle uncertainty in a productive manner is crucial for the present-day professionals, the organization they work in, for the educators that educate those future professionals and, finally, for society; they contribute to in the unstable and turbulent world.

Although education represents a critical factor for making the necessary changes and training future professionals, previous studies show that higher education institutions (later HEIs) and educators might lack the knowledge, skills and tools to support their learners to develop their abilities to handle uncertainty in a positive, generative and productive manner. Additionally, struggling with uncertainty is still undervalued, even though HEIs increasingly focus on training students to reflect on themselves as professionals. Without embedding uncertainty in the learning processes, as a part of professional and personal development, coping in the VUCA environment can lead to stress, anxiety, and vulnerability, and thus hamper a growth mindset¹ of students and the employability of graduates.

To respond to this need, the ambitious aim of the PUNC (Professional UNcertainty Competence) project is to fill the competence gap of handling uncertainty productively. For instance, the project professionalizes educators to enable learners to develop their PUNC in their professional performance to find a way through this increasingly uncertain, changeable, and ambiguous world. Supporting educators to train resilient professionals

who can engage their professional uncertainty in a positive and productive manner has also been the trigger for the idea to create this guide.

This guide is for educators who are interested in designing such hybrid learning environments simulating the VUCA world that prepare the students to the rapidly changing working life. The guide is created in cooperation with the six PUNC partners, from different corners of Europe, by combining their expertise, exchanging knowledge, and learning from one another's cultures among educators and researchers on the themes of learning, competence, and pedagogies. The guide bases on authentic experiences of educator experts from partner institutions collected through workshops and electronic surveys.

In this guide, we present some characteristics of the VUCA world that form the base of today's demanding working life where several competences are needed from the point of view of both the professional and private life. The aim is to prepare the students to cope with the VUCA world in a safe way already during their studies, to learn to acknowledge and thus tolerate better the future situations in the changing world. However, our goal is to anticipate and overcome the possible negative sides of the VUCA world by supporting the students to become aware of the opportunities to leverage volatility, uncertainty, complexity, and ambiguity together to success and wellbeing.

The aim of the guide is to provide the reader with both theoretic and practical views. It presents the key results of experiences of educator experts in the PUNC project integrated with theoretical parts. The theories start with a short description of the concepts and models applied in the booklet. The idea of these theoretical parts is to familiarize the reader with the VUCA components and the basics of designing a learning environment, maybe seen from a wider view than traditionally thought. Each theoretical part is followed by a results section based on the perceptions of experts from workshops around these themes. The guide also includes key points of a survey about the experiences of the educators that have been planning and experimenting the VUCA learning environments in the five participating institutions. Additionally, to deepen readers' understanding and to help to put VUCA in a concrete form in education, the guide presents nine practical cases representing three different types of hybrid learning environments. With these nine different cases, we aim to give a better understanding of the options and provide opportunities for readers to develop their own learning environments in different ways, from simpler to a more complex implementation. Finally, the conclusion section summarizes the guide and presents a self-reflection exercise with guiding questions, to assist the reader to start developing a VUCA approach in their own daily pedagogical practices.

We hope that this guidebook can offer new knowledge and ideas for designing hybrid learning environments for the VUCA World. We wish you inspiring reading moments!

VUCA world

2

The VUCA acronym stands for Volatility, Uncertainty, Complexity, and Ambiguity and it describes a turbulent environment, often referred to in the context of leadership theories^{2,3}. However, originally this acronym was coined decades earlier by the social scientists at a military school in the U.S., attempting to characterize the future environment in which the students would need to operate. After that, the VUCA acronym has been generalized as a term in the discussions on several topics in geopolitics, organizations, business, and leadership as well as in working life in general⁴.

The VUCA world has been characterized by many interconnected parts and variables and although information was available, it is typical for the VUCA environment that the amount of it is overwhelming as well as difficult to process⁵. In addition, the causal relationships are not clear, and this leads to complexity and even situations of “unknown unknowns”⁶. This makes the problem unstable and possible actions to solve it unclear and uncertain. The high mobility of people and goods and services have broadened the sphere of activities and the global trends and megatrends are widely spread at a fast pace. Reconfiguration at a mental, technological, and physical level and evolving technological interconnectivity⁷ form an ongoing process that changes the ways people act in their private and working life. This all makes the insights of the future working life unstable, obscure, unpredictable, fuzzy, and even chaotic.

The role of education in society is to enhance the welfare of the inhabitants, as well as in the whole society through the competent and skilful workforce. Therefore, we as educators should consider how to equip the students with such competences that are needed in the evolving working life, both personally and professionally. Educational organizations are under pressure while facing an emerging need for the demands of the changing world and working life⁸. However, educational institutions are not in isolation

in society and the changing world. Instead, the education systems need to offer proactive solutions for the future as the value of competences expires with time, especially in the changing world of the 21st century⁹. This means that pedagogy will situate learners at the centre of the learning process¹⁰, wherein the young ones, who are the adults of the future, must have the right to learn a wide variety of skills and competences, meaning the 21st century skills. These skills have been categorized, for example as information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills.

2.1 VUCA components

The VUCA acronym has been presented typically as a cavalier concept that describes the turbulent environment or “unpredictable change”¹¹ in a uniform way¹². However, there are also some attempted suggestions to define the volatility, uncertainty, complexity, and ambiguity as separate concepts as well as their suggested interconnectivity. The rationale in understanding the VUCA components also as separate sub-concepts forms an opportunity in a leadership context, and thus it is worth learning for the future professionals that they may act in a role of leading others but at least in leading themselves through self-management.

Volatility is liability for stability and something changing rapidly. Uncertainty relates to the quality of information one has – or the degree to which the outcome of an event is knowable in advance. Complexity increases when there is a greater number of relevant variables or interrelationships; the more variables, the more complex the situation. Ambiguity occurs when an event, situation, or context is unclear, either because information is missing, inconsistent, contradictory, or obscured in some way¹³.

In the next table the characteristics of VUCA components are presented based on literature, mainly in business and economics, strategic management as well as in society in general.

Table 1.

The characteristics of VUCA components.

| | |
|--|--|
| <p>VOLATILITY <i>"The nature, speed, volume, magnitude and dynamics of change."</i>¹⁴</p> <p>LACK OF STABILITY¹⁵ CHANGE^{16;17;18} SUDDEN, EXTREME, AND MULTI-LAYERED FLUCTUATIONS¹⁹ PAST EXPERIENCE AND BEST PRACTICES NO LONGER PROVIDE HELP²⁰ TURBULENCE OR THE UNEXPECTED²¹</p> | <p>UNCERTAINTY <i>"The lack of predictability of issues and events."</i>²²</p> <p>LACK OF KNOWLEDGE²³ LACK OF ADEQUATE INFORMATION²⁴ QUALITY OF INFORMATION²⁵ ABSENCE OF PREDICTABILITY IN ISSUES AND EVENTS²⁶ NO CONCRETE PATTERNS WHICH MAKE IT DIFFICULT TO ESTABLISH WHAT WILL HAPPEN NEXT AND BASE DECISIONS ON THAT²⁷ UNKNOWN OUTCOMES²⁸</p> |
| <p>AMBIGUITY <i>"The confounding of issues and the chaos that surrounding any organization."</i>²⁹</p> <p>LACK OF CLARITY^{30;31} BECAUSE INFORMATION IS MISSING, INCONSISTENT, CONTRADICTORY, OR OBSCURED³² LACK OF UNDERSTANDING OF CAUSAL RELATIONSHIPS³³ INABILITY TO IDENTIFY THREATS AND OPPORTUNITIES³⁴ UNKNOWN UNKNOWN³⁵ INFORMATION IS DIFFICULT TO INTERPRET UNEQUIVOCALLY³⁶ NEWNESS³⁷</p> | <p>COMPLEXITY <i>"The haziness of reality and the mixed meanings of conditions."</i>³⁸</p> <p>INFORMATION OVERLOAD^{39;40} OVERWHELMING NUMBER OF MOVING PARTS⁴¹ SHEER VOLUME OR FORM OF THE DATA CAN INTERFERE THE ABILITY TO PROCESS THE INFORMATION⁴² MANY/MULTIFORM INTERCONNECTED PARTS^{43;44} MULTITUDE OF POSSIBLE CAUSES INVOLVED THRESHOLD OF CHAOS⁴⁶ DIFFICULT TO UNDERSTAND THE RELEVANT INFORMATION IN ITS ENTIRETY⁴⁷</p> |

Although it is useful to consider these components separately, it is good to keep in mind that they may be interconnected in several ways. As an example, information might be available, but it may be overwhelming to process, and this may lead to the situation becoming unstable and cause uncertainty.

2.2 VUCA in the educational context

There is lack of research of VUCA in the educational context. However, some publications are available like applying experimental learning pedagogy to prepare the students to cope with a VUCA work environment⁴⁹ or how to prepare learners for an unknown future with the CCR (The Center for Curriculum Redesign) framework that consists of knowledge, skills, character, and meta-learning competences⁵⁰.

In this guide, inspiration was pursued to be reached in a workshop of experts in the field, educators that have practiced several hybrid learning environments that aim to prepare the students to the VUCA world, from five European HEIs. In the next table, the descriptions of the VUCA components are presented based on that data to illustrate how VUCA can be run through the educational context.

Table 2.

VUCA components in the educational context.

| | |
|--|--|
| <p>Volatility</p> <p>Different than earlier courses with their own study group.</p> <p>Working life orientation and new challenges.</p> <p>Usual academic approaches are not applicable. Students must make up their own approach.</p> <p>Changes in tasks, actors, schedules.</p> <p>Working on the fly.</p> <p>Unfamiliar and heterogenic students and other stakeholders.</p> <p>Teamwork.</p> <p>Team dynamics.</p> <p>Leaning to collective resources instead of individual approach.</p> <p>No typical strict structure that the students will follow.</p> <p>Supervised and non-supervised meetings.</p> | <p>Uncertainty</p> <p>Lack of adequate information.</p> <p>Not knowing.</p> <p>Unpredictability of the results.</p> <p>No trust in students' own capability.</p> <p>No theory, tools, or methods from the curriculum.</p> <p>Working with hypotheses and the means at hand.</p> <p>Reflection.</p> <p>Gaining expertise step by step.</p> <p>Personal engagement.</p> <p>Forecasting is difficult.</p> <p>Need to take an active role.</p> |
| <p>Ambiguity</p> <p>Unknown study path.</p> <p>No teacher-centricity.</p> <p>Unclear expectations.</p> <p>Multi-sided tasks.</p> <p>Experimenting and testing.</p> <p>Different interpretations.</p> <p>Not only one right way to do the work.</p> <p>Not only one solution.</p> <p>The criterion to excellent work is unclear.</p> <p>Assessment is mostly based on self-reflection and team learning.</p> <p>Plans must be changed.</p> <p>Earlier experience may help or even disturb.</p> | <p>Complexity</p> <p>Many things going on at the same time.</p> <p>Prioritizing is difficult.</p> <p>Expected results are not known.</p> <p>Adjusting and managing several tasks.</p> <p>Many and complex perceptions.</p> <p>The interrelations of the whole and the parts.</p> <p>Difficult to trust own perceptions and to trust others.</p> <p>Individual and team learning.</p> <p>Both academic, professional, and personal skills are needed.</p> <p>The unbalanced combination of study-work-private life.</p> <p>Pooling the collective means and resources.</p> <p>Previous experience can cause confusion.</p> |

The ways that volatility is present

A volatile learning environment can be characterized as a new, or at least different from the learning environments that the students are used to take part in. Usual academic approaches are not applicable; thus, students have to make up their own approach. However, the aim is still to create a relatively safe context to learn to tolerate the challenges of unstable circumstances. It may be chaotic because too many things change at the same time and the students must work on the fly. The tasks may change as well as the participants: some students may drop out and new ones may join. In addition, meetings are changing as some of them are supervised and some are not. In addition, it may be considered weekly whether the meetings take place face-to-face or remotely. The changes in timing or deadlines may cause similar pressure for students as in working life reality.

Additionally, in a volatile learning environment, many tasks are worked and solved in teams and students must lean on the collective resources of the team they are in. Working with unfamiliar team members that may also be from different study fields may cause challenges. The teams are facing different challenges in team dynamics and conflicts. The students learn who they are in a team context and what they can contribute professionally and personally. Dealing with unstable change and developing resilience is necessary. This kind of learning environment also pushes the teacher boundaries.

Moreover, as the subject and situation are new, there is neither prior knowledge nor rules for how to work with them. Few earlier, trusted patterns from the past are available both to the team process and to the innovation challenge, and students must rely on their personal perception and actions to learn to recognize and create their own patterns. They must deal with a volatile working process in the team consisting of students with different knowledge and contributions. They have made up their own approach to define and manage their own tasks to contribute.

Turning the presence of volatility to an opportunity

As the team is new and starting to work with a challenging assignment with strangers who may represent other study fields, or speak a foreign language, it is important to use time for grouping and get the students to familiarize themselves with others. Several changes may occur during the course. Thus, the teams are provided with sufficient support by the educator or a student who has earlier participated in a corresponding course. The support may be offered actively according to a pre-planned schedule, e.g., every second week, or only when needed. Typically, the educator is available, although

not always present in the meetings. Even the feeling that the educator is available, and the students are not left alone, calms the students as they must work with the changes e.g., in tasks or schedules, on the fly.

The needs in the modern working life are linked to the learning environment and that motivates the students. Many issues can be discussed and justified together. Flexibility and adaptivity are supported. Students must learn to recognize and create their own patterns, as the usual academic approaches are not applicable. Opening the nature of the assignment and revealing that clear guidance may be missing prepares the students for the forthcoming situations. It is helpful to argue why this course is different from the typical courses as well as explaining why things are done like this and what skills (and how) are developed during the process.

The ways that uncertainty is present

Uncertainty in learning environments is mostly based on not knowing. This refers both to the knowledge of the subject and the working process as the projects are sometimes real problems from real companies. Also, the often unknown students cause challenges, as these learning environments are not teacher-centred like typical academic courses. Instead, the students must tolerate uncertainty in trying to find out how to start to work in a team and find adequate information. They often lack sufficient or incomplete information but are pressed to make decisions or act anyway. The students do not trust their capability neither as individuals nor as team members. As there are often no theories or methods to apply, they must work with hypotheses. In their work or project, causality can be understood but forecasting is difficult as students work with many stakeholders with different agendas and tasks. Thus, the students must define their own approaches, activities, and results. They must rely on the resources they have at hand and gain ability step by step during the work, which they usually do not have when the project starts.

There is a need to put a lot of work in the preparation process of the assignments as well as managing co-operation with often unknown team members, and still, they are uncertain about the reactions of others and the outcome. The students do not know the other students in the beginning but still they should be open about their thoughts, feelings, anxieties, and difficulties they face and communicate their ideas but as they are unexperienced in doing that, they find the personal engagement as a challenge. Thus, revealing themselves as a person and a professional and exposing themselves in front of the other team members or other stakeholders, increases uncertainty. These learning environments differ from the typical academic courses and the role of the students is more active in several ways, and this requires the ability to reflect and argue as well as illustrate in opinion and action.

Turning the presence of uncertainty to an opportunity

As there is lack of trust at several levels, it is important to create trust in many ways. Learning to trust the team members is one view but it is even more important to learn to trust one's own competence to find a solution. As the students cannot rely on theory, they have contributed personally – with own ideas, thoughts, and reflections. The teams are encouraged to discuss together, to try alternative ways to do things, and ask for help. To learn to act productively with uncertainty is based on reflection, both at individual and group level. Some existing reflection taxonomies or online materials may be applied to give perspectives to individual reflections that can be discussed in the class. Thus, feedback is important during the course as well as in the end.

