Professional UNcertainty Competence Framework

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Content

PUNC

Professsional UNcertainty Competence
is the ability to acknowledge, to explore and to handle uncertainty in a productive way.

The PUNC framework is a method to support the development of one's PUNC by:

- Understanding one's uncertainty experience in terms of acknowledging, exploring and handling uncertainty.

- Deciding which elements of knowledge, skills and attitude one want to develop regarding this experience.

- Formulating one or more learning outcomes in which these knowledge, skills and attitude are incorporated.

Three-parts strategy

Your need for PUNC can be diverse. Here is our three-parts flexible strategy to discover where your main need is focusing on.

Acknowledging

To recognize and accept uncertainty. To resiliently endure uncertainty and wanting to deal with it without panicking, giving up or stopping learning.

Exploring

To get acquainted with one's uncertainty, to gain understanding and to learn how to become able to take action on it.

Handling

To continuously develop the ability to deal with uncertainty and to be able to acknowledge, explore and handle uncertainty in other contexts/situations by reflecting on the outcome.

Knowledge, skills and attitude

A competence in general contains elements of knowledge, skills and attitude. Which of these elements do you need to handle uncertainty?

Check the PUNC menu!

Learning outcome

When the student has decided on which part he wants to focus, and what knowledge, skills and attitude is needed, he can construct a concrete learning outcome. This learning outcome defines his personal PUNC within that specific situation.

Introduction

People live, work and study in a world that can be characterized as VUCA: Volatile, Uncertain, Complex and Ambiguous. In a VUCA world it is evident that not everything can be known on forehand. 'Not-knowing', in its broadest sense, can stir up feelings of uncertainty which can be on the surface or profound, steady or rapidly changing. Uncertainty can hinder to come into action and disturb a learning-, work- of personal development process. On the other end feelings of uncertainty can stimulate creativity, reflection, thinking out-of-the-box and other actions. If and to what extent uncertainty is experienced, depends on how 'VUCA-isch' the situation is experienced by a person and on his personal capability to deal with that experience (Hänti et al, 2021).

In higher education, both students and educators often show a lack of knowledge and skills (and a need for tools) to learn to handle uncertainty in a productive manner. To bridge this competence gap, it is important to be aware of the nature of the experienced uncertainty, what it is triggered by, and what professionals need with regard to knowledge, skills and attitude in order to learn to handle it productively.

In the Erasmus+ Professional UNcertainty Competence project (PUNC) 6 European partners in higher education work together to develop 4 products that supports this need:

1- An educators' guide for designing hybrid VUCA learning environments.
2- A competence framework for identifying one's PUNC and for formulating individual and context-relevant learning outcomes.
3- A toolbox that supports the developing of one's PUNC.
4- An E-portfolio that monitors this development.

The six project partners are: Turku University of Applied Sciences (Finland); University of Gdansk (Poland); Innocamp (Poland); Valencia Polytechnic University (Spain), Business Academy Aarhus (Denmark), Utrecht University of Applied Sciences (The Netherlands).

In this document we present the PUNC competence framework. A framework that supports the development of the Professional UNcertainty Competence (PUNC) by defining personal learning outcomes based on personified PUNC elements and tailored to a specific professional situation.

After the presentation of the PUNC framework itself, a substantiation of this framework is presented by describing the theoretical and practice-based research activities that laid the foundation for the framework: a literature study, surveys and validation sessions. This is followed by a reflection on the quality of the research process, its outcomes and the usability in general of the PUNC framework in the educational practice.

1. The PUNC Competence Framework

1.1 The intentions behind the PUNC Competence Framework

What is PUNC?

The PUNC Competence Framework is developed to help the individual to define his PUNC. But what is PUNC?

Professsional UNcertainty Competence (PUNC) is the ability to acknowledge,

to explore and to handle uncertainty in a productive way.

PUNC is very individual and personal, and it is depending on the context of the person that experiences uncertainty. As uncertainty is experienced by the individual in a highly personal manner, the PUNC framework focusses on the individual needs of the user. So uncertainty can be experienced in many different ways and everyone deals with it in a personalized manner. This doesn't mean that both this individual and his uncertainty experience are independent of their context. Especially when a situation can be addressed as volatile, uncertain, complex and ambiguous (VUCA - see: Hänti et al, 2021), the manner and form in which uncertainty can be experienced differs between individuals. Also uncertainty can be triggered by the social or organizational context of the individual. So as the individually experienced uncertainty is firmly interconnected with the professional context of the individual, the need to develop one's PUNC also has to be seen within this context. PUNC depends very much on the situation it is needed for and on the personal demands to be able to act adequately in that situation. Therefor it is important that a person defines his own personalized PUNC.

PUNC is a so-called transversal competence that, when addressed properly, allows for other professional and domain specific competences to be developed. The experience of uncertainty can produce distress that in its turn inhibits learning and the development of other competences. So when addressed properly, the individual can learn to make the experienced uncertainty productive and thus diminish its hampering effects and create the possibility for other competences to be developed.

In order to develop the ability to make uncertainty productive, the PUNC Competence Framework is developed. This development of one's PUNC is supported by the PUNC Box, that contains various tools and activities that can be used in a personalized manner.

The PUNC Competence Framework

The PUNC framework is a tool to support the development of one's PUNC by:

- Understanding one's uncertainty experience in terms of acknowledging, exploring and handling uncertainty.
- Deciding which elements of knowledge, skills and attitude one want to develop regarding this experience.
- Formulating one or more learning outcomes in which these knowledge, skills and attitude are incorporated.

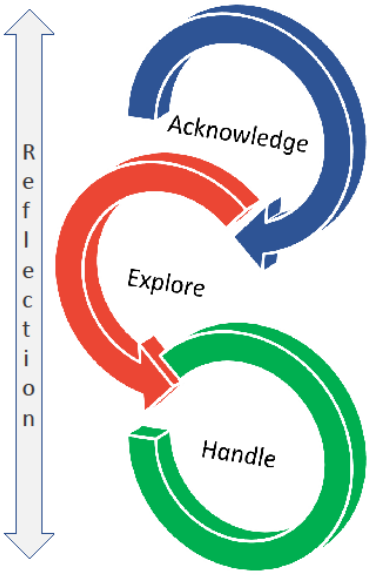
Therefore the PUNC framework consists of:

1. Description of a sensemaking strategy for making uncertainty productive.

2. Menu of PUNC elements that defines the gap between the uncertainty experience and being able to handle uncertainty productively
3. Examples of how context-specific and personal learning outcomes can be composed, that help to make the experienced uncertainty productive.

Sensemaking strategy

Competence development can be interpreted as a process of sensemaking. We describe the sensemaking process of uncertainty as a three-part flexible strategy to discover where one's main need is focusing on: is it about acknowledging, exploring or handling uncertainty? These questions help the individual to reflect on the focus of one's need. And to choose a starting point for developing one's PUNC. So, even though the three parts are interrelated, they can very well be approached separately.



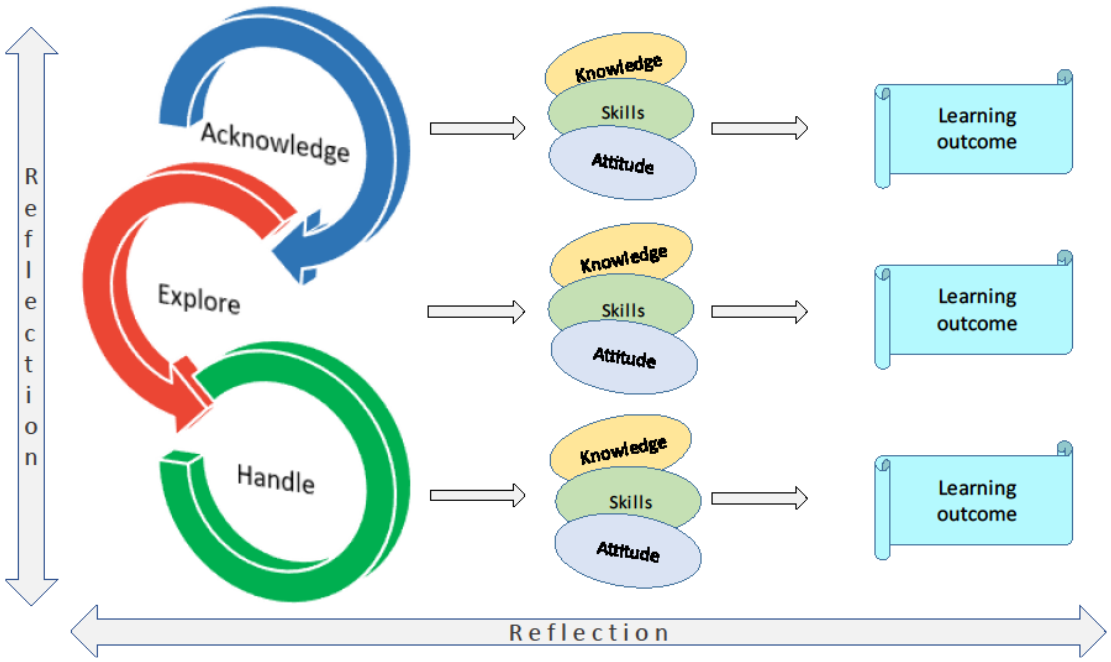
To *acknowledge* is: to recognize and accept uncertainty (as a given, as an opportunity; a source; a possible drive for action, entrepreneurship or innovation). To resiliently endure uncertainty and wanting to deal with it without panicking, giving up or stopping learning.

To *explore* is: to get acquainted with one's uncertainty, to gain understanding and to learn how to become able to take action on it.

To *handle* is: to continuously develop the ability to deal with uncertainty and to be able to acknowledge, explore and handle uncertainty in other contexts/situations (transfer) by reflecting on the outcome.

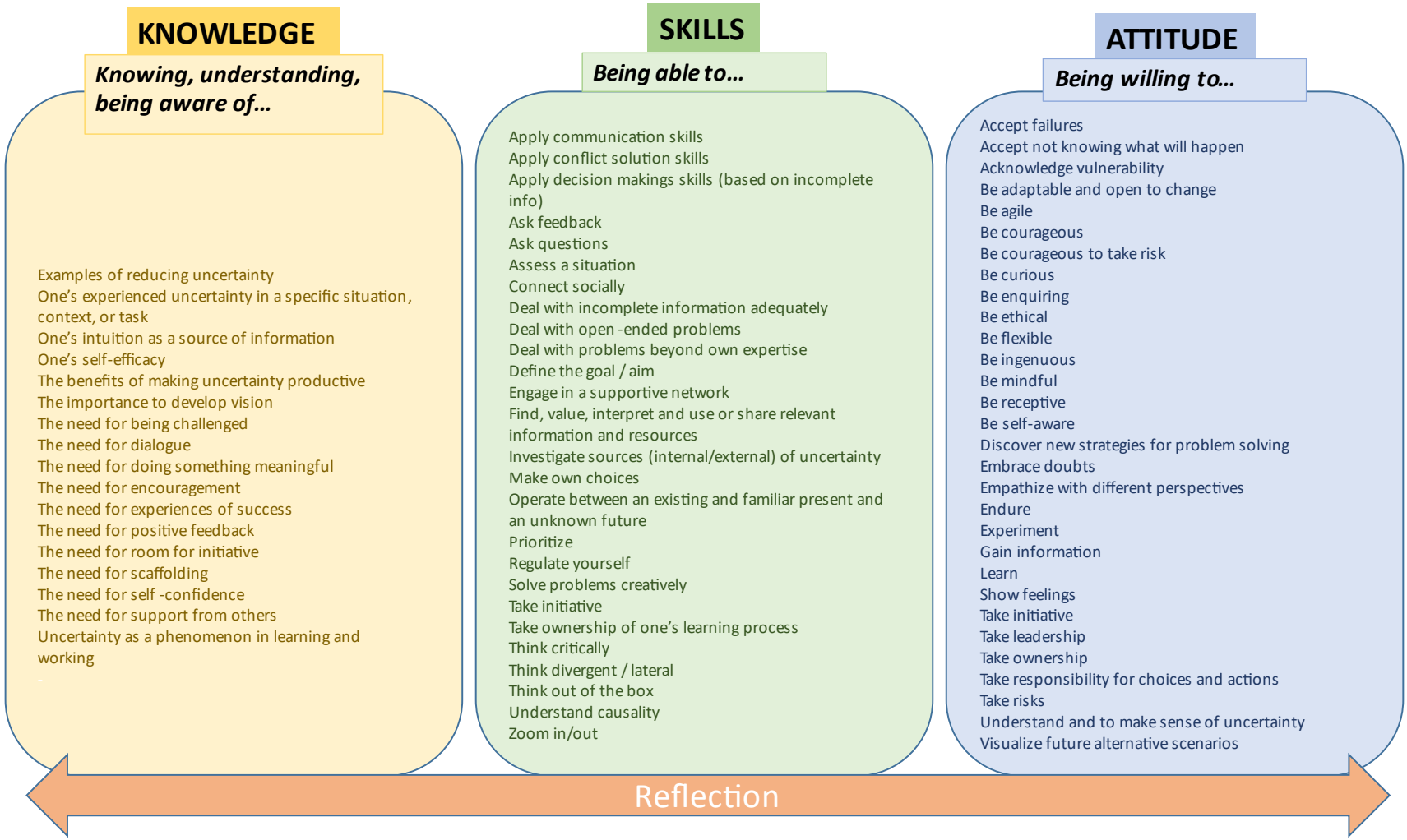
A competence in general contains elements of knowledge, skills and attitude. For PUNC this means that an individual can define which knowledge, skills and attitude he wants to develop. He can do that with the three parts in mind: Does he want to focus on acknowledging, exploring or handling uncertainty? And, what elements of knowledge, skills and attitude does he think are needed to handle this uncertainty productively? In the PUNC Menu (see below) a number of possible elements of knowledge, skills and attitude are presented, from which the student can choose.

When the individual has decided on which part he wants to focus, and what knowledge, skills and attitude is needed, he can construct a concrete learning outcome. This learning outcome defines his personal PUNC within that specific situation. The focus on concrete knowledge, skills and attitudes helps the individual to focus his attention on what he wants to learn and also to come into action in a focussed manner.



Working with the three parts, specific elements of knowledge, skills and attitude, and personalized and context specific learning outcomes, helps to make uncertainty productive, especially when they incite the individual to action. The individual can choose one or more tools (from the PUNC box) that can help to develop the required knowledge, skills and attitude. Additionally reflection is an important driver of professional development and learning. The development of all other elements is very much encouraged by the willingness and quality of self-reflection.

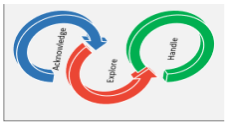
1.2 The PUNC menu



1.3 Instructions for working with the PUNC Competence Framework

The PUNC framework offers support for the formulation of specific, contextually relevant and highly individual learning outcomes. The need for such a learning outcome emerges from the individuals' reflection on an experience of uncertainty. Based on this reflection he decides which of the PUNC elements of the menu (knowledge, skills, attitude) are relevant for him to develop in this specific case. Then he combines these elements in one or more concrete and personal PUNC learning outcomes.

Here follow 4 steps that the individual can take to come from his experience of uncertainty to a concrete learning outcome that helps him to handle your uncertainty productively. These steps can be taken individually, or together with a tutor or other 'significant others':



Step 1 — Describe your uncertainty experience and decide on your focus

Step 2 — Choose relevant elements from the PUNC Menu

Step 3 — Define your personal learning outcome

Step 4 — Come into action!

Step 1:

Experiences of uncertainty can be difficult to comprehend. In order to discover what one needs to develop so that he can handle this uncertainty in a productive way, it is very helpful to put one's uncertainty experience into words by telling or writing about it. If one has a clear view of the uncertainty experience, he can try to decide what he wants to do with it. Does he want to acknowledge it? Or to explore it? Or to make it productive?

Step 2:

When he described his experience of uncertainty, he can go to the PUNC Menu. In the PUNC Menu he'll find various elements of Knowledge, Skills and Attitude. The individual can go through the Menu and try to find elements of knowledge, skills and attitude that he wants to develop with particular situations and one's uncertainty in mind. What knowledge does he think he needs? What does he want to be able to do? What does he want to be willing to? This PUNC Menus is meant to inspire and is not exhaustive. One can add personally relevant elements to the PUNC Menu and so personalise the Menu for own use.

Step 3:

After having chosen these elements, one can start formulating one or more learning outcomes. Try to combine the chosen elements of the PUNC menu in the learning outcome. If it is not possible to make combinations, then one can formulate a separate learning outcome for that element.

Step 4:

The learning outcome(s) gives concrete direction in which one can develop. Take a thorough look at the PUNC box, or try to search for other relevant tools and activities that can help to develop one's PUNC. Discuss with others and decide on the action that is needed to achieve this learning outcome. And then: come into action! Make sure that one learns from any action he undertakes or any insight that he gains. Reflection in and on action will help to draw lessons from the experience and helps to handle the experienced uncertainty productively.

Example 1

Step 1. A person experiences uncertainty when he is assigned a task that he doesn't understand. He wants clarity as he doesn't know what the results have to be.

Step 2. Having knowledge of: where to find relevant information

Being able to: ask questions

Being willing to: take initiative, be courageous

Step 3. Learning outcome: "I am able show courage by taking initiative to ask my tutor for support on where I can find relevant information with regard to my task."

Example 2

Step 1. A student experiences uncertainty while working on a final exam together with a fellow student. The fellow student fails to deliver the material that they agreed on. How to pass the exam?

Step 2. Having knowledge of: where to find relevant information

Being able to: deal with an open-ended problem; connect socially, apply communication skills

Being willing to: show feelings; be courageous; be receptive; gain information.

Step 3. Learning outcome 1: "I am able to deal with this open-ended problem by connecting socially with my fellow student by applying adequate communication skills in order for the problem to be discussed."

Learning outcome 2: "I am willing to deal with this open-ended problem by showing feelings, being courageous and by being receptive in order to gain information about why he fails to deliver."

Example 3

Step 1: A person experiences uncertainty during his first day of his internship at the company of his dreams. He has high expectations of himself and he thinks that his colleagues have high expectations of him too. He feels that he has to succeed in everything and he has to be highly appreciated by his colleagues.

Step 2: Having knowledge of: one's intuition as a source of information; one's experienced uncertainty

Being able to: investigate sources of uncertainty (internal/external); ask questions; take initiative; connect socially, apply communication skills, accept not knowing what will happen.

Being willing to: embrace doubt; endure; be receptive

Step 3: Learning outcome 1: "I am able to trust my intuition by using my former uncertainty experiences as a source of information."

Learning outcome 2: "I am able and willing to investigate sources of uncertainty (internal/external) in former experiences of uncertainty."