In addition, the educator needs to have an attitude to trust the students' input and competence to solve the assignment of the stakeholders that may also be from a real company. This means that the students are given a big responsibility to deliver the solution and manage the team process. To respect and appreciate their work is crucial in their development to learn to act productively in uncertain situations. Even though the process and assignment may be unstructured, students are supported to e.g., make a project plan by showing good practices, sharing knowledge, and preparing a template of documents. The students are provided with incomplete information and forced to think creatively as well as critically to collect the needed knowledge. It is useful to emphasize that testing the solutions on each other as well as on certain target groups is fruitful, as practice makes perfect.

The ways that complexity is present

Working together and doing too many tasks, handling several processes, and stakeholders at the same time contributes to a sense of complexity amongst the students. The students can be overwhelmed by the complexity in tasks and roles in the team. Establishing confidence in the team and pooling the team's collective means and resources, recognizing what causes what and how to solve the problems, makes the learning environment complex.

Overseeing the whole and how its parts interrelate is challenging for the students. It is difficult for the students to make choices and find out what must be done first. As the situations may vary, plans must be changed. The assignments may be complicated in nature and include, e.g., convoluted rules and law (GDPR) that must be considered. The students must consider a lot of variables at the same time in a complex and time-tight schedule. The students need to adjust their tasks, agendas, and responsibilities to go

ahead with all their duties. The context and working process requires both academic, professional and personal skills and competences that often play at the same time, and this causes the students to experience complexity to a high degree.

Turning the presence of complexity to an opportunity

Supporting students' teams to manage a complex learning environment may happen by helping them to slice the complex entities to smaller parts to make them more handleable. This may happen e.g., through preparing a schedule, sharing, and dividing tasks, familiarizing with other projects as examples, and asking questions. Coaching is a useful approach for students to realize the main points and prioritize the steps to continue in complex situations. Many times, the assumptions of the students must change as what they believed turns out differently thus, they must change their way of acting. By discussing the difficulties and how to overcome those the students may find the ways to proceed.

Heterogeneous teams may foster the complexity as students with different profiles and character skills perceive the situation in a unique way. Thus, each assignment may have as many answers as the number of students. Stressing that this is perfectly acceptable, and part of the learning process and curve is important. Tools and guidance are given how to plan and execute an assignment.

The ways that ambiguity is present

The students must combine this atypical course with their study programme not only physically, by scheduling appointments and activities in several places, but also regarding the formal demands that must be met, like competence development. There is no teacher telling them what to do, and the students experience ambiguity when they feel that things can be interpreted differently from different angles or by different stakeholders. The students are asked to be their own director of learning and they have many questions around that when they are facing the unknown study path and struggling with handling with all the unclear expectations. The expectations are unclear in many ways e.g., what are the expectations of the clients, educators, or coaches and what the students should learn and perform. In addition, the assessment differs from typical academic courses because of the process-type working and reflecting. Also, the educator is not the only one who is assessing, as there are typically some self- and group assessment methods applied. Besides, the creativity of the solutions and the possible changes during the process might make it challenging for the students to know when the output is good enough to pass the course or what are the criteria for an excellent work.

There are multi-sided tasks to execute. On the one hand, the process as it is typically teamwork, and the other hand, the solution to the innovation challenge. The project outcomes are not defined in detail nor is there only one right way to do the work or project, as many results depend on many issues and the results may be creative. The project owner and project manager of the student team have a crucial role and the team members are dependent on them, affected by them. However, the roles of team members may also change during the project if it does not proceed. Although some students may have some earlier experience, for instance experience of project work, it can help or disturb as the situation is new and many things may change during the process. In some cases, a pitching event or even a pitching competition might be organized for the final evaluation.

Turning the presence of ambiguity to an opportunity

The ambiguity in a learning environment is based on lack of clarity. Thus, instructions and support to help the students to plan their work helps. The unclear project goals can be discussed with the project owner or commissioner. Writing the process as well as using design thinking illustrations are useful tools to clarify the mutual understanding.

Tutoring and mentoring as well as asking and answering questions are fruitful tools. Communication is very important between the team members and other stakeholders, to keep the team on the right track. In addition, educators may show some cases – from their earlier experience or other sources that can open the obscured situation. Peer support may also be valuable. Allowing the students to discover, experiment and try out different approaches to see what is working and what is not stands for a way ahead. Challenging the thinking of the students and encouraging them to creative thinking and stepping out of their comfort zone is valuable. Both the educator and other students should accept potential failures in interpretations, analysis, and testing. Room for failure should be given and learning from them is beneficial.

Embedding VUCA in learning environment design



3

In this chapter we open the concept of a pedagogical approach, called innovation pedagogy, used as a framework for designing VUCA methodology in higher education, define the concept of a hybrid learning environment, and describe how VUCA approaches can be embedded in practice on a more concrete level with designing elements; epistemic, spatial, and instrumental, social and temporal, based on the educators' perceptions from five European HEIs (see Figure 1).

We, the educators, are also facing the competences needed in dealing with the turbulence and the increasingly frequent change as well as the uncertainty, both in the way we approach the designing of the learning environments and the way we work with the environment. In an educational setting, learning is often well planned and structured which is conflicted in the real VUCA world where we are living and working. Therefore, it is crucial to prepare students to tolerate a sense of uncertainty, as well as to solve and apply professional problems in a productive manner without being stressed already during their daily pedagogical settings. Innovatively but carefully designed learning environments can be used as a safe platform for students to experience and train acting in the VUCA world.

A learning environment can be understood in a wide perspective as a socio-cultural continuity and discontinuity between the daily academic practices and the challenges of the VUCA world. The learning environment is based on the rationale, as a “basic philosophy”⁵¹ of the curriculum design that refers to the pedagogical approaches to learning (e.g., problem-based learning) and interventions applied to encourage learners to participate⁵² (see Figure 1).

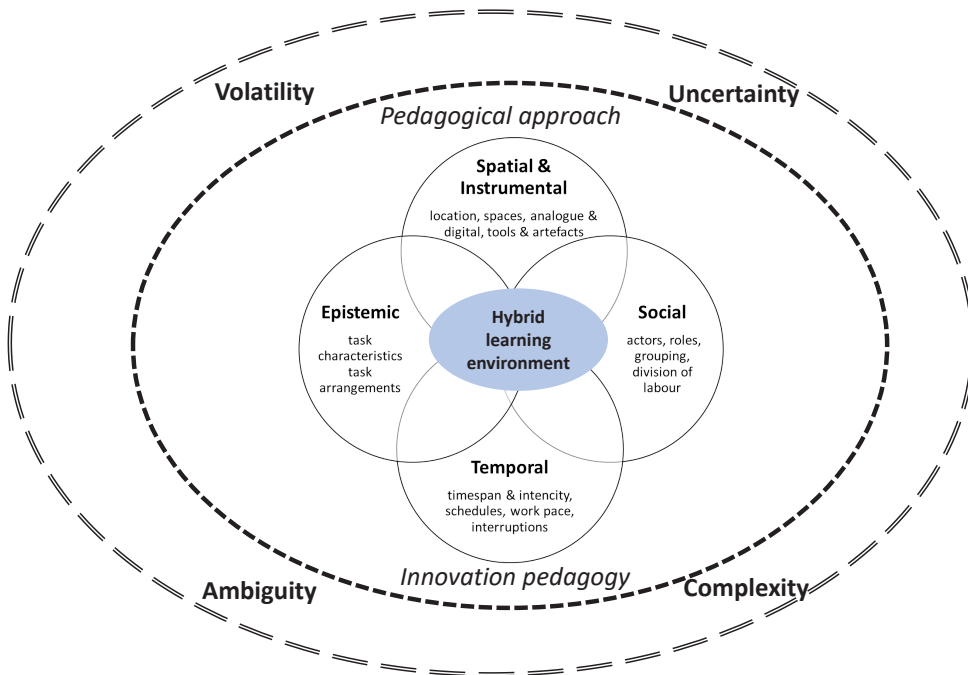


Figure 1.
Conceptual framework for learning environment design.

3.1 Innovation Pedagogy as a pedagogical approach for learning environment design

Innovation pedagogy is a pedagogical approach with an aim of developing innovative experts who have the required competences enabling them to participate in the versatile innovation processes of their professional career. Innovation pedagogy supports the argument that through social interaction, students may reach a higher state of development than they would achieve by working and studying on their own. When different actors (e.g., educators, students, working-life representatives) can work together in dialogue in such a manner that their own expertise can be efficiently shared and combined in fresh ways, it results in something more than the sum of its parts. This process also enables novel knowledge creation and understanding based on the thoughts and ideas presented by others. Moreover, according to innovation pedagogy, when the purpose of the universities of applied sciences supporting regional development is integrated to the learning process, achieving intuitive learning and tacit knowledge from practices and culture of community with facilitation is possible.^{53;54;55}

The aim of innovation pedagogy is to generate learning environments wherein learning takes place by applying knowledge by doing and experimenting in a problem-based manner in the context of working life. Learning also occurs through collaborative learning, not only from and with others but also from different sources of information in a multidisciplinary manner, by creatively combining different competences and experiences. From educators this requires supporting, encouraging, and guiding, in order to make life-long learning, collaborative working methods, combination of different expertise, and utilization of reflection and feedback possible.⁵⁶ It also involves not only competence in activating teaching and learning methods, and in planning and implementing successful teaching and the learning processes, but also competence in co-operation and networking with working life organizations, in flexible study paths, in internationalization and entrepreneurship⁵⁷.

A learning environment is most frequently understood as physical (e.g., a classroom or campus) or virtual premises and spaces (e.g., learning systems or platforms), meant and built for learning purposes, wherein we share the description, contents, and goals of the study unit. Some authors have been rethinking a learning environment from psychological and physical perspectives, e.g., the psychological comfort with space as well as the motivational and inspirational effects of space.

However, the concept of a social learning environment is often neglected in this discussion, although in the VUCA world problems are solved and innovations are created in groups and networks. Solving wicked problems requires people from many different disciplines who are expected to work effectively together, and knowledge and skills which do not belong to the scope of one discipline only. According to innovation pedagogy, the social aspects of working and learning are emphasized and group processes where learning happens in teams form an essential part of the whole process of learning. A social learning environment is formed by people with different talents and competences and by the interaction enabling collaborative learning.⁵⁸

In this guide, following the bases of innovation pedagogy, we aim to widen our thinking and define a learning environment “to indicate educational arrangements or systems that are designed and managed”⁵⁹. In addition, we underline that a learning environment is “both the socio-cultural and the physical/digital settings where learners perform their tasks”⁶⁰ wherein connectivity plays a key role by referring “to the relationship between work experience, learning and knowledge”⁶¹. “Learning across contexts implies that learners interact with, move across or participate in different practices and thus cross boundaries between these practices”⁶². In this guide, we called these kind of learning environments as hybrid environments, wherein the elements for work practice are incorporated into education.

3.2 Hybrid learning environments and design elements

To prepare students for the working life in the VUCA world, the curricula and the learning environments necessitate intentionally designed environments and learning processes for recognizing and thus understanding VUCA in a motivational educational context. This renders to turn professional uncertainty in to something positive and productive. All this requires specific designable elements for different types of learning environments.

The design characteristics of learning environments are expected to be broadened beyond the higher education institutions towards working life, e.g., by creating “dynamic learning systems”⁶³. In other words, the learning and working process can be merged, and learners can not only simultaneously learn and work, but also grow into community practice. These kind of intentionally designed hybrid learning-environments at the boundary of university and working-life facilitate communication between both contexts. They also include authentic goal-directed work activities or centrality of real-life work tasks. Additionally, physical settings in which learners can practice and be guided by experts from occupational practice and the variety of roles that actors fulfil in a learning environment are key elements as well.⁶⁴ These components can be designed in more concrete level by applying epistemic, spatial and instrumental, social, and temporal elements in design.

- *Epistemic elements* of a learning environment design are the task characteristics and the task arrangement. These elements are based on the needed competence that is seen as meaningful in the relevant domain. Supporting students to learn a vocation, epistemic elements are related to the occupation for which learners are being prepared; how people engage in work practice and what they can learn from the practices, what kind of tasks learners are supposed to engage in, and what kind of information they need to perform those tasks.⁶⁵
- *Spatial and instrumental elements* consist of physical features. Spatial elements are the location (university, work or third location), spaces (analogue or digital) and how these spaces are furnished (e.g., as professional workspaces or as traditional classroom spaces). Instrumental features include all tools and artefacts needed to perform relevant tasks.⁶⁶
- *Social elements* consist of all actors present in a learning environment, the roles that they fulfil, such as educational roles (e.g., coach, learner, assessor) and roles related to the profession (e.g., junior or senior colleague, or managerial roles), how actors might interact, how they are grouped and how tasks are appointed to and divided between different actors (i.e., the division of labour).⁶⁷
- *Temporal elements* illuminate the importance of considering affordances related to timespan and intensity of the programme, nature of the schedule, work pace (including the amount of time pressure), and work interruptions to slow down, accelerate or pause the work process for educational purposes.⁶⁸

The aim of this guide is to offer educators ideas and principles for pedagogical development. Therefore, we have divided the above-described hybrid learning environments in three different types of design to inspire many readers and show different levels to start with their own cases (see Table 3).

Table 3.

Describing hybrid learning environments through three types, applied from Bouw et al. 2020⁶⁹.

| HYBRID LEARNING ENVIRONMENT | TYPE 1 | TYPE 2 | TYPE 3 |
|-----------------------------|--|---|--|
| Epistemic | Task arrangements are simple. | Task arrangements are complex but relatively low risk. | Both basic and complex tasks, requiring high fidelity and responsibility for client. |
| Spatial & Instrumental | Situated at school (or digital learning platform). No specific spatial requirements apply. | Special physical requirements to replicate professional practice, perform certain procedures and/or work with specific tools. If situated in a school building a regular classroom can function as workplace. Tools, artefacts, and instructions from the relevant work practice are used to replicate that practice and train specific skills. | Fully mirror a professional work practice. Often located at a worksite and in the proximity of relevant businesses, experts or clients. If it is situated in a school building the spaces are fully furnished and equipped to function as real workplaces. Artefacts from school and professional practice are used to perform the required working and learning tasks. |
| Social | Number of actors/roles is limited. Students have the role of learners. Educators have the role of coach, mentor, reflection facilitator. | In the incorporation cases, teachers might be consulted on their expertise, but they do not intervene or participate in the work process as senior colleagues. | Both educators and students fulfil hybrid roles, i.e., they are at the same time Educator/learner and perform a professional role in the field. Large variety of actors and disciplines. Learners work with real patients, clients and professionals. |
| Temporal | Fixed timespan and scheduled group meetings, no work-related temporal features. | Purposeful limitation of time to simulate time urgency or purposeful extension to allow for more training and reflection. | Pace corresponds to workplace practices or customer's needs. |

Differences between hybridization designs can be identified across all the designable elements, albeit the division between types should be seen more as a sliding scale than tight categorization. Like presented in Table 3, all the types include tasks simulating real-life connection and multiple actors fulfilling a variety of roles in the learning environment, but the diversity and complexity of assignments and roles differ. Similarly, all the types have spatial, instrumental, and temporal elements in the learning environment, but the diversity and complexity of authenticity of work practice and timespan, pace and schedule differ. Table 3 summarizes the main differences between the three categories.

3.3 Design elements including VUCA aspects

Epistemic elements including VUCA

VUCA can be designed in epistemic elements in several ways. First, *volatility* is included as the tasks and assignments are often from real working life and thus, the usual academic approaches are not applicable. Instead, the students must make up their own approach. The students must define their tasks and processes to complete the project. In addition, the tasks may change, and the students must reformulate and adjust the work, often on the fly. The projects are challenging for the students, and they experience *uncertainty* as adequate information is not available, and the educators are not supplying them the list of readings or materials. Instead, the students must recognize themselves what knowledge is needed, where to find it and how to apply it to the case. In perceiving the needs for executing the tasks, solving the problem, and managing the processes, the students do not trust their own capability. The results are not predictable and forecasting the output is difficult. They are forced to create hypotheses and proceed by testing and retesting them as well as reflecting on their own thinking and experiences.