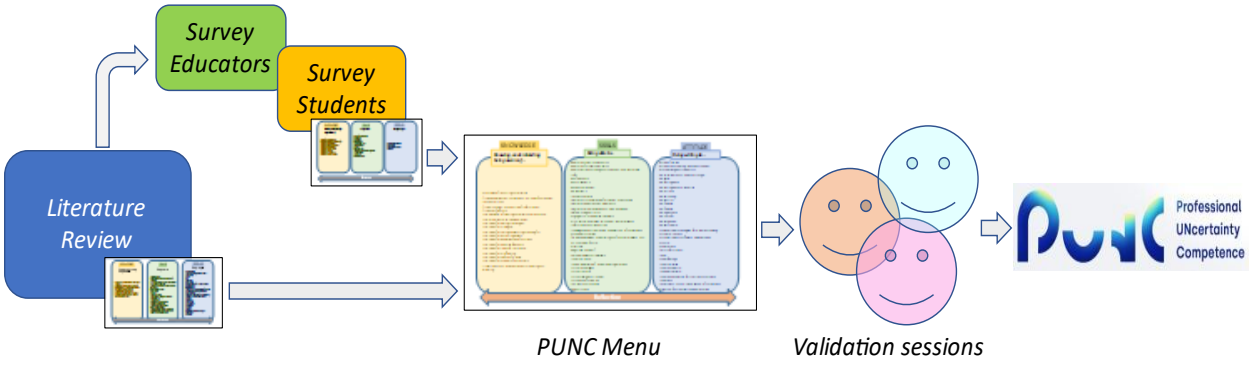
Learning outcome 3: "I am able to apply communication skills like asking questions."

Learning outcome 4: "I am willing to take initiative and be receptive in order to connect socially."

Learning outcome 5: "I am willing to endure and able to accept not knowing what will happen and embrace doubt.

2. Research set up

The PUNC Competence Framework is based on three research activities as visualized below:



1) Literature review (theory-based knowledge): the literature review was the theoretical starting point of the framework. As it focusses on defining the gap between the experience of uncertainty and making it productive, its result is a theory-based 'menu' of elements of knowledge, skills and attitudes that can be part of the PUNC competence.

2) Survey amongst educators and students (practice-based knowledge): These theoretical insights and the menu were used to construct a survey amongst educators and students of all partners universities. This survey yielded practical knowledge of how educators and students think about what knowledge, skills and attitude are needed in order to make the experienced uncertainty productive. Therefore the outcome of the survey includes an practice-based menu of relevant PUNC elements.

3) Validation of the above with educators and (when possible) students: Both the theory-based and practice-based menu's are combined into the "PUNC menu". Also a description of how to generate personalized and contextually relevant learning outcomes, based on these menus, form the first version of the PUNC Competence Framework. This first version was discussed and validated by educators and students from all partners universities in national validation sessions.

Ultimately this research approach resulted in a an actionable PUNC Competence Framework.

2.1 Set up of the literature review

The literature review was the first step in defining the Professional UNcertainty Competence (PUNC). As the instruction We started the review with a study of sensitizing concepts derived from relevant (inter)national literature. This resulted in these concepts: Uncertainty (internal/subjective) in HE learning; Professional uncertainty (internal/subjective); Competence design; Competence development; Learning outcomes.

Subsequently all partners were required to use at minimum 3 academic publications and additional (open access) sources per concept. Also, for the first two subjects, all partners collected domain specific literature for the professional domains that they represent: Business, Education, Law and Engineering. We only searched for articles/books with the access to full text mode. All partners used various search engines and key words in both English and the national languages. For a detailed overview, see Factsheet (Add I). This yielded 386 possibly relevant texts. After a first reading of titles, summaries and conclusions we selected 131 texts for in-depth analyses through close-reading. Based on the selection per partner, each partner delivered input on the above concepts to the editors (HU). The editors synthesised this diverse and rich information into a first draft. In this draft 63 texts were actually used. This draft was reviewed by the partners and revised accordingly. The final result of this literature review is a description of PUNC, a theory-based 'PUNC menu' and a first version of the PUNC framework.

2.2 Set up of the survey

Based on the outcomes of the literature review, a survey was conducted amongst educators and students of the project partners. With the survey we gained information on the students experience with regard uncertainty in their learning process and their 'needs' in order to handle this uncertainty in a productive way.

Our main focus was on the educators because they are the expert professionals that design and organize and implement education to help students develop their competences. However, in addition to this expert information, a similar survey was conducted among students.

The topics for the survey were constructed in a common effort by all project partners, based on the literatre review, and these topics were classified according the separate concepts that form the VUCA acronym: Volatile, Complex and Ambiguous. For a detailed process description, see the *PUNC Competence Framework - Survey Report,* July 2021. Based on the literature review, we approach the U of uncertainty basically as 'not knowing'. Uncertainty is the experienced (internal/subjective) uncertainty of the students during his/her learning process. In relation to VUCA this means that the Uncertainty in the students experience relates to Volatility, Complexity and Ambiguity: I don't know what will happen …..; I don't know how to act…. The same goes for the 'needs' of the students in order to handle uncertainty productively. That's why in every category V, C and A the topic was viewed from the perspective of uncertainty (U) and therefore 'U' didn't have topics of its own. For both the experiences and needs topics were defined. Also, three 'open' questions were added in order to retrieve information about the learning environment the respondent works in. The learning environments are relevant for relating the PUNC learning outcomes to VUCA learning environments. The respondents could answer on a scale of 5 possibilities. The tool we used for the survey was CrowdTech and the survey for the educators was open between April 1st and June 5th of 2021; the survey for the students was open between May 15th June 5th of 2021. The data was analysed in SPSS, after checking Cronbach's alpha. The final result of this survey is a practice-based addition to the PUNC menu.

2.3 Set up of the validation sessions

The outcome of the literature review and the survey was discussed and validated in validation sessions that were conducted by all PUNC partners. The aims of the validation were:

- to test and validate the recognizability and understandability of the PUNC framework in itself and of its separate elements.
- to test and validate the usability and functionality of the PUNC framework and especially the instruction(s).

The set up was for every partner to organize a validation session with minimal 10 educators and if possible, a validation session with students. Every partner decided how many students would be involved. Every partner also could decide which setup fitted best their organizational setting and educational culture. The questions that were used to focus the validation sessions can be found in *PUNC Competence Framework - Validation Sessions Instructions and Results, February 2022*. partners were asked to report their findings in the reporting formats (see: *PUNC Competence Framework - Validation Sessions Instructions and Results, February 2022*) in which they also described the choices they made in the design and execution of the sessions. The sessions were organized between Oct. 15th 2021 and Nov. 30th2021. After having received all input, the HU team synthesized all findings. These findings were discussed with all partners and accordingly was decided which changes were to be made to the PUNC Competence Framework.

3. Research results

3.1 Literature review

3.1.1 Exploration of uncertainty

Uncertainty makes up an inherent part of our emotional palette. We often associate uncertainty with anxiety and stress as all these intense and often negative emotions affect our wellbeing (EVA, 2018). It is argued that in higher education students should develop emotional competences in order to handle their emotions and wellbeing in the context of work and profession (Isacsson, et.al,.2019) because acknowledging emotions can help to understand them better and make use of them. Some also argue that "emotional competence" is a skill needed in the working life, that can and should be learnt (Isacsson, et.al., 2019). Others vote for developing "uncertainty competences" (Fazlagić, 2018; Tauritz, 2016)

Like emotions (Savijärvi, 2016), uncertainty can be classified as positive (activating, eustress) and negative (inactivating, distress) and has mental as well as physiological effects (Bigdeli, 2010). Viewed from the negative perspective, uncertainty can be experienced as a source of threat, anxiety and fear (Majerek, 2018) with the result that it can decrease creativity, weaken performance and make people resort to safe work practices or methods (Savijärvi, 2016).

From a positive perspective uncertainty can be interpreted as a growth factor, a driver for creativity and innovation. As a professional skill, it is powerful and productive to be able to view uncertainty as a rich source of opportunities, as it can offer the possibility to create new forms of thinking and acting (Joosten, 2021). Positive uncertainty opens new possibilities for action and thus implies a goodbye to dogmas and limitative normative frames (Jacobs, 2010). It is a prerequisite for developing the ability to deal with open-ended problems in the future (Muukkonen & Lakkala, 2009).

Emotions like uncertainty can differ throughout the learning process and present themselves in waves (patterns): at the beginning, throughout, or even after the learning process (Arpiainen, et.al., 2013). Especially when a student encounters a new threshold (waypoint) in their learning process, it brings about the uncertainty of what lies behind it. Taking the risk of entering this liminal space, enables the student to grow and develop (Osmond & Tovey, 2015).

Not knowing

In working and learning, uncertainty is often interpreted as 'not knowing'. Professionals experience uncertainty when they lack certain knowledge that seems to be needed at that particular moment. Knowledge has many different connotations and in this review not-knowing is used in the broadest sense of knowledge: cognitive, emotional, tacit, explicit, embodied, actionable, etc. (Markauskaite & Goodyear, 2017). Jordan (2015) defines uncertainty as a form of metacognitive awareness in which a person is conscious about one's lack of knowledge. Also, Tracey & Hutchinson (2016) describe uncertainty as a lack of adequate knowledge about events that may occur in the future or that may have already occurred. Hillen, Gutheil, Strout, Smets, & Han (2017) replace 'lack of knowledge' with the broader concept of 'ignorance'. And from the perspective of the learner and professional, they are dealing with problems beyond his expertise (Muukkonen & Lakkala, 2009). As stated above, this "knowledge uncertainty" (Tauritz, 2012) is just one element of the professional and personal emotional palette.

Sources of uncertainty

This lack of knowledge can have different origins. With regard to time, uncertainty is one's subjective experience of not knowing how the future will unfold, what the present means, or how to interpret the past (Jordan, 2015). A teacher for example is never sure about how the results that his pupils show are actually influenced by his interventions (Kelchtermans, w.d.). And an engineer has to design a durable, robust and safe construction without actually knowing how the construction will behave under unknown future circumstances (Havik, et.al., w.d.).

Hillen, et.al. (2017) describe three kinds of sources for the perception of uncertainty: ambiguity, probability and complexity. When something is ambiguous, we are uncertain about whether something is true or not. Lane and Maxfield (2005) define this as truth uncertainty. Probability refers to randomness or unpredictability, as we do not know what is going to happen in the future or cannot predict what the effects are of actions. Complexity relates to situations where it is difficult to comprehend because there is multiplicity in causes, variables, perspectives or different meanings of phenomenon. Hillen et al. (2017, p. 70) argue that 'probability, ambiguity, and complexity each produce uncertainty once individuals perceive them – that is, when they become aware of them as sources of ignorance'. This perception is moderated by individual characteristics like personality traits or different situational, cultural or social factors.

Other sources of uncertainty can be traced to the variability and the limitations of knowing (Van et.al., 2003). Variability points to the unpredictable, chaotic and changeable character of processes, nature, people's behaviour, technology, society, paradigms, etc. Limited knowledge refers to imperfect accuracy, lack of measurements/observations, impracticability, conflicting information and non-reducible ignorance. Some knowledge will never be obtained.

3.1.2 Uncertainty in learning and working

Uncertainty is as much a part of the learning process as it is of the professional process (Arpiainen, et.al.,. 2013; 2016; Bigdeli, 2010). It is widely recognized across various professionals' domains and it is usually regarded to be connected to knowledge intensive jobs (Danish Technology Institute, 2013). These are jobs in which decision making is central (e.g. education, management, law), jobs that aim for innovation by new (digital) technologies (technique, design, education) (Bahl et al., 2020; Perez-Gomez, 2019) and jobs that focus on the future (e.g. engineering, construction, education) (BYGGERIET 2035, 2018).

Decision making

Through all professional domains the role of decision making seems to be closely related to uncertainty. Decision making is always aimed at creating an outcome that has to be relevant to an unknown future and thus has unknown consequences (Perez-Gomez (2019). Not knowing the consequences means taking risk (Rodriguez & Estévez, 2005). The consequences relate to the amount of (useful) information that is available. Four categories can be defined (Raaphorst, 2017):

- uncertainty of information: uncertainty about whether one can find enough information to support one's decision

- uncertainty of interpretation: especially when 'rules of decision making' give little support.

- uncertainty of action: when one has to act on the spot but doesn't know how, based on the available knowledge.

- uncertainty of result: what will be the outcome/impact?

The example of legal professionals gives us a glimpse of how decision making in uncertainty can occur:

> Legal professionals experience uncertainty in their decision making because they experience uncertainty of proof (not knowing for sure in the present) and uncertainty of prediction (not knowing the effect in the future). Legal professionals call the range in which they can make a decision "discretionary space" (Raaphorst, 2017; Severijns, 2015). Discretionary space is used to create probably effective patterns to handle the limited time and means available. Patterns like rationing, focussing on successful cases or ignoring troublesome cases (Geenen, et.al., 2017). These patterns come into being through heuristics, cognitive schedules and logical deductions for relevant facts (Goderie & Bouttelier, 2009). Heuristics are rules of thumb that allow the legal professional to decide swiftly in case of uncertainty through selective observation and productive omission. They react by collecting information to reduce the uncertainty of information to an acceptable level; examining the rules; examining the organizations handling bandwidth; influenced by personal opinions, experiences and beliefs (Severijns, 2015; 2019). This handling of discretionary space for decision making demands an attitude of staying with uncertainty and of having the patience to suspend judgement (Van Donkersgoed, 2019). And ultimately, a decision is acceptable when it an adequate fit with the context is obtained instead of being just logical or statistical true (Hildebrand, 2011).

With regard to uncertainty and decision making, Tauritz (2012) presents this helpful model (figure 1) that shows the place of and coping strategies with not knowing/uncertainty in decision making and its results:

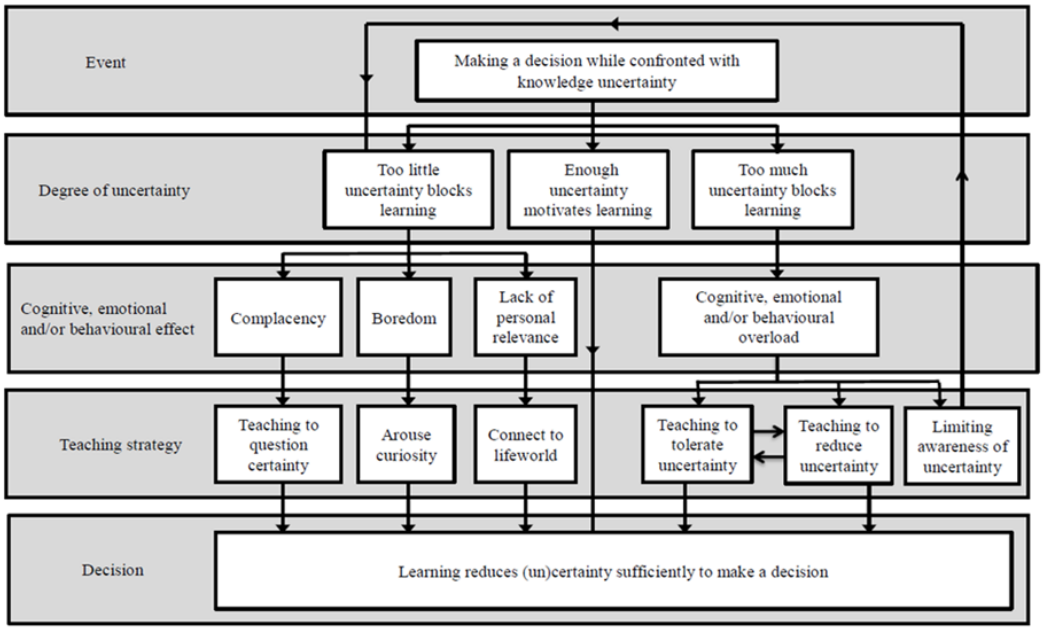


Figure 1: Pathways for handling knowledge uncertainty

Figure 1: pathway to handling knowledge uncertainty (Tauritz, 2012, p.305)

3.1.3 Transition

Another form of uncertainty is encountered during the transition between the world of study and world of work (Saarnivaara & Sarja, 2007.) This transition from study to working life means moving to new social conditions and leaving group membership of same values, beliefs and practices. They are leaving the environment that has contributed to their socialization and the forming of their (professional) identity. For some this incites much uncertainty as they are only just becoming aware of their own professional identity and on top of that already have to get acquainted with the professional identity that the new work environment demands. This is even a larger source of uncertainty when the new professional identity isn't clearly defined by the work field either (Ropo, et. al., 2015).

3.1.4 Productive uncertainty

Even though uncertainty can be experienced as an unwanted emotional state that many professionals try to avoid or to resolve (e.g. Bar-Anan, et.al., 2009; Nevalainen, et.al., 2010) several authors argue that it also can be an aspect that is most potent for innovation and change and can be considered to be an essential dimension of professional competences (Attard, 2008; Lane & Maxfield, 2005).

Uncertainty incites us to test our premises and hypotheses and makes us assess our capabilities and means available for a particular ambition or action (Fields, 2011). When experienced as doubt, uncertainty can invite us to look for errors or alternatives and therefore transform uncertainty into a source of information (Locke, et.al., 2008). In addition, it is an essential feature of creative processes like writing (Carabine, 2013) and if embraced, it encourages ongoing inquiry by the professional (Attard, 2008). Lingard, et.al. (2003) call this handling of uncertainty 'the art of uncertainty' from which follows that professionals have to learn that certain forms of uncertainty can be useful for the quality of their work. This opens up the possibility for professionals to learn to handle uncertainty in their professional performance in a productive way.

When we define uncertainty as not knowing, it can be a trigger for *sensemaking* (Cramer et.al., 2004; Weick, 1995). When one is not able to understand (make sense of) reality with common routines and mental schemes, one can react in terms of exploration, investigation and reflection (Kommunikation og sprog, 2018; Bollinger & Van Rooijen, 2016). Therefore uncertainty can help to appropriate new beliefs, values, and conceptions and facilitate creative problem-solving (Jordan, 2015). A "dynamic degree of certainty" helps for keeping ethical fibre and developing a critical thinking attitude (Bauman, 2008). In search for plausible answers and relevant knowledge, many other possibilities are discovered (and possibly dismissed) (Attard, 2008) and serendipitous learning is encouraged. In this way uncertainty can become a catalyst for innovation (Kommunikation og sprog, 2018).