During the task, there are several issues going on at the same time and that makes the situation *complex*. Students must decide what to do and in which order although they might feel confused. The complexity increases as the students do not easily perceive or handle several interconnected parts and the big picture is often lost. More confusion may be caused by the challenges of balancing the tasks and duties from the project with all the other courses in the curricula, as well as private life. *Ambiguity* is based on unclear tasks and expectations. The students cannot be instructed clearly what to do but more encouraged to think creatively. Also, the criteria for excellent work may remain unclear and assessment is typically based on reflection. Interpretation of assignments and the ways of solving the problems may differ as there is neither only one right way to do the work nor only one solution.

Spatial and instrumental elements including VUCA

The hybrid learning environments, presented in this guide, can be characterized with different structures compared to typical academic courses or programmes. When aiming to create a learning environment that supports the students to manage in the VUCA working life, it is not only about the physical premises that can be e.g., smaller team working spaces than typical classrooms or auditoriums, or spaces that are furnished or equipped like an office or other workplace. Correspondingly, the tools or digital platforms may vary from the ones that are used in academia or private life in general to those industry specific ones that are used in a certain occupation. However, the main idea for including VUCA components to design the spatial and instrumental elements in the learning environment is based on the practices in which they are applied.

Working life orientation prepares the students for the volatile world but still in a safe environment that supports the wellbeing of students during their education. *Volatility* means that there is not necessarily any strictly structured schedule, but the students must agree on the meetings, meeting places, and those may also change. The students get used to different meetings where the participants may change time to time and some meetings are supervised, and some are not. In addition, it can be considered weekly, whether the meetings are face-to-face or remote. It is important to allow that learning can take place both in personal and professional contexts.

By providing an environment where the students can acknowledge *uncertainty* in a relatively safe way, the students may tolerate its presence in a productive way. For this, different online tools, e.g., for communication or reflection purposes may be provided. *Complexity* is based on the difference from their typical classes and the need for students to organize and adjust their work, agendas, and responsibilities. The students must invest in visualizations of the process with suitable tools to communicate the bigger picture of the project. There is not only one way to do the work, which refers to the presence of ambiguity: the students are encouraged to learn to combine their different means and resources as well as choose the communication tools and meeting places for the teamwork according to their own choice.

Social elements including VUCA

These hybrid learning environments are typically based on teamwork and several VUCA components are connected to that. *Volatility* is caused by the heterogeneous students that form the teams as they are typically unfamiliar to the student, at least in the beginning

of the project. In addition, the students may represent a different degree programme. Thus, the team may be multidisciplinary or some of the members are exchange students, so there is a variety of challenges in communicating and the ways of thinking. Team dynamics are usual, as there are often changes when some students may step out of the course and new ones come in. Some conflicts in the team process are not rare. In addition, the roles of students may change during the course.

Students must learn to be open-minded and reveal themselves as well as present their ideas in front of the others, which may cause *uncertainty*. The students can be paralyzed and unable to act in that context. Even though they feel uncertain, they must take an active role as a learner or team leader. Collaboration is crucial, asking questions and supporting others as well as reflecting, arguing, and illustrating the opinions to other team members. Students work with many stakeholders with different agendas and tasks that makes forecasting difficult.

The students learn from reflecting, having the courage to engage themselves and discussing these with others, which usually leads to a higher ability to reflect and acceptance of complexity. The students must take different roles and at least some of them act as leaders of the team and the individuals. *Complexity* makes it difficult for students to establish confidence in the team and pool the team's collective means and resources. Sometimes, it is challenging for the students to open up, trust their own as well as the other students' competence. Overall, the students can learn to support each other and thus reduce the complexity they experience.

Ambiguity is caused by unclear expectations of the students themselves, the other students, the coaches as well as the project owners or commissioners. As these courses are not teacher-centric, the roles of the students are not as clear as in a typical academic course and the interpretations of others must be considered, thus mavericks do not succeed. The students discuss their choices and reflect upon them with other students in the team. Team-based work means that the team is learning together. The assessment is also typically based on team learning, and self-reflection as well as team reflection is required.

Temporal elements including VUCA

The students experience *ambiguity* whenever they start a new course or a new study programme. In these hybrid learning environments, the situation is even more challenging as there are many things going on, e.g., managing the team and other stakeholders as well as the process of proceeding with the challenge. Working together and doing too

many tasks at the same time the students experience *complexity* to a high degree. This complexity makes it difficult for the students to make choices and to find out what must be done first.

Volatility is experienced as many of these tasks and processes may change during the course, and alongside the assumptions must change as well. Thus, the things the students believed in reveal to be different so they must change the way they initially wanted to develop the project. In addition, the meetings may change even weekly, and the schedule of the project is dependent on the project owner's timetables that may also change. Thus, it is important to be flexible with the project owner's or clients wishes. It has been found useful to give only the starting and ending dates but keep the schedule between them open. Thus, the students must adjust their approaches on the go. These issues enable the students to handle their uncertainty productively by learning to acknowledge and tolerate its presence from the beginning when they do not know the other students, the challenge is unknown as well as forecasting the output is extremely difficult. However, these learning environments aim to prepare the students for uncertainty in the future working life.

Experiences of educators in VUCA embedded learning environments

4

In this chapter the aim is to deepen the subject with educators' experiences on working in a hybrid learning environment.

Working in a VUCA learning environment and educators' experiences of it, form an interesting area for research. As a part of the PUNC project, some experiences of the educators were collected via a survey. The aim of the survey was to examine educators' perspectives and opinions of specific higher education learning environments. The survey clarified educators' experiences, perspectives, and opinions about how it is to work in these hybrid learning environments.

The survey was conducted in five different European countries (Denmark, Finland, Netherlands, Poland, and Spain) representing five HEIs. The survey was conducted during March 2021 and in total 177 replies were collected. First, the survey revealed that the participants are very experienced in teaching. The educators are very professionally experienced as most of them (70.5 %) have more than 10 years working experience, approximately one quarter (19.5 %) have 6–9 years' experience, and a minority (10 %) have 1–5 years of working experience as an educator, as illustrated in Figure 2.

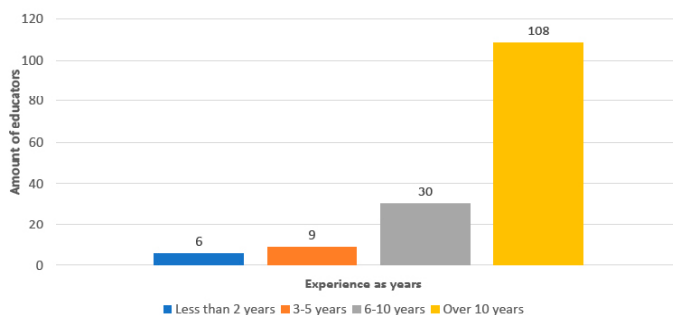


Figure 2.
Educators' working experience as years.

To describe the feelings when working as an educator in a VUCA learning environment, the educators were asked to evaluate following experiences: meaningful, enhancing my competence as an educator, inspiring, rewarding, motivational, challenging, uncertain, stressing, insufficient and confusing in the context of that learning environment. The educators gave 'completely agree' or 'somewhat agree' answers to the variables; challenging, motivational, rewarding, inspiring, and enhancing my competence as an educator. The answers to describing the learning environment as stressing or confusing were completely or somewhat disagreed with.

In other words, it seems that although working in a hybrid learning environment can be very challenging for an educator, at the same time it is also a motivational, rewarding, and inspiring environment to work in, which also enhances educators' competence considerably. Generally speaking, the educators seem to be satisfied with the learning environments they have as shown in the figure below. (Figure 3)

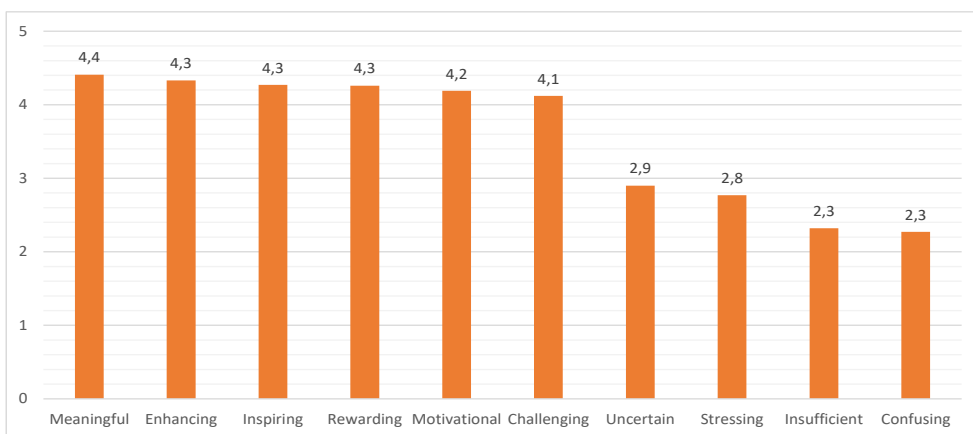


Figure 3.
Experience as an educator.

The survey also contained open answer parts, in which the educators had the opportunity to describe more specifically their perceptions and opinions of important elements in enabling students' learning in hybrid learning environments. Next, we raise the key points which the educators highlighted in their answers.

Based on the open data results, in VUCA learning environments educators often think about the suitable balance in giving guidance and instructions and, on the other hand, not over-instruct but give enough freedom to the students to organize, solve problems and

arrange the tasks. Some learning environments are fundamentally made for exploration and trial and error type of work, where more freedom and less guidance are given to the students. Other learning environments may require clearer tasks, solid structure, and well-defined goals for desired outcomes to actualize, otherwise the learning process may end up being too chaotic. For educators, *finding the right balance between the control and freedom* is not always an easy task to solve.

Educators pointed out that learning by doing is the best practice to enhance the skills that are needed in working life. The students who *learn to ask why, when, and how* and can use creativeness, flexibility and adaptiveness skills are the ones who do well in the real world too. When the learning environment offers possibilities to practice problem-solving skills and working in versatile teams, it creates important skills for working life and makes students better in terms of their future jobs.

Students should be encouraged and it should be explained to them that *not knowing* is a very important aspect of the learning process. Learning is about exploring knowledge and an educator is a facilitator of this process. Educators see that their role is to support when things are getting difficult and the students are stuck but otherwise, students must be very active in problem solving and try out how to manage tasks themselves. In this way, the students can make mistakes and learn from those but still get results. By giving the students enough room and flexibility to make their own decisions will enhance their creativity and increase knowledge. Educators are thinking that mistakes and uncertainty of how things should be done are usually more acceptable in a learning environment than in an actual work situation. Therefore, it is essential *to make mistakes and learn how to deal and solve those first* in safe learning environments.

From educators' point of view, uncertainty is an element which is a necessary factor for learning purposes. To make an essential leap in learning, *students need to come out of their comfort zone*. However, they also need enough safeness, like structures, encouragement, and skills to face the uncertainty. The skill of tolerating uncertainty is one of the most essential ones, not just in learning contexts but also in context of life. Uncertainty is part of daily life, both personally and professionally. In learning environments some VUCA components emerge as a surprise in the process of working. These may be based on internal issues of the group as well as on outside-in events or actions of other stakeholders. When students learn to work in a changing and somewhat chaotic settings, it prepares them to manage with real life.

In the survey, the educators described their role as being more like the one who sets a right learning direction of a learning process, provides support and guidance to the students in the work process. The role could be described more like an advisor and *facilitator, than a director*. An educator is the one who keeps an eye on that the learning

goes in a productive direction. Too much detailed instructions and teacher-centricity can lead to passiveness of the students. Thus, for an educator, it is important to find a *balance in steering, guiding, trusting, asking and even in when to let go*. Naturally it is good to remember that opposite things don't necessarily contradict each other. Allowing mistakes, and encouragement for creativity doesn't mean that clear instructions should not be given.

Students learn from, with and through each other, and doing and learning together is much more effective than someone telling you exactly what to do. *Educators' role is to inspire and stimulate the students as well as show good practices but also give enough space for their own thinking and learning in students' own rhythm*. By preparing everything well the outcome may be too much "teacher desirable". Perhaps it is important more to understand that an educator may have a clear vision of the outcomes but there are many solutions and paths to solve problems. If an educator primes too much, the students will not genuinely start to think themselves and an outcome can be much less creative than what it could have been.

The educators emphasized that *creativity and creative thinking are the engines of a learning development*. Students can be very creative in constructing their knowledge. An educator should encourage creativity and creative thinking and let students form their own opinions and reflect on their actions and outcomes, so that students are able to apply different techniques for creative problem solving. For a creative process to be successful, it is important that the students have freedom to move in different directions. Albeit the process might be controlled but is better to keep the way of moving relatively free.

Diversity in learning teams is seen as an important tool for broadening the vision of the learner. Working together allows students to learn from each other, construct knowledge and discover new things together, but also to make mistakes and find a way to correct those and make progress in learning. Working with others provides the possibility for encountering uncertainty, especially when they are unfamiliar with the others. Very often many students at the beginning of the course are very shy, and they need some time to start working together. Working together and being responsible for results increase *trust and students can learn to trust themselves and other team members*. Teamwork enables students to develop communication skills and to understand the meaning of *being an active agent of their own learning*, as well as developing self-management and leading skills.

In the next chapter, the guide presents three different types of hybrid VUCA learning environments where the survey respondents are working.

Nine cases of hybrid learning environments simulating the VUCA world



5

In the next chapters, we present altogether nine different cases, which are higher education courses of hybrid learning environments simulating the VUCA world. In those cases, the elements of the learning environment have been partly consciously considered to include components of the VUCA world but very often, some VUCA components emerge as a surprise in the process of working during the course, like described in the previous chapter.

The cases are categorized into three groups according to the hybrid type of intensity of the embeddedness of the working life context to education (see Table 3 in Chapter 3.2).

5.1 Type 1: Case designs based on hybrid learning environment

5.1.1 Character Skills, BAAA - Business Academy Aarhus

”For a creative process to be successful, it is vital that the participants are free to ‘move’ in different directions.” – Anonymous educator

The Character Skills course is meant for first semester students completing a bachelor’s degree. The subject content is based on promoting an understanding and acceptance of the importance of personal competencies and character qualities as additional, but equally important elements in the educational programme as knowledge and professional skills. This is done by an initial presentation of existential philosophical

questions, ethics, psychology, resilience etc. The subject couples character traits with the formation of a growth mind-set, which is necessary to succeed in the 21st century labour market.

The course is carried out as a blended learning course with individual online preparation and reflection exercises and working in class. Currently, in the learning environment there are 4 teams of 35 students (2 international + 2 Danish), which each are led by one educator/teacher. In total, it includes approx. 140 students and 4 educators, but soon more bachelor students will be in.

The course is based on innovation pedagogy, draws on philosophy and psychology and is carried out as blended learning – where studying emphasizes learning through experimenting, from and with peers and most importantly, through reflection. The course is about becoming aware of the importance of character skills and preparing for 21st century skills. In the course, the students work on developing overall life skills and the six character skills: ethics, curiosity, courage, resilience, mindfulness, and personal leadership. It is not a question of increasing or decreasing the character skills, for instance becoming more courageous, but being able to gain knowledge about, relate to and reflect over courage as a character skill, prioritizing if, how and when to be courageous, professionally and personally.

The student has an active role and is responsible for their own learning and ongoing reflections and creating an e-portfolio. The lecturers' role is to facilitate and support students' reflection skills.