Professionals and students that aim for *innovation* are dealing with constant change, risk and unpredictability (Fazlagić, 2018). Students learn that knowledge is needed to reduce the uncertainties that accompany these factors and to make choices possible, even if this knowledge is provisional (Savelsbergh, 2019), especially because they operate between an existing and familiar present and an unknown future (Havik, et.al., w.d.). Thus in the 'meta-field' of innovation one has to provide for adequate results based on inadequate knowledge about the unknown past, the unknowable future and the unpredictability of the present (Marchau, 2013). Innovators experience 'deep uncertainty'. With regard to the future, positive uncertainty supports decision making for an unknown future. Especially when one can accept the fact that the future is. Then uncertainty allows one to be a proactive instead of reactive decision maker (Gelatt & Gelatt, 2003).

So in summary, not knowing has negative and positive effects on the professional. On the whole it is argued that it is important that learners develop a repertoire that helps them to work with uncertainty (Kommunikation og sprog, 2018). So, what is it that actually supports learners and professionals to manage their internal world in order to create the necessary adequate psychological flexibility (De Toro, 2020) to handle uncertainty productively?

3.1.5 Describing a competence

is important to clarify what we mean by a 'competence'. That is not an easy job as many authors have conducted literature reviews on the topic (e.g. De Bie, 2002; Wesselink, Biemans, et.al., 2007); Bouw, Zitter & De Bruijn, 2020). One of the conclusions is that "The one and only true competence definition does not exist, nor will ever be" (Stoof , et.al., 2002, p. 347). Authors use different words or synonyms when they refer to competence, such as: "performance, qualification, capability, ability, knowledge, skill, attitudes, expertise". (Stoof et.al., 2002, p.358). Every concept has its own nuance. Capability and ability seem to have the closest association to competence. Stoof et.al. (2002) introduce the idea of a constructive approach, which focus on viability: This means that a definition of competence should be adequate for the situation in which it is being used" (p. 347.). A common notion in the description of a competence, is to use the concepts of knowledge, skills and attitudes. Two types of knowledge can be distinguished, namely: declarative and procedural knowledge. Knowledge can be tacit or explicit. Knowledge is about "What we know and understand" (Fadel et.al., 2015, p. 43).

Skills are closely tied to knowledge (Baartman & De Bruijn (2011), can be seen as doing or acting in practice, involving motor skills as well as cognitive skills" (p. 127) and are constructed in interplay with the social world. In the words of Fadel et.al. (2015, p. 43), skills point to "How we use what we know". And attitude refers to behaviour, "can be relatively stable" (Baartman & De Bruijn, p. 131) and/or can be constructed in a specific context. Fadel et.al.(2015, p. 43) use the word Character, which means "How we behave and engage the World".

Knowledge, skills and attitudes are interrelated elements, they are indivisible. This refers to a fourth element, namely meta-learning: "How we reflect and adapt" (Fadel, et.al. (2015, p.43). This element is a the

ability to reflect on the application of knowledge, skills and attitude in a useful way in a specific context and supports the transfer of a specific competence in other situations.

3.1.6 Learning outcomes

A competence description should be accompanied by learning outcomes. Cedefop (2017) states the following: 'Competence can be understood as actually achieved learning outcomes, validated through the ability of the learner autonomously to apply knowledge and skills in practice, in society and at work ' (p.31). With the direct relation between a competence and its learning outcomes, we have to be clear about the purpose of the learning outcomes. While focussing on learning from a constructive perspective, the description of learning outcomes are 'process-oriented and open-ended, limiting measurability' (Cedefop, 2017, p.44). In this way a learner, has the possibility to orientate, explore, interpret, monitor and reflect on the development of a competence. To describe learning outcomes it can be helpful to use the ideas as shown in figure 3:

Domain of learning	Levels of sophistication	Common verb associations
Cognitive (knowledge) What will students know?	remembering, understanding, applying, analysing, evaluating, creating	define, identify, describe, differentiate, explain, apply, analyse, resolve, justify, recommend, judge, create, design
Psychomotor (skills) What will students be able to do?	imitation, manipulation, precision, articulation, naturalisation	adapt, arrange, build, calibrate, construct, design, deliver, demonstrate, display, dissect, fix, mimic, operate, sketch, use, perform
Affective (attitudes, values or habits of mind) What will students value or care about?	receive, respond, value, organise, characterise	ask, challenge, demonstrate, discuss, dispute, follow, justify, integrate, practise, judge, question, resolve, synthesise

Sources: Marzano and Kendall (2007); Kennedy et al. (2006); Anderson et al. (2001); Bloom et al. (1956; 1964).

Figure 3: Domains of learning, with example levels of sophistication and common verb associations (Cedefop, 2017, p. 52).

3.1.7 Designing competences

When designing a competence we should take three aspects into account (Stoof, et.al. 2002). First a competence should be designed with different stakeholders, to include more perspectives which can contribute to viability. Second, be conscious of whether a competence is teachable or not. For a teachable competences instruction is needed and it has implications for the learning environment (including the role of teachers) in which the competence can be developed. According to Simons (zd), it is also possible, that competences can only be learned by practical experiences and not by instruction. A third aspect to take into account is to minimize the risk of a wide and vague description, which might result in too many learning outcomes. To minimize this risk, we have to be aware to address the following questions such as: Does it contain personal or task characteristics, is it a specific or generic competence, are there competence levels or not and how transferable is a competence? Those questions refer to the goal of the competence and the way the competence fit with the (learning and professional) context in which the competence is needed.

3.1.8 Development of competences

Seen from a constructivist perspective, the development of competences is considered as a holistic approach "to overcome the risks of the disintegrative approaches" (Biemans, et. al., 2004, p. 528). In this

paragraph we present some ideas about competence development, based on the perspectives from our partners practice. We will discuss a few models, without exploring them totally and deeply.

Four Dimensional Education

An interesting model with a holistic approach for competence development is the model in this figure:

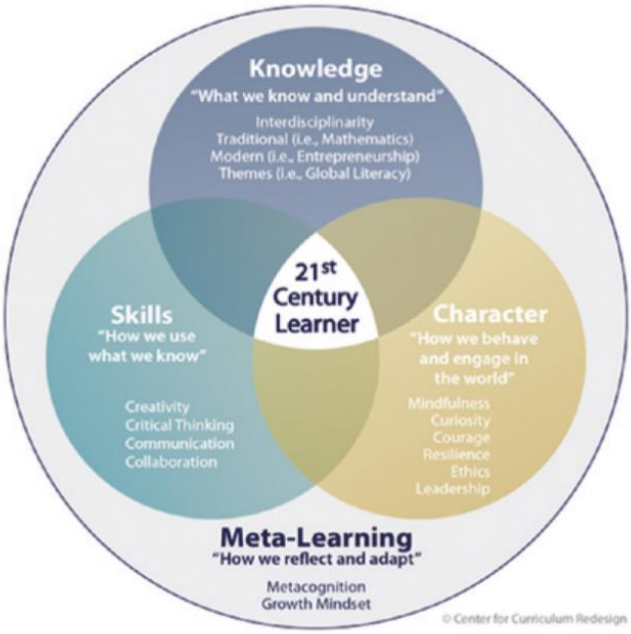


Figure 4 : The foundational framework of the Centre for Currciulum design Fadel et.al. (2015, p 43).

Although the model is developed for redesigning a whole curriculum, it is applicable for the development of competences. The model is based on three important aspects. First the model is adaptive, which means it is "fluid and evolving" (Fadel & Groff, 2019, p. 272). It means there is not a rigid structure or roadmap for the development of competences. The second aspect in the model is balanced, which refers to a variety of perspectives that students supports to develop a competence. The last aspect flexibility, is important in developing competences. Students have different needs, competences should be transferable and be further developed. According to Fadel and Groff (p.278) "these four dimensions can't just be added in and taught independently from one another", which fits with an holistic approach of competence development.

Innovation Pedagogy

Another interesting approach for competence development is 'innovation pedagogy' (Innopeda®). (see figure below). It is a strategic learning approach which 'aims to develop innovation competences of individuals and groups' (Konst, 2017, p. 1438). Although the focus is particularly on innovation competences, we think there are aspects in the strategy that are useful for holistic competence development.

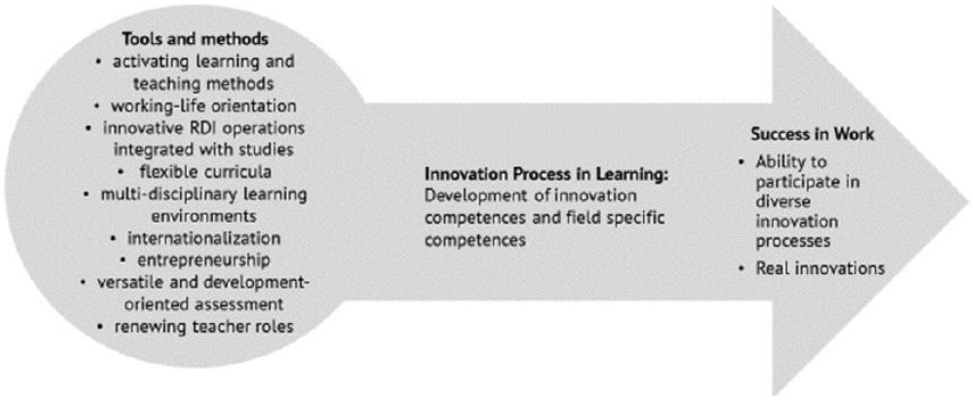


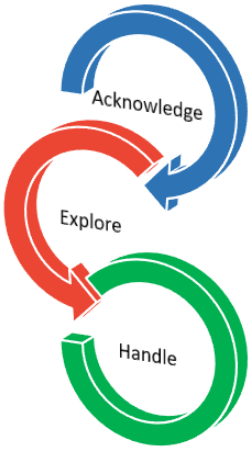
Fig. 1 Innovation pedagogy in a nutshell [15]

Figure 5: Innovation Pedagogy in a nutshell (Konst, 2017, p. 1439)

As can be seen in the figure above, innovation pedagogy puts important elements of the learning environment in the spotlight. The strategy provides many tools and methods for students and teachers, which are helpful for developing competences. One fundament of the strategy is: "to bridge the gap between education and working life" (Konst, 2017, p. 1439). This is a very important aspect of a holistic approach of competence development and rises the viability and transferability of a competence. With the innovation approach the four elements (knowledge, skills, attitude and meta-learning) will be addressed and it will enable students to take ownership of the creation of a competence that is needed.