VUCA in Character Skills

| | |
|--|--|
| <p>Volatility Different from the other academic subjects. The usual academic approaches are not applicable. Working life orientation. Personal character and value-based orientation.</p> | <p>Uncertainty Unexpected content. Reflection, argumentation, and illustration of opinions and actions. Need to engage and involve themselves personally. A risk to expose themselves in front of the teammates. Paralyzing and inability to act in the context.</p> |
| <p>Ambiguity Lack of understanding the character skills. Unknown ground as each assignment has many possible and very individual answers.</p> | <p>Complexity Overwhelmed by the complexity in the interpretation of the character skills. Thinking, meaning, and reflecting upon and applying character skills personally and professionally is complex and exhausting. Difficult to trust own perceptions and to trust others.</p> |

VUCA design elements

The main design element that includes VUCA components in the Character skills course are *epistemic elements* that are strongly based on the students' own capabilities and reflections on the six character skills defined in the Four Dimensional Education Model⁷⁰. Among the *temporal elements* are the fact that the course shifts between individual preparation/students' own work through the online material and the teaching lessons in class. Here the online material and the reflections caused by the material and reflection tasks comes into play. On the one hand, students must manage a tight schedule, but on the other hand have freedom to plan their own pace. Some students can administer that very well, others not quite. The teaching lessons (*spatial elements*) are situated in the regular classroom, but the rules during classes are like in a workplace. Full attention, no mobile phones or computers open, pre-defined working teams etc. Exercises take the starting point in "when you work as an intern or a marketing assistant" (just an example) you must illustrate curiosity etc. to be able to replicate in the practice after graduation. However, *social and instrumental elements* are also included in the description.

The working life orientation and the overall purpose to prepare students to act in a VUCA world is achieved by focusing on character skills as a valuable resource and stable part of personal skills and competences. It is perfectly acceptable that there are no right or wrong answers, instead there may be as many answers as the number of participating students. Thus, it is required that the students develop and work with acquiring high reflection skills and accepting the uncertainty and complexity in the subject of character skills itself. As the usual academic approaches are not 100 % applicable in this unexpected course, the students can only partly rely on theory, tools, or methods from the curriculum. Instead, they must rely on their personal perception, ideas, and actions towards the character skills. They must apply this in a both personal and professional context as a future entrepreneur or intrapreneur, in a sales and marketing career or whatever line of professional areas of work they are to pursue after graduation.

The students need to engage and involve themselves personally to a higher extent than on other academic courses. It is not possible to "hide" behind the academic content and context. The students experience that they might risk exposing themselves in the classroom in front of their teammates, thus experiencing uncertainty and ambiguity. Reflection on the actions and the consequences of acting is a difficult and complex discipline for most students. They may be overwhelmed by the complexity in the interpretation of the character skills and how to apply them in real life. In addition, it is complex and difficult for some students to open up and trust own perceptions, thoughts, and reflections and to trust others. The students can be paralyzed and unable to act in that context.

Ways of turning VUCA to opportunities

Recognizing and accepting uncertainty in the Character Skills course contains the opportunity to prepare for uncertainty and more or less all VUCA elements in the future working (and personal) life. It also increases the motivation for the students. The framework for reflection, e.g., online material, is helpful. The students learn from being curious, mindful, reflecting and having the courage to engage themselves and their reflections in discussions with others, which usually leads to a higher ability to reflect and accept complexity. As mentioned before, the idea is not to increase some of the character skills, e.g., courage, or moving their own character skills on a scale but more about reflecting over what courage means to them and maybe decide to work with developing courage.

Experiences of the educators and their tips

The Character Skills course promotes an understanding and acceptance of the personal competencies, especially in knowledge and professional skills. An educator encourages the students to understand that not knowing is an important aspect both in life and in studies. Building and supporting students' reflection skills are crucial in this course. Building trust inside the team as well as trust in students' own capabilities is vital. During the studies, the students meet regularly in a learning environment where complex issues are managed, and development-orientated situations are in place. A core part of the studies is that a student can identify their own learning needs and develop their own knowledge, skills, and competencies in relation to the development of character traits. As this course is about personal and professional skills, also learning is interconnected.

The educator's role is to show good practices and support the students in many matters like following a work-like schedule and organizing regular meetings. Also, to train students to tolerate temporal changes and to work under pressure is important in this learning environment, thereby to transfer and display the character skills in reality.

From an educator to an educator

- “Try to have a growth mindset yourself.”
- “Using structure as a design element, give the students a safe frame, where the process sometimes can be perceived as chaotic, but after evaluation and reflection, the students realize that they actually learned a lot.”

Some additional facts about the Character Skills

| | |
|---|--|
| Institution | Business Academy Aarhus |
| ECTS/credit points | 5 |
| Students' main subject/Degree Programme | Business and Innovation and Entrepreneurship + international students |
| Level of studies | Bachelor |
| Year of studies | First semester Bachelor students |
| Number of students | Approx. 140 students. 4 teams of 35 students (2 international + 2 Danish) |
| Internationality | 2 exchange students' teams |
| Educators (amount and type) | 4 lecturers, each team is led by one lecturer. |
| Evaluation and grading | Oral exam based on a written self-reflection and teamwork reflection. |
| Spatial and instrumental issues: the learning spaces and tools used | 50% in class; 10% in field; 40% self-studying Tools applied: Canvas (LMS), MS Teams |
| Epistemic issues: assignments and tasks are executed | 50% individually; 50% in teams in class |
| Temporal issues: timing, schedule, pace etc. | Estimation of 48 hours working of which 30 hours are individual online work preparing for class. |
| Social issues: centeredness and roles | 30% teacher-centred; 70% student-centred The lecturers' role is to facilitate and support students' reflection skills |
| Other issues | Students keep an e-portfolio and hand in reflections after each teaching lesson, one character skill at a time |

5.1.2 Research Project Course, UG - University of Gdansk

”Learning is a part of life, we have to expect the unexpected, keep our eyes open.”
 –Anonymous educator

Research Project Course is a learning environment in different academic fields (i.e., Psychology, Economy, etc.), wherein preliminary research projects, based on empirical research tradition, are carried out in groups of 14–18 mostly third-year students, divided in smaller teams, with 1 educator (with a PhD) per group. The research projects are obligatory courses.

In the Research Project Course, students learn research project work and management in practice and theory. Each seminar has its own topic (main research theme), and students form smaller teams (4–5 students per team) in which they perform the research project they have chosen. It is oriented towards project- and research-based learning methods. In the course, student can increase their project, research and analysis skills. Students have an active role, and they are also responsible for their team.

During the course, students are supposed to invent, design, perform (research/ implementation/experiment), analyze and present their own research projects following a strict timeline and ending with a presentation during the seminar’s contest.

VUCA in Research Project Course

| | |
|---|--|
| <p>Volatility Different than earlier courses. Unfamiliar students.</p> | <p>Uncertainty Not knowing the rules of working before they start. The preparation process needs resources, but the reaction or outcome is uncertain. Unknown expectations and outcomes. No idea how much time they must spend to achieve results.</p> |
| <p>Ambiguity No “one solution”, many results depend on several issues and views. Mistakes in conducting the research. Different interpretations of results.</p> | <p>Complexity Overwhelmed by the complexity in the Consider many variables. Research methodology (especially psychological one) is extremely complicated. Rules and law (GDPR) are challenging. Need to prepare a complex and time-tight schedule.</p> |

VUCA design elements

The Research Project Course design includes views on all the four elements at some level. *Epistemic elements* are present through the challenges of doing research in various academic fields, which is complicated based on the methodologies, rules, and law (GDPR). There are many variables to consider and lack of knowledge about various methods that is part of the *instrumental elements*. The students need to put a lot of work in the preparation process, they are uncertain about the outcome, and the reaction. Thus, the allocation of resources may be much more demanding than the predicted results. The students are often insecure if their research idea is good enough, thus the willingness of changing the idea occurs time to time. Mistakes in conducting the research and different interpretations of the results makes the situation inconsistent and obscured. In addition, it is confusing that there is no "one solution", as many results depend on several issues.

Considering the *social elements* in this learning environment, the unknown expectations of others are in an important role as both students and teacher are not sure what to expect from one another. The students are working in small teams, often with unfamiliar peers, on something new, complex, and they may not know what to expect from their teammates. *Temporal elements* are present, as the students need to prepare a complex and time-tight schedule although they do not have any idea how much time they must spend to achieve results.

Ways of turning VUCA to opportunities

Although the learning environment is challenging, it increases the students' motivation to innovation and creativity. The students learn to work as a team and thus share and divide tasks as well as read others' research. The educator may support the students by showing good practices, sharing knowledge and previous research presentations. In addition, preparing templates of documents or making a general research seminar plan may be helpful for the students to understand when and what they should prepare. Asking questions, spending a lot of time in the library, and testing the solutions on each other is proceeding in the process, as practice makes perfect. Accepting potential failures in interpretations, analysis or testing and learning from these failures is important.

From the educator's point of view, this way of designing a learning environment also changes the way of thinking, disturbs the educators' well-known frameworks as well as forces them to be more tech-savvy. However, it is important to trust in students' competences and utilize methods of tutoring and mentoring.

Experiences of the educators and their tips

As the Research Project Course is very much about making projects, it is important to understand the project mindset and implement it in practice. This means that students are working in different professional roles, they learn to work towards given deadlines and apply digital communication tools of different kind. In client work, flexibility to the clients' timetables or other wishes is important. To run projects successfully, the team must learn to trust each other, take responsibility, and learn to work together. The Research Project Course utilizes peer- or team-based methods.

In general, the studies offer a learning environment where complex issues are relatively safe and possible to manage. An educator's role is to encourage the students to think creatively, to trust students' capability to run the projects and support students to reflect their work. This learning environment is about learning both in personal and professional contexts.

From an educator to an educator

- “Let the students learn by themselves and from their peers. Be more like a mentor rather than teacher as at school.”
- “Listen to students and adapt the pace and manner of work to their needs. At the beginning of the class, do not expect students to be aware of their needs – you must discover them in them. Be flexible and mindful. Guide them, but not relieve them in their work and thinking.”
- “Trust students, their imagination and creativity.”
- “Creating a flexible but structured timetable and supporting students with interesting materials. It works when methods involve different kinds of tasks like visual thinking or problem solving but still are based on literature.”
- “Have patience. Educate and allow for mistakes but require effort and engagement in the tasks.”

Some additional facts about the Research Project Course

| | |
|---|--|
| Institution | University of Gdansk |
| ECTS/credit points | 4 |
| Students' main subject/Degree Programme | Various degree programmes |
| Level of studies | Undergraduate/5-year long uniform Master Degree |
| Year of studies | Third year |
| Number of students | Total ca. 14–20 students, divided in small teams where ca 4–5 students in each. |
| Internationality | |
| Educators (amount and type) | At least PhD-level Educators, 1 per group (i.e. about 15 on Psychology) |
| Evaluation and grading | Internal and external research competitions |
| Spatial and instrumental issues: the learning spaces and tools used | 20% in class; 40% in field; 40% self-studying Tools applied: MS Teams, SPSS |
| Epistemic issues: assignments and tasks are executed | 30% individually; 70% in teams |
| Temporal issues: timing, schedule, pace etc. | During the spring semester: February–June. Estimation of 60 working hours, of which ca. 30 hours is research and analyses working and about 30 hours are meetings, project management, preparations, weekly 2-hour group meetings. Competition for the best research projects from every group at the end of semester. |
| Social issues: centeredness and roles | 10% teacher-centred; 90% student-centred. Each student group has one educator. |
| Other issues | Very short time for the research. |

5.1.3 Building Startups, UPV - Universitat Politècnica de València

“It allows them to face real problems, in real situations with the instruments that will do it in their professional life.” – Anonymous educator

Building Startups is a learning environment for students from different years in the field of Engineering and Business. Building Startups is carried out in groups of 30 students and run twice in academic year with 5–6 different groups, divided in smaller multidisciplinary teams working on a real business idea. Every team has its own mentor and coordinator.

In Building Startups, students learn business model development through the Lean Startup methodology^{71,72,73} in student teams. The practical course includes theory about all the phases in business model development and an “out of the office” part to validate the hypothesis. The learning is supported with theory, teamwork, and mentorship meetings. Students learn through experimentation by working in interdisciplinary teams with different backgrounds, combining different sources of knowledge and real-life experience to develop their projects.

During the course, all the phases of business model development include theory, project development, practical work, and reporting. The mentor and coordinator carry out personalized monitoring of the teams and make a final evaluation of the projects carried out.

VUCA in Building Startups

| | |
|---|---|
| <p>Volatility The “rules” to develop new business models have changed. The ways of validating hypothesis have changed. Forming a team with heterogenic and unfamiliar students. Different from the normal classes.</p> | <p>Uncertainty Working with hypothesis. How the hypothesis will be responded needs to be completed with information. Unexpected situations occur. Uncertainty about how to develop the projects with unknown people.</p> |
| <p>Ambiguity Developing new business models for something that did not exist before. Several issues must be validated in real life.</p> | <p>Complexity Working and competing in a global market means different market characteristics and different regulations. Adjusting the tasks, agendas, and responsibilities to go ahead with all their responsibilities.</p> |

VUCA design elements

Temporal elements in this learning environment are crucial as the markets are in constant change and the COVID situation has made the changes even more radical. Thus, the “rules” and ways how to develop new business models have changed. In addition, complexity is present in the daily basis because it is different from their normal classes and the students must adjust their tasks, agendas, and responsibilities to go ahead with all their responsibilities.

Social elements are present at the beginning of the programme as most of the students do not have a team, they do not know the people they are going to work with, and this causes situations of uncertainty about how they are going to develop their projects. Heterogeneous teams with no previous experience as well as different profiles and character skills may cause situations that can be complex to deal with.

As developing digital business solutions involves working and competing in a global market, that means different market characteristics as well as different regulations, there is a need for a wide understanding of the *spatial and instrumental elements* of the learning environment. *Epistemic elements* include information to create and validate hypothesis about markets, customers, and price, to get response from the markets via different tools. Typically, something unexpected occurs in the situations where new products or services are developed.

Ways of turning VUCA to opportunities

Discovering the opportunities is important. During the programme the assumptions must change, the things the students believed in, are revealed to be different. Thus, the students must change the way they wanted to develop the project. Constant monitoring of this process supports the students.

Experiences of the educators and their tips

This learning environment blends multidisciplinary students in smaller groups, in which the students lead and oversee the activities. Student activity is supported by a mentor. The team’s common goal is to create a business idea and develop it further together. Developing their own business idea requires creative thinking, peer- and team-based working methods, and tolerance of uncertainty. This course crosses the borders between university and working life.

The mentor meets the students regularly and gives support and helps in reflective thinking. This is important as students must prepare a complex and tight schedule by themselves and apply theoretical knowledge in practice. The mentor uses pre-planned work interruptions but at the same time everybody must be flexible as temporal matters may change due to the nature of the course.

From an educator to an educator

- “Apply project-based learning where students can find multiple solutions to a given problem.”
- “The establishment of clear processes through the student’s teaching guide has been very positive, since that way they know ‘the rules of the game’ from the beginning.”
- “Establish ‘agreements’ with students from day one.”

Some additional facts about the Building Startups

| | |
|---|--|
| Institution | Universitat Politècnica de València |
| ECTS/credit points | 4,5 |
| Students’ main subject/Degree Programme | Multidisciplinary. Students in the field of Engineering and Business. |
| Level of studies | Bachelor |
| Year of studies | Fourth year. First and second semester. |
| Number of students | Approx. 30 students in each semester, divided in 6 teams of 5 students. |
| Internationality | Teams include international students |
| Educators (amount and type) | 3 lecturers and a mentor for each team |
| Evaluation and grading | Evaluation based on business model document, Individual portfolio of activities and oral presentation (pitch deck) |
| Spatial and instrumental issues: the learning spaces and tools used | 40% in class; 20% in field; 30% self-studying Tools applied: Miro-board, Zoom, Teams, Dropbox, Trello |
| Epistemic issues: assignments and tasks are executed | 10% individually; 90% in teams |
| Temporal issues: timing, schedule, pace etc. | First group: October–January; Second group: February–May |
| Social issues: centeredness and roles | 30% teacher-centred; 50% student-centred and 20% expert-centred. Each student group has a mentor and coordinator. |
| Other issues | A final presentation of the projects is held in front of a jury of “investors”. |

5.2 Type 2: Case designs based on hybrid learning environment

5.2.1 Project Hatchery, Turku UAS - Turku University of Applied Sciences

"It is important that students are given enough room to try and succeed, and learn from their own judgement and possibly even mistakes, yet enough vision and objectives are needed for the students to know which way to go." – Anonymous educator

Project Hatchery is a learning environment that is obligatory for all first-year students in 15 different Degree Programmes in the field of Engineering and Business. The concept of Project Hatchery has been developed since 2008. There are yearly over 1300 students participating in approximately 100 multidisciplinary student groups, each consisting of 10–15 students, with ca 25 educators and over 100 second-year student tutors, whose role is to support and direct hatcheries' work, but they do not participate in the project itself.

In the Project Hatchery, the student has an active role, and they are responsible for their own learning and project implementation. Working-life orientation is emphasized, and project-based learning methods are used. The course includes project work in practice and theoretical studies of project management. Each project hatchery group has their own real-life project that they will work with independently throughout the course. The course also includes a theory part on project management, which includes independent studying and social and cooperative learning in thematic reading groups. Reading groups are implemented three times during the course and they are led by the student tutors. Scheduling is planned and agreed on in the group.

During the course, each hatchery group prepares:

- a group orientation task including rules, roles, and responsibilities,
- project plan,
- poster with pitch,
- innovative presentation and
- a final report.

Each group member completes an individual task in the orientation phase, a final reflection of their own work and self- and peer evaluations at the end of the project.

VUCA in Project Hatchery

| | |
|---|---|
| <p>Volatility Lack of stability; heterogenic and multidisciplinary groups, unfamiliar members in the group or changes in group members.</p> | <p>Uncertainty Lack of knowledge or inadequate information; no prior knowledge about the assignment or project work, new roles/responsibilities of students/educators (not teacher-centred), 1st year students do not trust their capability to complete the projects.</p> |
| <p>Ambiguity Lack of clarity/understanding; no teacher telling what to do, the expected project outcomes are not defined in detail, the criterion for excellent work is unclear. Interpretative; there is not only one right way to do the work.</p> | <p>Complexity Overwhelming number of moving parts; several issues are changing during the course or no specific tasks defined.</p> |

VUCA design elements

The emphasized design elements that include VUCA components in the Project Hatchery are *social and epistemic elements*. Social elements include volatility based on the team dynamics and unfamiliar team members that represent students from several other disciplines, like engineering students and business students from a variety of Degree Programmes. In the Project Hatchery, the students have different roles than in their studies usually, and they must take the lead of the organization process themselves. The daily tutoring is the responsibility of a student tutor as the educator is more in the role of background support. This differs from daily academic courses, as the educator is not giving exact instructions.

Epistemic elements consist of assignments where both the subject and the working process are new to the students. The needs in the modern working life are linked to the course to motivate the students. However, as the participants are 1st year students, they do not necessarily trust their capability to complete the project. In addition, it is typical that the tasks change during the course. Teamwork is important as mavericks do not succeed. The expected outcomes of the projects are not defined in detail and there is not only one way to do the work. The criterion for excellent work is unclear and the students must evaluate their work and results themselves too.

Spatial and instrumental elements include e.g., complexity as there are several communication channels and platforms used. The hatchery work is planned to be executed at a given time and place. Each hatchery group has their own classroom, and the working time is in the school timetable. However, the groups have some freedom

to decide the place of work depending on the content and stage of the project. Working online is occasionally used.

Temporal elements include e.g., ambiguity and complexity. There is a general schedule for the course but not all the work is scheduled or similar to the groups. The groups must make their own schedule. The general schedule is planned by using the concepts of design thinking and the CDIO-model⁷⁴. Certain stages during the project work are identified and scheduled. The hatchery groups build their own schedule around this frame. On a weekly basis, there is a certain time for the hatchery work. During the school hours that are scheduled for hatchery work, the groups are free to decide how they use the time. However, the group members must update a common weekly report on what they have done for the project, what the results have been and what has been learnt. The group must plan their work and they are responsible for keeping up with the schedule on a weekly basis and in the longer term as well.

Ways of turning VUCA to opportunities

The educator supports the grouping and planning their work in close cooperation with the student tutors that give feedback to the students during the course and at the end. The way of working is justified by discussing with the group. In addition, the project goals are discussed with the project owner who may represent a commissioner either inside or outside the HEI. Self-reflection at the beginning as well as group reflection at the end help the students to understand the process and the outcomes.

Experiences of the educators and their tips

In the Project Hatchery learning environment, educators think that it is very important to encourage creative thinking and that students learn to tolerate the presence of uncertainty which is very common in project work. As the students are first-year students, it is good to provide an environment where complex issues are relatively safe to work with and educators are giving enough support throughout the project. This is done e.g., by meeting regularly with the students and giving starting and ending dates but keeping the schedule otherwise open. These give freedom to students to plan their own pace of working.

In the Project Hatchery, the educator's role is more like to act as a senior colleague who is showing good practices to the team members. As reflective thinking is important, the educator has a significant role in supporting students' reflections and being like a reflection facilitator. The educator should allow that learning can take place both in personal and professional contexts.

From an educator to an educator

- “Work with a colleague or two, don’t try it alone. Learn to live with ambiguity, don’t think yourself as superman!”
- “To encourage people is crucial and show that you trust them.”
- “Be positive and confident about what you are instructing, it is contagious.”
- “Relax and breath, you are going to do great. No one was born as a master, so give yourself and the students a bit of time to work everything out. Also, make your standing clear, you are not doing their project, they are. You help when needed.”
- “Think of everything from the real-life point of view. Explain how organizations work and what is a project manager, customer and a CEO for example.”
- “Just to be around and talk to people and observe. Quite often you will find the challenges in a team by observing it (the team is blind to them and do not say them directly to the educator).”

Some additional facts about the Project Hatchery

| | |
|---|--|
| Institution | Turku University of Applied Sciences |
| ECTS/credit points | 5 |
| Students’ main subject/Degree Programme | Multidisciplinary. Students represent 15 different Degree Programmes in the field of Engineering and Business. |
| Level of studies | Bachelor |
| Year of studies | First semester |
| Number of students | Total ca. 1 200–1 500 students, divided in ca. 100 groups where ca. 12–15 students in each. |
| Internationality | Optional for exchange students. |
| Educators (amount and type) | Total ca 25 educators and ca 100 second-year student tutors |
| Evaluation and grading | Educator-, self- and peer evaluations. Scale of grades 0–5. |
| Spatial and instrumental issues: the learning spaces and tools used | 60% in class; 20% in field; 20% self-studying Tools applied: MS Teams, Project management tools, e.g., Gantt Chart |
| Epistemic issues: assignments and tasks are executed | 20% individually; 60% in teams; 20% at the network/ community level |
| Temporal issues: timing, schedule, pace etc. | Estimation of 133 hours working of which ca. 80 hours is hatchery working and about 53 hours is project management and reading groups following the schedule of course and assignment requirements. Weekly 4-hour meetings in the group and common events (competitions, information sessions) for all students. |
| Social issues: centeredness and roles | 5–10% teacher-centred; 90% student-centred and 5% expert-centred. Each student group has one student tutor, one educator and project owner. The group chooses the project manager and other roles of the members. |
| Other issues | |

5.2.2 Experts in Teams, BAAA - Business Academy Aarhus

”It prepares them for working in real life, after graduation.” – Anonymous educator

The learning environment gives selected bachelor students new insights about group dynamics and innovation processes. It links both theoretical knowledge and practical training. The course is important as a modern graduate is expected to have strong disciplinary skills and the soft skills of interdisciplinary teamwork and communication.

Experts in Teams is carried out in six interdisciplinary teams, 5–6 students in each team. Students come from the degree programmes of Finance and Business, also exchange students are included. Some participating students are also part of the Talent Program at Business Academy Aarhus. The teams are altogether guided by seven educators.

The course consists of five teaching Workshops and these are at the same time a mandatory activity in Business Academy Aarhus’ Talent Program. Experts in Teams is considered as a valuable supplement to the students’ daily educational programme. The students work together with fellow students and the takeaways are multiple. The students’ task is to work with societal challenges, and they must present their work for a panel of judges who assess the students’ solutions according to feasibility, entrepreneurial vision, innovation, and sustainability. The student has an active role, and the learning outcome is very dependent of the students’ own engagement, reflections and taking responsibility.

The course teaches students to work in interdisciplinary teams together with students from other educational programmes. The teams go through an innovation process, prepare, and present a pitch and a final reflection. The course includes an oral exam with an individual business case, with marking according to the 7-point grading scale and with internal censorship. The business case is included in the grading together with the oral examination in an overall assessment. If the student passes the exam, the course will be added to their diploma.

VUCA in Experts in Teams

| | |
|--|---|
| <p>Volatility</p> <ul style="list-style-type: none"> Different than the daily academic studies. Irregularly scheduled workshops. Mostly supervised meetings. Students from interdisciplinary educations. Changes in team members and unfamiliar members in the teams. Students must discover patterns themselves. | <p>Uncertainty</p> <ul style="list-style-type: none"> Unknown tasks and team. Unpredictable flow in the team and working process. Personal engagement in uncertainty. Uncertain about one's own contribution. Working with the means at hand (effectuation theory). Prioritizing is difficult. Forces students to take an active role and responsibility. Learning by doing. |
| <p>Ambiguity</p> <ul style="list-style-type: none"> New interdisciplinary programme. Unknown study path. Unclear expectations. Multi-sided tasks. No right or wrong solution. Assessment is mostly based on team learning. | <p>Complexity</p> <ul style="list-style-type: none"> Many things going on at the same time. Adjusting and managing several tasks and processes. The unbalanced combination of study-work-private life. A combination of challenges that must be solved in teams. Pooling the collective means and resources. Both academic, professional and personal skills are needed. The interrelations of the whole and the parts. |

VUCA design elements

Temporal elements differ from typical academic course in this two-month course, because it is based on teaching workshops of which a peaking point is a 24-hour innovation workshop. Starting and ending dates are known, but otherwise the schedule is kept open and contains pre-planned work interruptions. As Experts in Teams is an extra-curricular course, the students need to be able to combine this with the tasks and demands they must fulfil in their main study programme and their private lives as well. In several ways it resembles a work-like schedule.

Epistemic elements include ambiguity and are present through the 2-sided unspecified tasks, related to the team process and actual innovation challenge with the expectations of delivering solutions. This makes it difficult for students to make choices and to find out what must be done first. For instance, establishing confidence in the team and pooling the team's collective means and resources, recognizing what causes what and how to solve problems. Although Experts in Teams can follow the planned and facilitated programme and process to encourage the students, among other tasks, to think creatively, students must find their own means and path in the programme to

reach both individual and team learning outcomes. Thus, it is learning by doing and action orientation. The teachers support the students to reflect and to trust their own capability.

Social, spatial and instrumental elements include uncertainty and complexity as there are several issues going on at the same time, like the tasks, the team, the innovation challenge, stakeholders, and processes. The teaching workshops and the teachers provide the frame/environment, where handling complex issues are relatively safe for the students, and secure that learning can take place in both in personal and professional contexts. Students must discover the patterns in how to work in a team and which team process they go through (based on Tuckmann's model⁷⁵). Most of the meetings are supervised but still, they must discover who they are in the team, show and contribute with themselves, personally and professionally. The assessments are mainly based on learning together. The students must deal with unstable change when some students do not participate or contribute to the teamwork, or even do not show up. These social elements automatically provide a frame for the students to lead the work on teamwork on their own, as well as they must learn to trust each other and give room for turbulence in the team. Most students realize in the reflections afterwards that this turbulence was ok, manageable, and quickly promoted internal trust in the team. In addition, the team consists of students with different knowledge and contributions. The students must collaborate, be open about their thoughts, feelings, anxieties, problems, difficulties they face and their uncertainty about how to contribute to the team and solve the innovation challenge. Again, the social elements of trust and team dynamics are at play, which is also facilitated by the teachers.

So, the context and working process require both academic, professional, and personal skills and competences, often in play at the same time. In addition, the demands of the course and the expectations of the coaches and other students, as well as their own expectations are unclear.

Ways of turning VUCA to opportunities

Experts in Teams starts with creating a relatively safe learning environment as the educators support the students with models and tools for developing and handling the unknown teamwork and innovation challenge. However, they are provided with incomplete information and are forced to think and act creatively to collect the knowledge they need as well as daring to have confidence in each other and the common pool of means and resources at the same time. Students must learn to use what means they have at hand. They must learn to adopt and apply an effectual approach⁷⁶, which demands students to be open minded, communicate in a clear way, and give and receive

feedback. In addition, it is important to be aware of the team dynamics as well as be able to reflect, to support team members in reflection, to show good practices, ask questions, learn how to learn, and to be curious. This can support students to handle uncertainty in a productive way. Students learn that having no obvious answers at hand or confusion is necessary to solve an innovation challenge and at the same time make the team process productive. In addition, it is important to emphasize that there is no right or wrong solution.

Experts in Teams gives students the opportunity to experiment with directing their own learning process in collaboration with their fellow teammates and to see the results of their choices and teamwork. They can develop resilience that prepares them for the professional working life and at the same time the ability to cope with the VUCA elements of life, of which not much can be predicted. Students can develop their agility, resourcefulness, and self-management. They can also develop their ability to handle their uncertainty productively by learning to acknowledge and tolerate its presence through leaning on the collective resources of the team they are in.

Experiences of the educators and their tips

In this hybrid learning environment, educators' role is much about to act as a senior colleague who encourage the students to think creatively and help in reflection. Regular meetings, pre-planned work interruptions and given start and ending dates (but otherwise keeping the schedule open) will give room for students to work in an environment where complex issues are relatively safe. Students will learn to tolerate the presence of uncertainty, and they have the possibility to learn to lead. While working in the teams, the students learn to trust each other. The learning environment also makes it possible to cross the borders between university and working life. Due to the course's nature, learning takes strongly place both in personal and professional contexts.

From an educator to an educator

- "Accept that failure is part of the process."
 - "Do not teach but be a facilitator."
 - "Be relaxed, be prepared for taking many different roles."
- "Accept that you cannot know the answer to everything. That you also work in a VUCA environment."

Some additional facts about the Experts in Teams

| | |
|---|--|
| Institution | Business Academy Aarhus |
| ECTS/credit points | 5 |
| Students' main subject/Degree Programme | Fields of Business and Finance + international students |
| Level of studies | Bachelor |
| Year of studies | First year students |
| Number of students | Approx. 34 students. 6 teams (5–6 student per a team) 4 international, 2 Danish teams. |
| Internationality | 4 exchange students' teams |
| Educators (amount and type) | 7 educators |
| Evaluation and grading | Oral test based on a written business case |
| Spatial and instrumental issues: the learning spaces and tools used | 100% in class Tools applied: Canvas (LMS), project management tools, e.g., Gantt charts, Trello, team tools ("20 efficient Team Tools", https://factumbooks.dk/?search_string=20+efficient+team+tools#) |
| Epistemic issues: assignments and tasks are executed | 70% in teams, 20% network/community, 10% individually |
| Temporal issues: timing, schedule, pace etc. | Estimation of 45 hours' working consisting of four 4-hour teaching workshops, one 16-hour innovation workshop and 13 hours of individual work, exam etc. Workshop 1: Meet your interdisciplinary team. Why is teamwork so important today? Presentation of the '3-zone process'. The individual in the interdisciplinary team. Workshop 2: Team development and the creation of new possibilities together, your role in the team, teambuilding. Exercises in facilitation and sociograms. Workshop 3: Conflict competence, the team in the innovation process, presentation of team challenge, inspirational keynotes. Two-day Innovation workshop: Team grounding, the innovation process: development of innovative solutions in the team. In-depth learning and training of facilitation. Presentation of solutions to a panel of judges. Workshop 4: Reflection, learning loop and evaluation. How will you use your learning output in future teamwork? Preparation for the exam. |
| Social issues: centeredness and roles | 20% teacher-centred; 80% student-centred |
| Other issues | |

5.2.3 Learning Teams, HU - University of Applied Sciences Utrecht

”For a person who wants to learn, it’s important to sit in the driver’s seat. A learning environment is full of uncertainties and asks the learner to show personal leadership and curiosity.” – Anonymous educator

Learning Teams aims to support the students’ learning process during their studies. The subjects, which the teams discuss and study are related to student wellbeing, study skills, balance between school-private-work life, competence development and topics that focus more on the content, like writing skills, research, etc. The Learning Teams have fixed coaches who support the students’ process.