3.1.9 Strategies on how to handle uncertainty as a competence

Competence development can be interpreted as a process of sensemaking. This sensemaking process is ongoing, creative, sensitive and reflexive, in which a person 'makes sense' of his or her experiences in a particular situation (Weick, 1995). Making sense of a collaborative experience will vary among individuals, who creates meaning from his or her perspective, history, culture and context. Instead of ignoring or avoiding uncertainty, it is engaged, explored and maybe even reframed into a new narrative that is fitting and possibly even required in that particular situation or learning experience. By sensemaking, uncertainty is made productive. We describe the sensemaking process of uncertainty as a three part and flexible strategy in which we make abundantly use of the educational approach of Innovation Pedagogy of the Turku University of Applies Sciences (Konst, 2017); the Four-dimensional-Education model of Fadel et.al. (2015) and the concept of 'safe uncertainty' (Bollinger and Van Rooijen, 2018). This three part strategy is to acknowledge explore and handle uncertainty:



To *acknowledge* is: to recognize and accept uncertainty (as a given, as an opportunity; a source; a possible drive for action, entrepreneurship or innovation). To resiliently endure uncertainty and wanting to deal with it without panicking, giving up or stopping learning.

To *explore* is: to get acquainted with one's uncertainty, to gain understanding and to learn how to become able to take action on it.

To *handle* is: to continuously develop the ability to deal with uncertainty and to be able to acknowledge, explore and handle uncertainty in other contexts/situations (transfer) by reflecting on the outcome.

1) Acknowledgement of uncertainty

The first phase is to acknowledge that a new competence is needed or an existing competence has to be further developed. In a VUCA-world with new, changing and unpredictable situations students have to acknowledge that they need to get access to knowledge and develop skills to adjust to the situation. They have to acknowledge whether or not they have the ability to do that by themselves, or that they need support from teachers and/or peers. And they also have to acknowledge that 'not-knowing' what, why, how and when to perform, can raise feelings of uncertainty. Fadel et.al. (2015) state that in this phase of acknowledgment character, especially courage, is an important aspect: "Courage can be thought of as the ability to act despite fear or uncertainty, in risky situations, or when we are feeling vulnerable" (Fadel et.al., 2015, p. 88). It means that students who experience 'not-knowing' and feelings of uncertainty, don't immediately lay down, sit back, or get paralyzed, but come into action. From the perspective of Innovation Pedagogy (Konst, 2017), a student needs therefore an inspiring and also safe environment, which has lots of opportunities to meet different kind of Peers (e.g. other students, teachers, friends) on a regularly and spontaneously base. The Peers can serve as companions and critical friends, with whom they can collaborate, dialogue, argue and get support from.

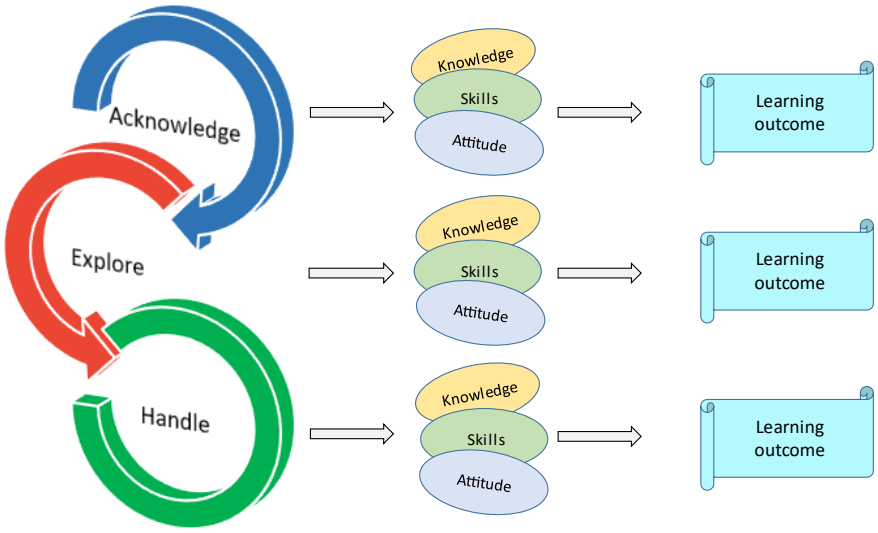
2) Exploration of uncertainty

In the second phase of exploration, the focus is on the sensemaking from 'not-knowing' to 'I know more' and to move from 'I feel uncertain ' to 'What helps me to make uncertainty productive'. Depending on for instance the ability for self-regulation, possibilities, the urge of the situation and need for answers, student's approaches to sensemaking can vary between superficial or more in-depth. Although there is nothing wrong with a 'quick-and-dirty' approach, the questions is whether or not such an approach will result in competences that are viable and transferable. The Four-dimensional-Education model (Fadel et.al., 2015) and Innovation Pedagogy (Konst, 2017) as learning strategies, provide many ideas to equip students for in-depth exploration. An illustration from the Fourth-Dimensional-Education, shows the importance that teaching should aim on making the connection between different knowledge areas explicit: "Highlighting interdisciplinary applications of concepts, meta-concepts, methods, and tools can be a powerful way of illustrating concepts and making them immediately relevant to student"(Fadel, et.al.,2015, p. 52). Another example comes from Innovation Pedagogy with a focus on the benefits of collaboration that has implication for the guidance of a collaboration process: "Collaborative learning enables different actors to work together in dialogue and in interaction in such a way that their own expertise can be efficiently shared and combined in new ways resulting in something more than the sum of its parts" (Konst, 2017, p. 1439).

3) Handling of uncertainty

The third phase of handling, is the phase in which students continue to exercise and work with the experiences and findings from their exploration phase. In this phase of the sensemaking process, students develop strategies and competences, which can be applied more automatically and at the same time engage students into a process of further development of those strategies and competences. From the Four-Dimensional Education (Fadel, et.al., 2015) we learn the importance of four elements that should be integrated in the sensemaking process. With maybe an emphasis on metacognition, because "critical reflection causes an expansion and deepening of learning" (Wesslink, et.al. p. 42). From the innovation pedagogy (Konst, 2017) we learn that tools and methods can create a learning culture, to provide students with challenging opportunities. In both perspectives we can find focus on sensemaking in authentic, challenging and hybrid environments or contexts. Where students take ownership, and where guidance (e.g. teachers, instructors) is adjusted to the need of the student. This implies that every strategy requires individually attuned elements of knowledge, skills and attitude that pertain to the situation at hand and the

personal needs of the learner. And additionally, all elements of knowledge, skills and attitude are developed and validated in practice by specific and personalized learning outcomes:



Also, based on research on tools of 'safe uncertainty', which were designed and tested in collaboration with the actual users (students), Bollinger and Van Rooijen (2018) found that: "Uncertainty can become productive when enough safety is experienced. One way of handling uncertainty and creating safety is by deploying educational tools that help students to make sense of their uncertainty"(p.1). So, these phases in the sensemaking strategy can be fruitfully developed by using specifically designed tools, as educational scaffolds. Working with the three phases helps to make uncertainty productive, especially when they incite the learner into action. In order to strengthen its productivity, these three phases and their outcome in terms of actions, are supported by the meta-competence Reflection. Reflection is an important driver of professional development and learning. The development of all other elements is very much encouraged by the willingness and quality of self-reflection.