Learning Teams offer students an opportunity to combine various experiences (in and out of school) as learning is viewed as a holistic process in which students invest themselves as humans, persons, and professionals/learners.

Learning Teams aim to be student-driven and peer learning is essential. Learning Teams coaches support the students’ processes and needs by supplying various tools and information. As Learning Teams do not come with ECTS, the assessment of participation and development of the students is incorporated in the various tests and assessments throughout each study year.

VUCA in Learning Teams

| | |
|---|---|
| <p>Volatility Students must discover patterns themselves. Teamwork. Changes in team members and roles. Learning together. Supervised and non-supervised meetings.</p> | <p>Uncertainty Students must find their own way. Making choices and prioritizing is difficult. Personal engagement is important. Students are expected to take an active role.</p> |
| <p>Ambiguity Learning teams are relatively new. Unknown study path. Unclear expectations. Timing of assessment is unclear. Difficult to find out what is good enough.</p> | <p>Complexity Confusion based on all the stimuli. The interrelations of the whole and the parts. The unbalanced combination of study-work-private life.</p> |

VUCA design elements

Temporal elements are present from the beginning as Learning Teams starts with creating a new but safe learning environment for a small group of students. The way the meetings are prepared change during the studies as at the beginning, the meetings are prepared by the coach and later by the students themselves. Although Learning Teams can follow a steady study programme, students must also find their own path in the programme and how to develop the expected learning outcomes. Students can make choices based on their needs and depending on their work pace.

This refers to *epistemic elements* as the students must define which learning outcome they want to focus on in which part of the programme. This combination of learning outcomes in relation to professional products that affirm this learning outcome and reflection on the learning process towards this outcome makes it difficult for students to decide their focus, make choices and to find out what must be done first, what causes what and how to solve problems. They face a fuzzy study path, and they struggle with handling expectations by others and themselves. They must take an active role and discover patterns in who they are and how they learn. Students can get confused with all the stimuli from the combined work-study and private environments and the demands they put on themselves. It is challenging for them to find out what they have to learn and perform, when assessments take place, and when it is good enough, and how to earn 60 ECTS's in one year. The students have a lot of questions in a – for them - new study environment that demands them to be(come) their own director in learning.

As learning together in teams characterizes this learning environment, *social elements* are very important. Thus, the students must reveal themselves as a person and a professional. They must learn to be open-minded, to give and receive feedback, to be sensitive, to communicate and reflect, to support other team members, ask questions and learn how to learn. The students must deal with the expectations of themselves as well as the other students, educators, and the programme. It is difficult for the students to find out when the performance is good enough for all these stakeholders, as the demands and expectations are not always clear. They have both supervised (with the educator) and non-supervised meetings. Collaboration with others, being open about their thoughts, feelings, anxieties, problems and difficulties they face, is challenging. However, learning together can support students to handle their experienced uncertainty in a productive way. In addition, they must deal with unstable change when students drop out of the learning team and new students come in.

Regarding *spatial and instrumental elements*, Learning Teams are planned on a regular basis throughout all years of the study programme. They usually take place in a live setting, but when that's not possible (for example because of a pandemic) the learning teams will meet up digitally, for example via MS Teams.

Ways of turning VUCA to opportunities

Learning together in a safe environment supports the wellbeing of students during their education. A Learning Team is a place where personal and professional topics are discussed, researched and worked out. Students learn who they are and develop the professional and personal agility that is necessary for their study and (professional) life. They can develop their resourcefulness, self-management, self-regulation as well as a vision on learning and experiment with the demands of their future professional life. They can also develop their ability to handle their uncertainty productively by learning to acknowledge its presence and further explore their uncertainties by analysis and experimenting by using the tools of "safe uncertainty".

Students learn that confusion triggers one to learn to plan, to make choices and set priorities. Students can learn and support each other by reducing the complexity they experience. Especially complexity in the combination study-work-private life but also the experienced complexity of the tasks they must fulfil during the programme, like finding one's way for resources and choosing one's own focus in the Learning Teams. Students develop a sense of clarity about their personal and programme goals, and gain information through dialogue to have more success in their study.

Experiences of the educators and their tips

In Learning Teams, it is important to support the students to think creatively and help with reflecting. While students can work in an environment where complex issues are relatively safe, they learn to acknowledge the presence of uncertainty and handle it productively. For work purposes the start and ending dates are given but otherwise the schedule is open for students to plan their own working pace. Use of digital communication tools will help in the learning and planning process. The educator's role is to act as a senior colleague who shows good practices and act as a reflector facilitator.

From an educator to an educator

- “Consult / ask / look as much as possible how other teachers deal with this and what their ideas are regarding the ups and downs in learning teams.”
- “Trust in yourself and the students is more important, then trust in books and theories.”
- “A challenging assignment with varying methods and tasks in which a lot of practice and testing can be done stimulates both the student and teacher to create an inspiring learning environment.”
- “See the students, listen to them and appreciate them. Do games/activities to get to know each other and let them get to know you. Create a safe and positive atmosphere by making appointments together in how to cooperate together.”
- “Be humanely involved and pay attention to the communication about result-orientation.”
- “The coach also participates in the learning team, which is a different role from that of teacher.”

Some additional facts about the Learning Teams

| | |
|---|--|
| Institution | University of Applied Sciences Utrecht |
| ECTS/credit points | N/A |
| Students' main subject/Degree Programme | Education and Legal programmes |
| Level of studies | Bachelor |
| Year of studies | All years of the program |
| Number of students | In total of 1 480 students divided in small teams of 6–9 students |
| Internationality | |
| Educators (amount and type) | 1 coach/team, total 88 coaches |
| Evaluation and grading | No separate grading |
| Spatial and instrumental issues: the learning spaces and tools used | 100% in class (virtual) Tools applied: www.veiligeonzekerheid.nl ; MS Teams |
| Epistemic issues: assignments and tasks are executed | 100% individually |
| Temporal issues: timing, schedule, pace etc. | Students work in groups of max. 9 persons for 1 or more years. 100% in class or digital; 2-weekly gatherings (or less, depending on which year). |
| Social issues: centeredness and roles | 30% teacher-centred; 70% student-centred. Each student group has one educator. |
| Other issues | |

5.2.4 Innovation Camp - INNOCAMP PL

Innocamp PL as the first institution in Poland organized innovation camps as social innovation initiatives in the higher education and local societies. The aim of the camps was to help faculty members, local NGO leaders, policy-makers, civil servants, HR managers and diverse end users (e.g., bikers, migrants, journalists, artists) get engaged along university students as a unique community of learners to find solutions to urgent social problems. Innocamp PL experts learnt the method from the PUNC project's current partners, Turku University of Applied Sciences and Aarhus Business Academy.

The alignment of innovation camp with aims and assessment is based on learning new competences needed in the VUCA world to help students collaboratively come up with novel solutions, bounce one's own thoughts off a group for feedback and this way develop them into even better and more competitive ideas. Networks built through the camps complement the competences of those participating in them with the principle of mutual benefit, trust, and resilience.

Innovation camps engage students and stakeholders (expert instructors, university facilitators, challenge owners from working life, community leaders). The participants work in international and interdisciplinary teams on the divergent challenge. They are encouraged to use specific design, creative thinking, business planning tools and strategies to come up with ideas for ventures that would impact the local eco-system. During approximately 30 hours of intensive problem solving the teams benefit from feedback sessions in which the groups present their work in progress and after pitching experts choose and often invest in the best team's proposal.

The starting point is a specific challenge, formulated in cooperation between the company, NGO or governmental organization and the educational institution. The camp leader controls the process along with a few process guides or facilitators, all trained to manage a short and intensive innovation process. Time pressure and interdisciplinary, cross-curricular teams push the participating students out of their comfort zone, and preferably, the participants work outside their familiar surroundings. The camp takes place as close to the stakeholder as possible so students interact with the environment. After teambuilding sessions, the students are introduced to the challenge along with a presentation of the product/service/destination, etc. The teams then have half a working day to come up with two ideas, which are pitched to all teams, teachers and experts, (usually local business or NGO leaders), who provide useful feedback. Afterwards, the

groups continue working with one of the two ideas that they find the most innovative and the best solution for the challenge given by the company or organization. Students are supported with different heuristics and business tools to work with the idea to turn it into a concept, which they must analyze, research and evaluate in terms of market potential, economy, development and innovation height.

After more rounds of pitches and feedback, the students go into competition mode! On the last day of the camp, all teams will pitch their best and final idea/concept in front of the company, a panel of external judges (local businesspeople, etc. with an interest in the challenge), all students and teachers. The judges select the most developed and innovative proposal and explain their choice in the announcement of the winner. The winning team receives prizes, usually sponsored by the company or organization that has provided the challenge.

Innovation camps help to increase the university’s social impact which can be measured by the indicators of funds saved by the actual problems being solved (biking apps, integrated systems), migrants’ council, NGO’s mentions of UG/INNOCAMP PL and perceived levels of social capital or/and well-being of the community impacted. Students’ resilience after taking part in innovation camps was evaluated in quantitative and qualitative research⁷⁷. The findings allow the authors to interpret resilience as the capacity for perseverance and problem solving under challenging conditions. Students’ self-reported efficacy beliefs on that capacity rose after the participation in innovation camps. Other values in the innovation barometer confirm the intuitive understanding of resilience as the ability to predict and discern causal relationships of own and team efforts to prevent or capitalize on failure.

VUCA in Innovation Camp

| | |
|---|--|
| <p>Volatility Lack of stability; heterogenic and multidisciplinary groups, time pressure and quick response to the feedback offered by stakeholders, changes in the working environment, or unstable emotional modes of team members.</p> | <p>Uncertainty Lack of knowledge or adequate information; no prior knowledge about challenge, new roles/responsibilities of students/educators (not teacher-centred), or non-linear mode of idea development.</p> |
| <p>Ambiguity Lack of clarity/understanding; divergent problems, the expected solutions do not have defined indicators of success, the criterion for excellent work is unclear, interpretative, or there are multiple perspectives and ways of solving the problem.</p> | <p>Complexity Overwhelming number of changeable elements; several insights change the understanding of the problem, multiple roles the students take in groups, or failure is part of learning.</p> |

VUCA design elements

The design elements that include VUCA components in the Innovation Camp are *social and epistemic elements*. Social elements include volatility based on the team dynamics and diversity of members that represent students from several different cultures or/and disciplines, like social science students and biotech or business students. In the method, different roles need to be explored and exchanged within a team, and students must self-organize and ask for advice and act immediately on feedback received. This differs from daily academic courses, as the educator does not give exact instructions but responds along with external experts to the ideas pitched.

Epistemic elements consist of assignments where both the subject and the working process are new to the students. The needs in the modern working life are linked to the method, similarly to Design Thinking. Students must both capitalize on their empathy to address the needs of the target group and build their own resilience and self-efficacy to complete the project. Teamwork and mobilizing extended networks of expertise and support to cope with the divergent character of the tasks is required. The criterion for excellent work is unclear and the students must rely on feedback but predominantly evaluate their work and trust the process themselves. They must accept the failure or misjudgement of opportunities as part of learning.

Spatial and instrumental elements include e.g., complexity as there are several communication channels and platforms used simultaneously. The method is planned to be executed at a given time and space, preferably outside of campus, close to the organization offering the challenge or in isolated place of nature.

Temporal elements include e.g., ambiguity and complexity. The groups must make their own schedule. Often students stay/live together in a camp setting and night-time may be used for work and its evaluation to simulate urgency but also the necessity to deal with different time zones, jetlag etc. Temporal organization is focused on meeting the objectives and frameworks of pitching, first mock-pitching, then final pitching. This creates the experience of flow for students.

Ways of turning VUCA to opportunities

Innovation Camp is the hybrid learning environment in which resilience, understood as the ability to engage in dialogical relationships, is developed. Innovation camps build resilience by encouraging the students to listen actively to peers and experts

for feedback and respond to unfolding new opportunities contributed by each team member. The students also learn how to manage conflicts creatively, so failures are avoided by prevention of unproductive conflicts or lack of agreement on how to advance the innovation processes. Since the method builds students' networking competencies, it may be assumed that innovation camps strongly address the needs of both the students themselves and the stakeholders (especially employers) for stronger integrity, ethical fibre and courage to cross the boundaries of disciplines or specific cultures to find a novel solution. Dialogical relationships and innovation camp tools encourage students to switch off their strong ego defences against being judged morally or labelled in a specific way related to risk avoidance and uncertainty. They have opportunities of exchanging ethical perspectives but, more importantly, becoming aware of emotions either limiting or enhancing self-efficacy beliefs about functioning in unstable networks. The camps allowed the students to re-define their social skills and integrity as the source of their resilience from just another element of competitiveness to the core of individual and collective accountability. The camps provided safe and positive interdependence, relief from the pressure of individual decisions which affect collective sense of solidarity and resilience. They also helped the students to break free from harmful self-censorship preventing the expression of diversity and reluctance to take risks which innovating in VUCA environments incurs.

Some additional facts about the Innovation Camp

| | |
|---|--|
| Institution | INNOCAMP PL |
| ECTS/credit points | 2 |
| Students' main subject/Degree Programme | Social sciences, biotechnology, business |
| Level of studies | all |
| Year of studies | all |
| Number of students | 25-100 |
| Internationality | Yes |
| Educators (amount and type) | 2-5 mentors, 2-5 judges/experts |
| Evaluation and grading | Pitching contest (winning group gets 100%), e-portfolio, (self and peer /expert evaluation) |
| Spatial and instrumental issues: the learning spaces and tools used | Camp setting – preferably away from campus Tools: colour zones (like in design thinking), feedback, mock pitching |
| Epistemic issues: assignments and tasks are executed | Learning is driven by the challenge, collaborative at team level (90%) network level 10% |
| Temporal issues: timing, schedule, pace etc. | 2–5 days, intensive schedule, working meals, walks, campfires etc. |
| Social issues: centeredness and roles | Student centred 75%, mentors/experts 25% |
| Other issues | Challenge owners provide criteria for innovation. Learning from mistakes and failures |

5.3 Type 3: Case designs based on hybrid learning environment

5.3.1 DARE!, HU - University of Applied Sciences Utrecht

"I need students who are creative, flexible and brave." – Anonymous educator

DARE! is a project-based hybrid learning environment of HU students, educators, and social partners in the Utrecht area. DARE! is a student-driven social organization that consists of one main multidisciplinary group of 30–40 students and additional subgroups of other student participants from other study programmes and educational levels. Participating HEI students come from the following programmes: Social Work, (Cyber) Security, Education. Students are working on real-life issues that are locally relevant and they work together with representatives for local social organizations.

The group is subdivided in three task groups with their own themes: Sports, Culture, (Party) Events. The students are facilitated and coached by 5 teacher tutors.

DARE! forms an authentic learning environment in which working and learning come together and where students gain real and often 'formative' practical experiences. Students combine their competence development with working in practice. Within DARE!, students perform relevant authentic learning tasks while working on the themes: Sports, Culture, (Party) Events. Learning tasks are often unpredictable, unstructured, and not easy to plan. Cooperation with others and concrete results are expected of the students. Students work together with other social/public organizations in the district and with students of other study programmes and study levels. Students also work together with youth from the area in Utrecht, Netherlands, that DARE! is situated in.

Students meet up (almost) daily and define their own (long term and short term) output, working assignments and tasks. The outputs that the students deliver are e.g., organized festival events, cultural meetups, collaboration with local schools, sport clinics etc.

The competence development of the individual students is assessed by the DARE! coaches and the teachers of the various programmes the students come from.