3.1.10 The theory-based PUNC menu

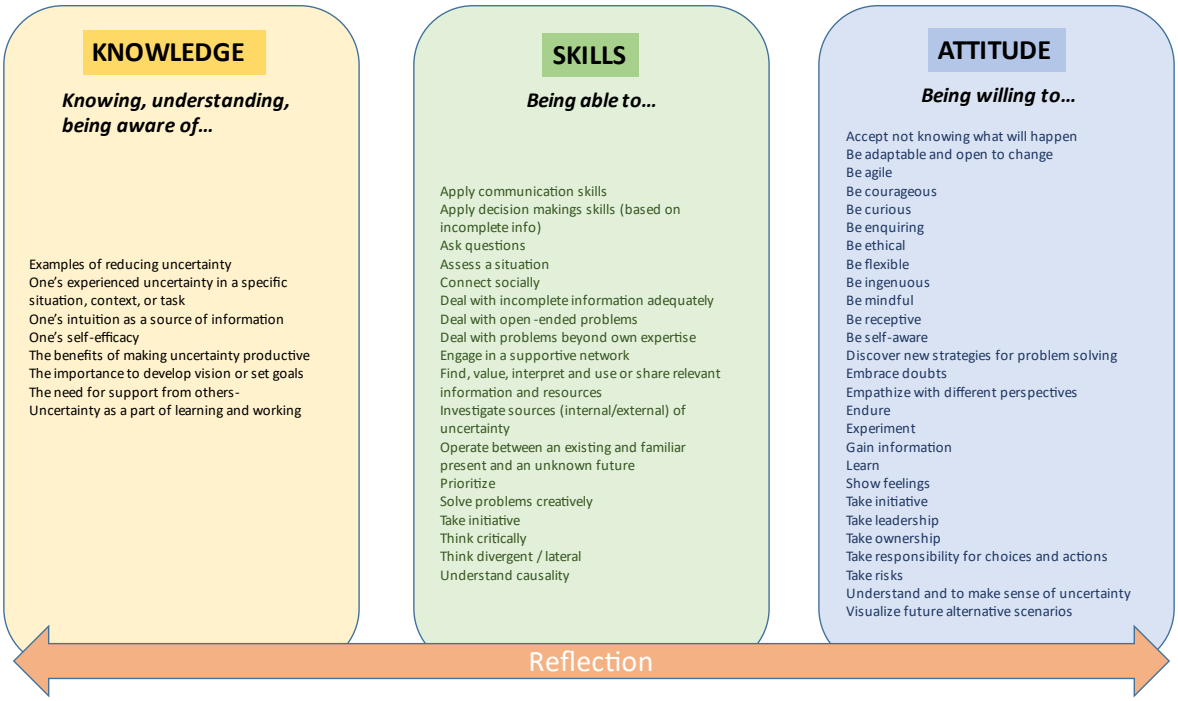
This version of the PUNC menu presents theory-based elements of knowledge, skills an attitude that help to bridge the competence gap between the experienced uncertainty and handling it productively.

Knowledge is understood as a multi-layered concept that includes: cognitive/hard knowledge (knowledge parts), understanding (constructs of various knowledge parts) and embodied/tacit knowledge (e.g. awareness). Skills are seen as abilities (being able to…) and an attitude is conceived as a conscious intention (being willing to…). Elements from these three categories can be combined into a specific and personalized PUNC learning outcome for a specific situation in which uncertainty is experienced (for further elaboration see 3.2 and 3.3). The fourth element - meta-learning by reflection – forms the basis for developing the specific PUNC learning outcome and is the activity that monitors and evaluates the effect of the combined elements of knowledge, skills and attitude in a specific learning outcome.

In practice, a competence always consist of the three indivisible components of knowledge, skills and attitude, so with regard to the flexible and personalized usability of the PUNC framework we chose to present an as rich and as specific as possible 'menu' of relevant PUNC elements. Any synthesisation of the separate elements into more general topics might lead to a generalization of meaning and a limitation in choice for the user. We also chose not to define the separate elements in this PUNC menu. Concrete definition could also lead to possible limitation of meaning as a user might want to attribute a different meaning to a certain element than how we defined it. It is therefore also possible that an element can occur

on more than one category. For example, based on the theory it is important to both be willing to 'take initiative' and to be able to 'take initiative'.

So both in quantity and quality of the presented elements we aim to remain as inclusive and inviting as possible for the user. This also means that the menu is not prescriptive in any way. A user can make his own meaningful combinations between the three categories and of course not all elements have to be developed in order to develop one's PUNC.



3.2 Survey

The aim of the survey (see: the PUNC Survey Report IO2, July 2021) was to retrieve information from the educators and students about what they see and think are the experiences and needs students have with regard to uncertainty in their learning process. In total we received from 141 students and 109 educators from Denmark, Poland, Finland, Spain and the Netherlands the survey.

3.2.1 Experiences

The first 28 topics refers to the question 'What do students ***experience*** with regard to uncertainty in their learning process within the learning environment?'. All educators and students recognize to a certain level the experiences as mentioned in the survey. A detailed overview of the frequencies per answer can be found in The PUNC Survey Report IO2, July 2021). The general results are shown in table 1.

Table 1: students experiences according to ≥ 45% of the educators and ≥ 40 % of the students

Students often	**Student are rarely**
are aware of one's owns strengths and weakness	capable to continue
are being judged	ask questions
are curious	feel discouraged
are excited	feel lonely
are fascinated	feel safe
are judged	have a perspective on the overall purpose

avoid risks	have a sense of direction
cling to fixed strategies	have conflicts during collaboration
feel overwhelmed	have patience
feel stressed	in control
feel vulnerable	receive feedback
have a drive to learn	take responsibility

The answers of the open-end question 'Please indicate any additional students' ***experiences*** of uncertainty in their learning process' are divers, mostly mentioned by a single educator and examples of the survey topics (See appendix C of the PUNC Survey Report IO2, July 2021 for the answers). In general the educators give examples of students uncertainty experiences related to:

- the context, e.g.: '*Students are feeling uncertain at the very beginning of the learning process because they do not know what is going to be the final product and how to get there';*
- judgment, e.g.: '*if it is not clear what they are judged on'* (translated from Dutch);
- peers, e.g.: '*pressure from peers to do well*';
- educators, e.g.: '*uncertainty about what they have done wrong with too little/unclear feedback from teachers'*(translated from Dutch);
- content / skills / ability, e.g.: '*Students do not read the material preparing them for classes, thus showing deficiencies in understanding the content. And after class, they don't have the habit of reading science in order to broaden their horizons'*;
- Self / attitude, e.g.: '*I see that uncertainty also often leads to passivity. Don't want to give in. Avoiding feelings of uncertainty. Present themselves better than they actually feel, or present themselves dependent*' (translated from Dutch).

The answers to the open-end question 'Do you have more **experiences** with regard of uncertainty in your learning process' are divers, mostly mentioned by a single student and examples of the survey topics. (See appendix D of the PUNC Survey Report IO2, July 2021 for the answers). The answers show several examples of 'not-knowing' e.g. about unclear formulated assignments, expectations from others, how to approach learning tasks, when something is good enough, where and from who to get an answer on questions and missing information. There are a few students that feel pressure to do everything in a good way and with a good result. There are some students who don't know what to do after graduation. There are students who experience uncertainty in group processes. Some answers are directly related to the Self, e.g. 'My usual state is uncertainty'. One student brings a relation with the past ' I think too often I can't do it. I think things from the past can cause you to experience uncertainty in certain things' and another students writes 'Not so much loneliness, but feel like you are on your own (translated from Dutch)'.

3.2.2 Needs

The next 29 topics refers to the question 'What are students' ***needs*** to handle uncertainty in their learning process within the learning environment?'. All educators and students recognize to a certain level the needs as mentioned in the survey. A detailed overview of the frequencies per answer can be found in appendix C of the PUNC Survey Report IO2, July 2021. The general results are shown in table 2.

Table 2: students' needs in a VUCA learning environment in order to handle uncertainty

50 - 65% of the educators **40 - 55% of the students**	**65- 80% of the educators** **55-70% of the students**	**≥ 80 % of the educators** **≥ 70% of the students**

acknowledgement of vulnerability	ability to prioritise	ability to prioritise
asking feedback	able to define the goal	able to define the goal
conflict solution skills	acceptance of failures	asking questions
scaffolding	asking feedback	Dialogue
self-regulation	asking questions	doing something meaningful
	being challenged	experiences of success
	conflict solution skills	positive feedback
	courage to take risk	Reflection
	Dialogue	room for initiative
	doing something meaningful	social connection
	encouragement	support from others
	experiences of success	
	Flexibility	
	making own choices	
	reflection	
	resilience	
	room for initiative	
	self-confidence	
	self-regulation	
	skills to zoom in/out	
	social connection	
	support from others	
	taking ownership of learning process	
	thinking critical	
	thinking out of the box	

The answers of the open-end question 'Please indicate any additional students' ***needs*** to handle uncertainty in their learning process' are divers, mostly mentioned by a single educator and examples of the survey topics. See appendix C of the PUNC Survey Report IO2, July 2021 for the answers. In general the educators give examples of students needs related to:

- the context, e.g.: '*Safe learning environment. That reflection takes place at different levels, and that is ok';*
- peers, e.g.: '*Connection with learning teammates and coach. Perhaps fellow students who have (had) the same experience'* (translated from Dutch);
- educators, e.g.: '*Students more or less can and are able to be very independent and make own decisions, but they need to know and have the feeling that the teacher is there for them. Not necessarily physically present, but showing their presence in some way (e.g. greetings, asking how things are, is everything okay) and answering quickly to their messages. The actual need might be small, but the encouragement and positive presence and "I'm here for you, if needed"- feeling is important and ensures safe learning environment to the student';*
- content / skills / ability, e.g.: '*Learning to deal with failure and failure also as learning to see'* (translated from Dutch);