VUCA in DARE!

| | |
|--|--|
| <p>Volatility Many things changing at the same time. Students must define and manage their own tasks and they can change over time. No patterns available. Students work and learn on the fly. Students must develop their own approach.</p> | <p>Uncertainty Not knowing is a part of working/learning in DARE!. Causality can be understood, but forecasting is difficult. Working in DARE! is unpredictable. Students work with many stakeholders with different agendas. Students must find their own way. Students experience lack of sufficient or incomplete information but are pressed to decide or act anyway.</p> |
| <p>Ambiguity Combining the DARE! environment with their study programme. Several parallel issues, tasks, processes and expectations. Different interpretations from different angles and by different stakeholders.</p> | <p>Complexity Upholding many tasks and developments at the same time. Working together with (too) many different stakeholders. Expected results are not always known. Difficult to recognize which approaches are useful to produce the results. Overseeing the whole and how its parts interrelate, is hard.</p> |

VUCA design elements

Epistemic elements are emphasized through tasks and approaches that the students must define and manage by themselves. Not knowing is an important part of the students' uncertainty. They often lack sufficient or have incomplete information but are pressed to decide or act anyway. Students indicate that when they must uphold too many tasks at the same time or must deal with too many developments at the same time, it is complicated. This causes uncertainty. As there are only few trusted patterns from the past available, it causes unpredictability and further uncertainty for the students. Anyway, they must make up their own approach. Complexity is increasing when students do not know the expected results of their work as well as when it is unclear to them which approaches are useful to produce those results. Overseeing the whole and how its parts interrelate is hard for students.

In addition, it is challenging for the students to combine their DARE! environment with their study programme from the *spatial* and *instrumental elements'* views. Not only physical, by scheduling appointments and activities in two different places, but also regarding formal demands that must be met such as competence development and other more implicit expectations.

Social elements play an important role as students work with many stakeholders with different agendas. In their work, causality can be understood, but forecasting is difficult as students work with many stakeholders with different agendas and tasks. In addition, students experience ambiguity when they feel that things can be interpreted differently from different angles or by different stakeholders.

Temporal elements are present, as the students must work on the fly and make up their own approach on the go, as several issues are changing over time. Students sometimes experience this learning environment as chaotic, especially when too many things change at the same time. And, at the same time, deadlines are to be met.

Ways of turning VUCA to opportunities

Students can develop their ability to handle their uncertainty productively by learning to acknowledge and tolerate its presence. They must learn to recognize it and to create their own patterns. Students can learn to create clarity by slowing down in their process, to zoom out (process-visualization) and to communicate with others about the bigger picture. In addition, students can learn to ask (specialists) for help in doing so.

Students must apply their critical thinking skills and their research competence to find actionable knowledge – increasing their ability to find actionable knowledge decreases their sense of uncertainty. In addition, they can develop their social skills, like questioning skills and learn to work together to obtain the necessary information. Students can develop their agility, resourcefulness and self-management/regulation.

Experiences of the educators and their tips

Like the course name DARE! suggests, in this hybrid learning environment unexpected changes happen and daring is an asset. Mistakes are not the end of the world and educators should even encourage mistakes to happen in various tasks and assignments. With creative thinking skills, many problems and obstacles can be tackled, and students learn to acknowledge the presence of uncertainty and its generative force. By using digital communication tools, giving freedom to e.g., decide their own meeting and working places and crossing borders between university and working life, DARE! creates a safe learning place for complex issues. Safety is also supported by forming fixed teams where students can take the lead and become the director of their learning. In teams, students learn from each other, but it is also important to give room for possible team dynamic turbulence.

The educator's role is to act as a senior colleague and show good practices and be a reflection facilitator for students' learning. Actual work start and ending dates as well as pre-planned work interruptions are given, but otherwise the schedule is open for students to plan and execute. This means that students must prepare a complex and tight schedule by themselves and educators may push students working under pressure in terms of time.

From an educator to an educator

- “Don't be afraid. Just dare, but inform your colleagues, management and partners regularly. Dare but don't be a lone wolf.”
- “Just do it! Peer to peer. Be an example. Ask and keep asking. Join in. Be available!”

Some additional facts about the DARE!

| | |
|---|---|
| Institution | University of Applied Sciences Utrecht |
| ECTS/credit points | Internship =30/60 EC; assignment = 5/10 EC |
| Students' main subject/Degree Programme | Multidisciplinary. Students come from programs: Social Work, (Cyber)Security, Education. |
| Level of studies | Bachelor + Vocational |
| Year of studies | First to third year (depending on program) |
| Number of students | 30–40 students per group |
| Internationality | Dutch and Belgian |
| Educators (amount and type) | 5 teacher tutors |
| Evaluation and grading | The competence development of the individual students is being assessed by the DARE!-coaches and teachers of the various programs. |
| Spatial and instrumental issues: the learning spaces and tools used | 100% in field Tools applied: MS Teams |
| Epistemic issues: assignments and tasks are executed | 30% individual, 50% in team, 10% in group, 10% network/community |
| Temporal issues: timing, schedule, pace etc. | Students meet up on various occasions during the week and at different places (HU, external location). Students can be part of DARE! for a whole year (internship) or on a project of module base. |
| Social issues: centeredness and roles | 10% teacher-centred 80% student-centred 10% social partner-centred Students work together with other social/public organizations in the district. The teachers/coaches are only in supportive role. |
| Other issues | |

5.3.2 Project-based Learning Environments, Turku UAS - Turku University of Applied Sciences

” Real-world projects/problems are not always so clear and well-defined either. It is important to learn to cope in those situations as well.” – Anonymous educator

Turku University of Applied Sciences has several Project-based Learning Environments in different disciplines e.g., Business, Engineering (ICT, Chemical Industry) and Circular Economy. Depending on the disciplinary and project learning environment, the students will form smaller groups where they study and do project work. The projects are often 3rd-party assignments where students can practice customer-oriented thinking and communication.

In the Project-based Learning Environments, learning is highly collaborative and requires good self-leading and communication skills. The learning environment is quite demanding as the students are solving real-life problems. To be successful in their projects requires both analytical thinking and practical work put in together. The students will learn to search and implement theoretical knowledge that they can put in practice right away. The work is oriented in project- and research-based learning methods. The learning environments require the students to be active in their roles and be responsible for their deliverables.

The tasks in the projects are various and require the students to be active and learn together as a team. The teams are supported by coaches/educators who will help the team e.g., in goal setting, in problems and support in reflective thinking.

VUCA in Project-based Learning Environments

| | |
|--|--|
| <p>Volatility An open learning environment without any strict structure. Unfamiliar and heterogenic students and other stakeholders. Team dynamics.</p> | <p>Uncertainty Lack of information about the projects. Level of difficulty varies. Guidance is not given all the time. Need to take an active role. Gaining expertise step by step.</p> |
| <p>Ambiguity No clear instructions – students must find their own way to solve tasks. Not only one right way to do the work. Not only one solution.</p> | <p>Complexity Projects may be quite complex in nature. Many and complex perceptions that may cause a need for changes.</p> |

VUCA design elements

Project-based Learning Environments can be characterized as open ones as there is no strict structure that students will follow. *Social elements* are present in Project-based Learning Environments as the groups consist of very heterogenic, often unfamiliar people and personalities that are used to unusual ways of working. Thus, the team dynamics can be challenging. In addition, the project owner represents e.g., a company or other 3rd-party representative that is as often unfamiliar to the students. As guidance is not given all the time, students must work independently and plan what needs to be done.

This refers to the *epistemic elements* that are challenging as the upcoming projects are not well defined and the level of difficulty may vary a lot. There are no clear instructions on how things should be done; students must find their own way to solve tasks. Projects may be quite complex in nature; situations can vary, and plans must be changed accordingly. The project outcome can be executed in diverse ways and the result can also be a creative one.

From the *temporal element* perspective, the students do not usually have expertise when the project starts but they will gain new insights and skills gradually during the work. Students must schedule their tasks that may origin from several sources: working in the Project-based Learning Environment is often parallel to studying in other courses. There is variation in the length and timing of projects, and the length may be unclear at the beginning.

The *spatial and instrumental elements* are present and recognized. The facilities that Project-based Learning Environments use are like the facilities in working life. The software and other tools are also used to simulate professional work practises.

Ways of turning VUCA to opportunities

Although these learning environments are volatile and challenging, the educator can provide sufficient support for the students in many ways. The students are aware of whom to contact and thus, they are not left alone. As a starting point, it is important to use time for grouping and get the students familiarize themselves with others. The groups are encouraged to discuss together, try alternative ways of doing things, and ask for help.

It is helpful for the students that the educator explains why things are done like this e.g., what skills (and how) are developed during the process. In addition, it is important to be

open and to explain the nature of the assignment and saying that clear guidance may be missing. Even though the process and assignment may be unstructured, some tools and guidance are suggested for them to try to make a project plan and execute an assignment. By explaining that there is not only one way to reach the goals, the students also understand that they must use their own thinking and make decisions and conclusions. Challenging the thinking of the students is worthwhile as well as encouraging them to creative thinking and stepping out of their comfort zone. In addition, room for failure is important. If the students are stuck at some phases, the educator may support them by discussing the difficulties with them and how to overcome those.

Experiences of the educators and their tips

The Project-based Learning Environment simulates quite closely authentic professional work practices, structures, and rules. This environment crosses the borders between university and working life, as assignments typically come from the working life representatives i.e., companies. Usually in project work, the start and end dates are given but otherwise the students can plan the pace of the project quite freely. Flexibility in the project is naturally important due to clients' timetables and other wishes. Project work teaches the students to tolerate the presence of uncertainty. Digital tools are commonly used to help e.g., organize the work.

An important part of learning is that the students will lead and oversee the project. As the students work in project teams, learning together is vital as well as learning to trust each other. The educator's role is to show good practices, support students to think creatively and learn to reflect.

From an educator to an educator

- “Be yourself and open-minded. Try to learn to interpret people so that you can tell which kind of responsibilities and workload each student can take.”
- “This environment challenges instructors’ competence a lot to tolerate uncertainty as the learning environment is student-led, not teacher-led. You can’t control things in the same way as when teaching on ‘traditional’ courses.”
- “In case of problems ask help from your colleagues, try not to solve things on your own.”

Some additional facts about the Project-based Learning Environments

| | |
|---|--|
| Institution | Turku University of Applied Sciences |
| ECTS/credit points | Flexible, based on the need of project and interest of student |
| Students’ main subject/Degree Programme | Fields of Business and Engineering + international students |
| Level of studies | Bachelor |
| Year of studies | Students from different years (first to fourth) |
| Number of students | Depends on learning environment (amounts may vary) |
| Internationality | optional |
| Educators (amount and type) | Depends on learning environment (amounts may vary) |
| Evaluation and grading | Based on project work performance, grades 1–5 |
| Spatial and instrumental issues: the learning spaces and tools used | Mirrors a professional work practice in HEI’s premises or work as remote. Tools applied are area specific tools e.g., project management (Teams, Trello, Padlet, Flinga), laboratory facilities and other equipment |
| Epistemic issues: assignments and tasks are executed | 100% in teams |
| Temporal issues: timing, schedule, pace etc. | Depends on the project |
| Social issues: centeredness and roles | 10% teacher-centred; 90% student-centred |
| Other issues | Possibility to join in RDI projects |

Conclusions

A large, abstract yellow graphic in the top right corner of the page. It consists of several overlapping, angular shapes that form a stylized number '6'. The number '6' is printed in a dark red color within the upper part of the graphic.

The aim of this guide is to offer educators a wide-angle view about VUCA in the educational context and how VUCA can be approached from different pedagogical approaches. The current working life itself can be very volatile, uncertain, complex and ambiguous; thus, it is important to prepare and develop certain skills in students, so that they can utilize the knowledge and gained skills productively in real life context.

In a continuously changing world, professional workers who are creative and brave enough to encounter the unknown and can cope with uncertainty and unexpected situations are very much needed. Learning environments where uncertainty and unexpected changes are present are good preparation for real working life. When the students encounter challenges and can experience difficult phases and situations in studies, they will learn to manage those in the future and understand that uncertainty is actually part of life in general. Furthermore, these skills are crucial elements for individuals' well-being and HEIs have an extremely important position in developing these skills and well-being of students.

Firstly, this guidebook gives understanding and knowledge on how an educator can start to recognize, explore, and identify VUCA elements present in their current learning environments where they are acting. Secondly, this guidebook opens alternatives how to embed VUCA elements in the educators' own pedagogical work and learning environment. Educators can create and develop great possibilities for students to train their tolerance of uncertainty in a safe VUCA learning environments, where support is available, and encouragement is given. Encountering VUCA with other team members is a great opportunity to practice VUCA skills like self-management and leading others, collaboration, open communication, coordination of matters, problem solving and abilities in reflective discussion about own work and deliverables. Every educator wants their students to be motivated, curious, creative, persevering and ones who can

see possibilities even in impossible situations. An individual who is too stressed and overwhelmed cannot often use their full potential and be fully functional in over-stressful situations. Students who are familiar with VUCA and its components, and who have had possibilities to train themselves in VUCA environments, will have better capabilities to act in complex and uncertain environments. Positive self-perception and believing in oneself are extremely important powers for an individual. These are something that can be nurtured and grown in the educational context too.

The fastchanging working life and its demanding requirements are something that also the educators encounter in their own working life. How to be in the front line of learning new and passing this knowledge to students, how to develop one's own pedagogical work and how to renew one's own competence to prepare world-class graduates? How to handle the workload balance, stress, and sudden change of plans? These questions are no doubt in all educators' thoughts. All this means that educators are facing VUCA greatly in their working environment and work in general. As working life requirements and demands are transforming, this requires educators to transform and develop pedagogical contexts and learning environments as well.

This guide aims to offer a starting point for this transformation and help educators to recognize and plan possible pedagogical changes. One way to start these changes is to spend time with the following questions, which will guide one's mind to recognize and explore own thoughts and perceptions about VUCA components through different design elements.

EPISTEMIC (task characteristics, task arrangements)

- Does the learning environment where I work require clear structures, deadlines and guidance?
- How important is it to allow lack of info in working with the tasks/assignment?
- What do I think about allowing unexpected changes in tasks/assignments to occur?
- How much do I support the students to reflect on the actions and the consequences of acting when working with the tasks/assignments?
- Do I allow mistakes in tasks and assignments because they are needed for learning?
- What do I think and feel about the presence of uncertainty in the learning process?

TEMPORAL (timespan & intensity, schedules, work pace, interruptions)

- How much freedom do I give to students for their own planning and schedules?
- Do I give starting and ending dates but keep the schedule open?
- To what extent do I allow many temporal matters (e.g., meeting schedules and tasks) to change at the same time during the work process?
- How much do I use preplanned work interruptions for specific topics, e.g., collective problem solving, feedback reflection?
- Do I to push students working with time pressure?

SOCIAL (actors, roles, grouping, division of labour)

- What do I think about forming a fixed team of the students with unknown people or students from different disciplines?
- How often do I use peer- or team-based methods?
- How much room should be given for turbulence of team dynamic during the work process?
- How do I see my own role, is it to act as a senior colleague or expert for students but to avoid intervening in the work process?
- How much do I show good practices and example for the students?
- How important do I see that the student becomes a director of their learning?

SPATIAL & INSTRUMENTAL (location, spaces: analogue & digital, tools & artefacts)

- How important is it that the learning environment mirrors a professional workplace at university with specially furnished lab, clinic or office?
- How important is it that the learning environment simulates authentic professional work practices with structures and rules (e.g., meetings, teams, organization structure)?
- To what extent the borders of university and working life should cross, e.g., by working at the stakeholders' premises or digital spaces?

References

- ¹Dweck, C. (2016). *Mindset: The New Psychology of Success*. Little, Brown Book Group.
- ²Pasmore, B., & O'Shea, T. (2010). Leadership agility: A business imperative for a VUCA world. *People and Strategy*, 33(4).
- ³Horney, N., Pasmore, B., & O'Shea, T. (2010). Leadership agility: A business imperative for a VUCA world. *Human Resource Planning*, 33(4), 32–38.
- ⁴Baran, B.E., & Woznyj, H.M. (2020). Managing VUCA, *Organ Dyn.* <https://doi.org/10.1016/j.org-dyn.2020.100787>
- ⁵Fadel C., & Groff J.S. (2019). Four-Dimensional Education for Sustainable Societies. In: Cook J. (eds) *Sustainability, Human Well-Being, and the Future of Education*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-78580-6_8
- ⁶Bennet, N., & Lemoine, G.J. (2014). What VUCA really means for you. *Harvard Business Review*, <https://hbr.org/2014/01/what-vuca-really-means-for-you>.
- ⁷Codreanu, A. (2016). A VUCA action framework for VUCA environment. *Leadership challenges and solutions. Journal of Defence Resources Management*, 7(2:13), 31–38.
- ⁸Taatila, V. (2017). Paradigm shift in higher education? *On the Horizon*, 25(2), 103–108.
- ⁹Muños, J.C., Redecker, C., Vuorikari, R., & Punie, Y. (2013). Open Education 2030: Planning the Future of Adult Learning in Europe. *Open Learning*, 28 (3). <https://doi.org/10.1080/02680513.2013.871199>
- ¹⁰Muños, J.C., Redecker, C., Vuorikari, R., & Punie, Y. (2013). Open Education 2030: Planning the Future of Adult Learning in Europe. *Open Learning*, 28 (3). <https://doi.org/10.1080/02680513.2013.871199>
- ¹¹Bennet, N., & Lemoine, G.J. (2014). What VUCA really means for you. *Harvard Business Review*, <https://hbr.org/2014/01/what-vuca-really-means-for-you>
- ¹²Baran, B.E., & Woznyj, H.M. (2020). Managing VUCA, *Organ Dyn.* <https://doi.org/10.1016/j.org-dyn.2020.100787>
- ¹³Laukkonen, R.E., Biddel, H., & Gallagher, R. (2019). *Preparing Humanity for Change and Artificial Intelligence: Learning to Learn as a Safeguard against Volatility, Uncertainty, Complexity, and Ambiguity*. Paris: OECD Publishing. doi:10.31234/osf.io/g5qwc

¹⁴Horney, N., Pasmore, B., & O'Shea, T. (2010). Leadership agility: A business imperative for a VUCA world. *Human Resource Planning*, 33(4), 32–38.

¹⁵Bennet, N., & Lemoine, G.J. (2014). What VUCA really means for you. *Harvard Business Review*, <https://hbr.org/2014/01/what-vuca-really-means-for-you>

¹⁶Bennet, N., & Lemoine, G.J. (2014). What VUCA really means for you. *Harvard Business Review*, <https://hbr.org/2014/01/what-vuca-really-means-for-you>

¹⁷Codreanu, A. (2016). A VUCA action framework for VUCA environment. Leadership challenges and solutions. *Journal of Defence Resources Management*, 7(2:13), 31–38.

¹⁸Johansen, B., & Euchner, J. (2013). Navigating the VUCA World. *Research-Technology Management*, January-February, 10–15.

¹⁹Codreanu, A. (2016). A VUCA action framework for VUCA environment. Leadership challenges and solutions. *Journal of Defence Resources Management*, 7(2:13), 31–38.

²⁰Codreanu, A. (2016). A VUCA action framework for VUCA environment. Leadership challenges and solutions. *Journal of Defence Resources Management*, 7(2:13), 31–38.

²¹Beabout, B.R. (2012). Turbulence, perturbation, and educational change. *Complicity: An International Journal of Complexity in Education*, 9(2). <https://doi.org/10.29173/cmplct17984>

²²Horney, N., Pasmore, B., & O'Shea, T. (2010). Leadership agility: A business imperative for a VUCA world. *Human Resource Planning*, 33(4), 32–38.

²³Bennett, N., & Lemoine, J. (2014). What a Difference a Word Makes: Understanding Threats to Performance in a VUCA World. *Business Horizons*. <http://dx.doi.org/10.2139/ssrn.2406676>

²⁴Bennet, N., & Lemoine, G.J. (2014). What VUCA really means for you. *Harvard Business Review*, <https://hbr.org/2014/01/what-vuca-really-means-for-you>

²⁵Laukkonen, R.E., Biddel, H., & Gallagher, R. (2019). *Preparing Humanity for Change and Artificial Intelligence: Learning to Learn as a Safeguard against Volatility, Uncertainty, Complexity, and Ambiguity*. Paris: OECD Publishing. doi:10.31234/osf.io/g5qwc

²⁶Fadel C., & Groff J.S. (2019). Four-Dimensional Education for Sustainable Societies. In: Cook J. (eds) *Sustainability, Human Well-Being, and the Future of Education*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-78580-6_8

- ²⁷Sinha, D., & Sinha, S. (2020). Managing in a VUCA world: Possibilities and pitfalls. *Journal of Technology Management for Growing Economies*, 11(1), 17–21. <https://doi.org/10.15415/jtmge.2020.111003>
- ²⁸Bader, B., Schuster, T., Bader, A.K., & Shaffer, M. (2019). The dark side of expatriation: dysfunctional relationships, expatriate crises, prejudice and a VUCA world. *Journal of Global Mobility*, 7(2). <https://doi.org/10.1108/jgm-06-2019-070>
- ²⁹Horney, N., Pasmore, B., & O'Shea, T. (2010). Leadership agility: A business imperative for a VUCA world. *Human Resource Planning*, 33(4), 32–38.
- ³⁰Stensaker, B., Frølich, N., Huisman, J., Waagene, E., Scordato, L., & Pimentel Bótas, P. (2014). Factors affecting strategic change in higher education. *Journal of Strategic Management*, 7(2), 193–207.
- ³¹Stensaker, B., Frølich, N., Huisman, J., Waagene, E., Scordato, L., & Pimentel Bótas, P. (2014). Factors affecting strategic change in higher education. *Journal of Strategic Management*, 7(2), 193–207.
- ³²Laukkonen, R.E., Biddel, H., & Gallagher, R. (2019). *Preparing Humanity for Change and Artificial Intelligence: Learning to Learn as a Safeguard against Volatility, Uncertainty, Complexity, and Ambiguity*. Paris: OECD Publishing. doi:10.31234/osf.io/g5qwc
- ³³Bennett, N., & Lemoine, J. (2014). What a Difference a Word Makes: Understanding Threats to Performance in a VUCA World. *Business Horizons*. <http://dx.doi.org/10.2139/ssrn.2406676>
- ³⁴Stensaker, B., Frølich, N., Huisman, J., Waagene, E., Scordato, L., & Pimentel Bótas, P. (2014). Factors affecting strategic change in higher education. *Journal of Strategic Management*, 7(2), 193–207.
- ³⁵Bennett, N., & Lemoine, J. (2014). What a Difference a Word Makes: Understanding Threats to Performance in a VUCA World. *Business Horizons*. <http://dx.doi.org/10.2139/ssrn.2406676>
- ³⁶Johansen, B., & Euchner, J. (2013). Navigating the VUCA World. *Research-Technology Management*, January-February, 10–15.
- ³⁷Bennet, N., & Lemoine, G.J. (2014). What VUCA really means for you. *Harvard Business Review*, <https://hbr.org/2014/01/what-vuca-really-means-for-you>
- ³⁸Horney, N., Pasmore, B., & O'Shea, T. (2010). Leadership agility: A business imperative for a VUCA world. *Human Resource Planning*, 33(4), 32–38.
- ³⁹Cousins, B. (2018). Design Thinking: Organizational Learning in VUCA Environments. *Academy of Strategic Management Journal*, 17(2), 1–18.

⁴⁰Bennett, N., & Lemoine, J. (2014). What a Difference a Word Makes: Understanding Threats to Performance in a VUCA World. *Business Horizons*. <http://dx.doi.org/10.2139/ssrn.2406676>

⁴¹Bennett, N., & Lemoine, J. (2014). What a Difference a Word Makes: Understanding Threats to Performance in a VUCA World. *Business Horizons*. <http://dx.doi.org/10.2139/ssrn.2406676>

⁴²Uhl-Bien, M., & Arena, M. (2017). Complexity leadership: Enabling people and organizations for adaptability. *Organizational Dynamics*, 46(11), 9–20.

⁴³Bennet, N., & Lemoine, G.J. (2014). What VUCA really means for you. *Harvard Business Review*, <https://hbr.org/2014/01/what-vuca-really-means-for-you>

⁴⁴Cousins, B. (2018). Design Thinking: Organizational Learning in VUCA Environments. *Academy of Strategic Management Journal*, 17(2), 1–18.

⁴⁵Baltaci, A., & Balci, A. (2017). Complexity leadership: A theoretical perspective. *International Journal of Educational Leadership and Management*, 5(1), 30–58.

⁴⁶Drucker, P. (2012). *Managing in the next society*. Oxford: Rutledge.

⁴⁷Bennett, N., & Lemoine, J. (2014). What a Difference a Word Makes: Understanding Threats to Performance in a VUCA World. *Business Horizons*. <http://dx.doi.org/10.2139/ssrn.2406676>

⁴⁸Fadel C., & Groff J.S. (2019). Four-Dimensional Education for Sustainable Societies. In: Cook J. (eds) Sustainability, Human Well-Being, and the Future of Education. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-78580-6_8

⁴⁹Seow, P-S, Pan, G., & Koh, G. (2019). Examining an experiential learning approach to prepare students for the volatile, uncertain, complex and ambiguous (VUCA) work environment. *The International Journal of Management Education*, 17: 62–76. <https://doi.org/10.1016/j.ijme.2018.12.001>
Partnership for 21st Century Skills, www.p21.org

⁵⁰Fadel C., & Groff J.S. (2019). Four-Dimensional Education for Sustainable Societies. In: Cook J. (eds) Sustainability, Human Well-Being, and the Future of Education. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-78580-6_8

⁵¹Van den Akker, J., De Boer, W., Folmer, E., Kuiper, W., Letschert, J., Nieveen, N., et al. (2009). Curriculum in development (as cited in Bouw, E., Zitter, I., & de Bruijn, E. (2019). Characteristics of learning environments at the boundary between school and work – A literature review. *Educational Research Review*, 26: 1-15. <https://doi.org/10.1016/j.edurev.2018.12.002>

- ⁵²Bouw, E., Zitter, I., & de Bruijn, E. (2020). Designable elements of integrative learning environments at the boundary of school and work: a multiple case study. *Learning Environment Research*. <https://doi.org/10.1007/s10984-020-09338-7>
- ⁵³Kettunen, J. (2011). Innovation pedagogy for universities of applied sciences. *Creative Education*, 2(1), 56–62.
- ⁵⁴Kettunen, J. (2013). Bridging the gap between learning inside and outside of higher education institutions. In K. Aaltonen, A. Isacsson, J. Laukia, & L. Vanhanen-Nuutinen (Eds.), *Practical skills, education and development: Vocational education and training in Finland. Haaga-Helium julkaisusarja, kehittämisraportteja* (pp. 51–63). Vantaa: Multiprint.
- ⁵⁵Kettunen, J., Kairisto-Mertanen, L., & Penttilä, T. (2013). Innovation pedagogy and desired learning outcomes in higher education. *On the Horizon*, 21(4), 333–342.
- ⁵⁶Keinänen, M. (2019). *Educating innovative professionals: A case study on researching students' innovation competences in one Finnish university of applied sciences*. Research Reports from Turku University of Applied Sciences.
- ⁵⁷Konst, T., & Scheinin, M. (2018). The changing world has implications on the higher education and the teaching profession. *On the Horizon*, 26(1), 1–8.
- ⁵⁸Räsänen, M., Kairisto-Mertanen, L., & Penttilä, T. (2013). The Role of Social Learning Environment in the Context of Innovation Pedagogy in Higher Education. *Proceedings of the Participatory Innovation Conference PIN-C 2013*, p. 537.
- ⁵⁹Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology*, 21(1) <https://doi.org/10.14742/ajet.1344>
- ⁶⁰Bouw, E., Zitter, I., & de Bruijn, E. (2020). Designable elements of integrative learning environments at the boundary of school and work: a multiple case study. *Learning Environment Research*. <https://doi.org/10.1007/s10984-020-09338-7>
- ⁶¹Griffiths, T., & Guile, D. (2003). A connective model of learning: The implications for work process knowledge. *European Educational Research Journal*, 2(1), 56-73. <https://doi.org/10.2304/eeerj.2003.2.1.10>
- ⁶²Akkerman, S. (2011). Learning at boundaries. *International Journal of Educational Research*, 50(1), 21-25. <https://doi.org/10.1016/j.ijer.2011.04.005>
- ⁶³Laukkonen, R.E., Biddel, H., & Gallagher, R. (2019). *Preparing Humanity for Change and Artificial Intelligence: Learning to Learn as a Safeguard against Volatility, Uncertainty, Complexity, and Ambiguity*. Paris: OECD Publishing. doi:10.31234/osf.io/g5qwc
- ⁶⁴Bouw, E., Zitter, I., & de Bruijn, E. (2020). Designable elements of integrative learning environments at the boundary of school and work: a multiple case study. *Learning Environment Research*. <https://doi.org/10.1007/s10984-020-09338-7>

- ⁶⁵Bouw, E., Zitter, I., & de Bruijn, E. (2020). Designable elements of integrative learning environments at the boundary of school and work: a multiple case study. *Learning Environment Research*. <https://doi.org/10.1007/s10984-020-09338-7>
- ⁶⁶Bouw, E., Zitter, I., & de Bruijn, E. (2020). Designable elements of integrative learning environments at the boundary of school and work: a multiple case study. *Learning Environment Research*. <https://doi.org/10.1007/s10984-020-09338-7>
- ⁶⁷Bouw, E., Zitter, I., & de Bruijn, E. (2020). Designable elements of integrative learning environments at the boundary of school and work: a multiple case study. *Learning Environment Research*. <https://doi.org/10.1007/s10984-020-09338-7>
- ⁶⁸Bouw, E., Zitter, I., & de Bruijn, E. (2020). Designable elements of integrative learning environments at the boundary of school and work: a multiple case study. *Learning Environment Research*. <https://doi.org/10.1007/s10984-020-09338-7>
- ⁶⁹Bouw, E., Zitter, I., & de Bruijn, E. (2020). Designable elements of integrative learning environments at the boundary of school and work: a multiple case study. *Learning Environment Research*. <https://doi.org/10.1007/s10984-020-09338-7>
- ⁷⁰Fadel C., & Groff J.S. (2019). Four-Dimensional Education for Sustainable Societies. In: Cook J. (eds) *Sustainability, Human Well-Being, and the Future of Education*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-78580-6_8
- ⁷¹Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons.
- ⁷²Blank, S., & Dorf, B. (2020). *The startup owner's manual: The step-by-step guide for building a great company*. John Wiley & Sons.
- ⁷³Maurya, A. (2012). *Running lean: iterate from plan A to a plan that works*. " O'Reilly Media, Inc."
- ⁷⁴Young, P.W., & Hallström, S. (2007). Chapter five Design-Implement Experiences and Engineering Workspaces. In: E. Crawley, J. Malmqvist, S. Ostlund & D. Brodeur (Edit.), *Rethinking engineering education: The CDIO approach*. Springer International Publishing.
- ⁷⁵Tuckman, Bruce W. (1965). "Developmental sequence in small groups", *Psychological Bulletin*, 63, 384–399.
- ⁷⁶Read, S. & Sarasvathy, S.D. (2005). "Knowing What to Do and Doing What You Know. Effectuation as a Form of Entrepreneurial Expertise". *The Journal of Private Equity* Winter 2005, 9 (1) 45-62; DOI: <https://doi.org/10.3905/jpe.2005.605370>
- ⁷⁷Konst, T. & Jagiello-Rusilowski, A., (2007). Students' and Higher Education stakeholders' concepts of resilience in the context of innovation camps https://www.researchgate.net/publication/320166049_Students'_and_Higher_Education_stakeholders'_concepts_of_resilience_in_the_context_of_innovation_camps