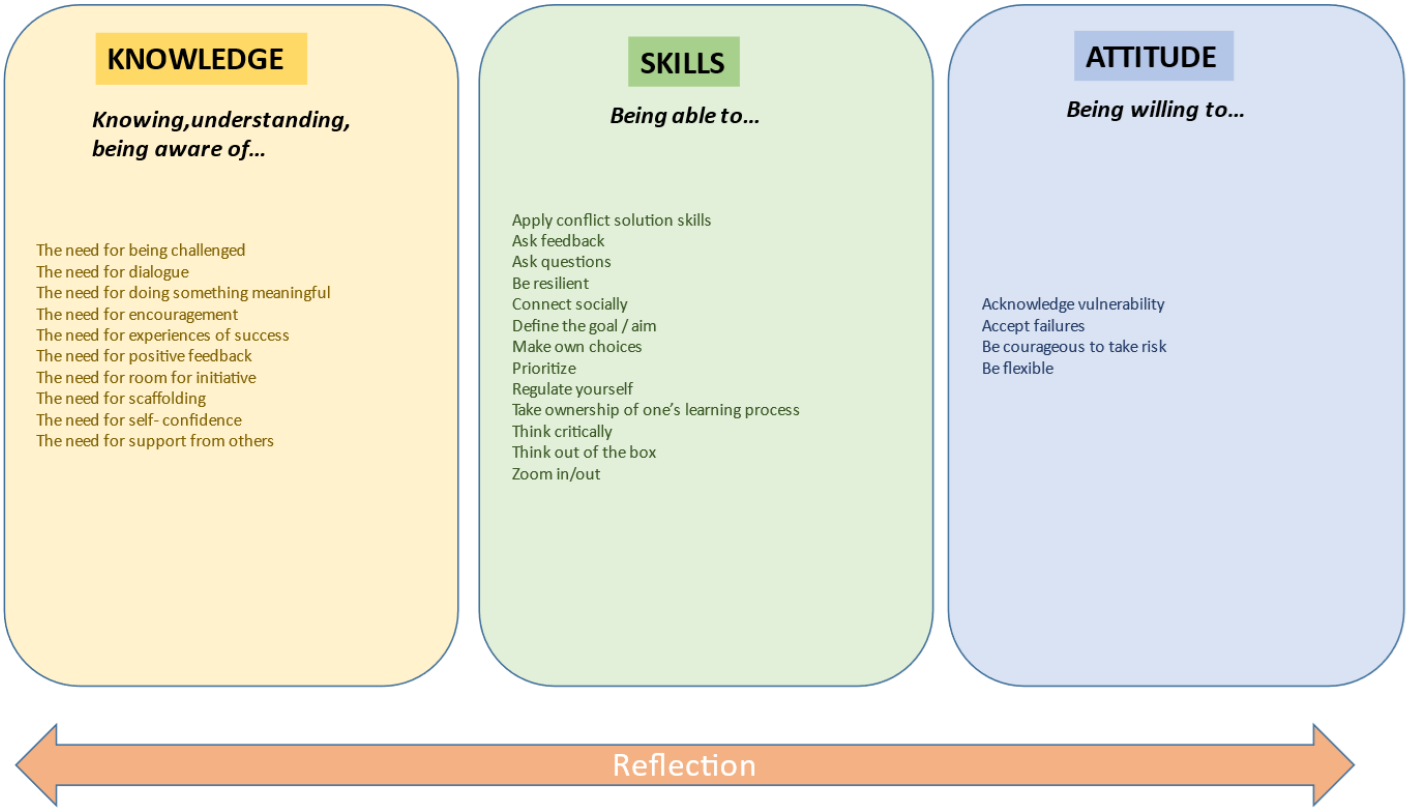
- Self / attitude, e.g.: *'giving and taking constructive feedback not so personally'.*

The answers of the open-end question 'What do you *need* more to handle uncertainty in your learning process' are divers, mostly mentioned by a single student and examples of the survey topics. See appendix D of the PUNC Survey Report IO2, July 2021 for the answers. Students often give suggestions about the support, encouragement, time and dialogue they need from educators and peers. Some students need more motivation, more time to process information, clarity about tasks. A single student want more solo tasks, guid lines, flexible grades. Looking to themselves a single student writes '*to deal with uncertainty I would need to be open to innovative perceptions of reality*'. Some students refer to the acknowledgement of uncertainty and the need for positive feedback or '*Reassurance that I'm doing my best, especially at this difficult time when you have to do a lot yourself. But also the feeling of getting other that I can be insecure*' (translated from Dutch).

3.2.3 The practice-based PUNC menu

The two open-end question to add additional student's experiences of uncertainty and student's needs to handle uncertainty productively, did not resulted into new topics. The added information gave examples, personal and contextual information about the topics of the survey.

When synthesized into a practice-based version of the PUNC menu to help to bridge the competence gap between the experienced uncertainty and handling it productively, it can be visualized as:



3.3 Validation sessions

The aim of the validation sessions was:

1. To validate the recognizability and understandability of the PUNC framework in itself and of its separate elements.
2. To validate the usability and functionality of the PUNC framework and especially the instruction(s).

All partners designed their sessions in line with their educational setting and culture. For a detailed description, please see: *PUNC Competence Framework - Validation Sessions Instructions and Results, February 2022*. The information received from all partners was analysed and synthesized into the following conclusions:

The PUNC Competence Framework is seen as a powerful tool for dialogue and reflection because it gives words to uncertainty and supports the conversation about uncertainty. It is important to pay attention to this theme because students often tend to avoid uncertainty or keep quiet about it. The great thing about PUNC Competence Framework is that it allows students to investigate their own uncertainty: what is its cause? The positive approach is also good, it is about something that you can learn and develop. It helps our students to become aware that there is uncertainty, that there is no uniformity in experiencing uncertainty and that you can deal with that.

Also improvements could be made:

In general

- Indicate what the WHY (aim/outcome) of the framework is: to 1) make uncertainty productive and 2) to support students to choose tools from the toolbox in order to develop their PUNC

- clarify that the PUNC is a transversal competence that can support the development of other professional or domain specific competence. It is up to the educators to seek the right fit for the PUNC competence within or next to the competence profile of their programme.

- Indicate what the follow-up is after using the framework, for example that students write something about it or choose a tool that helps them to develop their PUNC.

- Uncertainty is now approached too individually: take the context, collectiveness and organizational processes into account. So, establishing the relationship between uncertainty, the professional context in which it emerges and the role of others and systems in the uncertainty experience.

- Explain that the framework (and therefore also the learning outcomes) in principle focuses on the individual experience of uncertainty and the individual needs of the student. That may make the framework more difficult to use in large groups.

- Broaden the theme 'making uncertainty productive' by indicating that uncertainty can be experienced in many different ways and that everyone can deal with it differently.

- Clarify whether or not all three phases have to be completed in this order or whether you can choose where to start. And also include in the picture that reflection on that process is essential.

- The three phases requires more explanation: what do the arrows mean, can learning outcomes result from the entire loop?

- Develop questions for teachers in the three phases so that they can guide the students.

- The design of the framework can be made more user-friendly and more professional.

- Relate the applied language as much as possible to the profession and the target group.

- Provide for a video instruction showing how to use the framework.

With regard to the instruction

- Adapt text to the country, culture, organizational processes, target group, profession.

- Translate into the language of the country it is used in.

- Make use of visualization through, for example, an infographic.

- Make the instruction more practical with examples and exercises.

- Add a digital instruction/training for teachers on how to work with the Framework e.g. through videos.

- Create an 'enhanced' version for teachers and a 'light' version for students.

- The reference to emotions and physical reactions is missing. That is relevant. This reference can be made in the given examples.

- Give more examples of learning outcomes and how these can be formulated.

- Add a first step (Phase 0): becoming aware of uncertainty. Because everything starts with an experience of uncertainty. Als an explanation is helpful to show how one takes the other steps.

- Add a last step: (supporting tools that can help you) Take action!

With regard to the PUNC menu:

- Translate into the language of the country it is used in.

- Concepts are open to many interpretations. Thus some concepts could be in all three columns. There are also a lot of items. It is advised to narrow them down.

- It is not clear whether anything can be added to the menu, so indicate that it is not a complete list, but that (personalized) additions are possible.

- Offer downloadable material (tools) for working with the menu and a downloadable menu

- Provide more tips on how to use the menu.

- Convert menu from lists into correlating word groups.

- Supplement the menu with e.g. 'accepting failures' (attitude)

- Design: the menu contains a lot of text which makes it difficult to read. Possible solution: use a (decision) tree structure instead of columns, or visualize per column, so that you don't get everything in view at once.

4. Concluding remarks

The outcome of the validation sessions is addressed in the following manner. The more general remarks were processed in the above version of the PUNC Competence Framework. By doing so, the Framework is finalized as it provides for information about what PUNC is, why it is important to develop PUNC and what the 'gap' is between the uncertainty experience and addressing this experience in a productive manner.

The PUNC Competence Framework also forms a basis for the PUNC Box (IO3) as it supports students and educators to choose the right tools from the PUNC box or to develop one for oneself. Different parts of the PUNC Competence Framework will be included as tools in the PUNC box. For example:

- the three phase model,
- how to create learning outcomes
- PUNC Menu

Many of the more specific remarks for improvement of the PUNC Competence Framework will be included in the development of the PUNC Box as design principles for (tools of) the PUNC Box itself.

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Addendum I: Factsheet

Search engines used:

Google, Google Scholar, Google Scholar, EBSCOhost, ERIC, SCOPUS, Web of Science, Research Gate, Academy.com, LinkedIn (hashtagged articles) WoS, Dialnet, Emerald Insight, Helda, Arto, Journal.fi, Sage Journals, Aaltodoc

Search terms used:

HU: discretionaire ruimte, - bevoegdheid, recht, jurist, onzekerheid, onzeker, accountancy, onzekerheid, management, commerciële economie, bedrijfskunde, ondernemen/-ing, entrepreneur, sales, leerkracht, leerproces, leren, onderwijs, hoger onderwijs, techniek, Competentie, ontwerp, ontwikkelen, ontwikkeling, leeruitkomst, competentieleren, competence, competence design, competence development, competence learning, learning outcome

BAAA: Uncertainty (internal/subjective) in HE learning, Professional uncertainty (internal/subjective), Competence design, Competence development, Learning outcomes, Wellbeing

INN: Law: niepewność, VUCA, prawnicy, sądy, adwokaci, wymiar sprawiedliwości; Business: zarządzanie niepewnością, niepewne czasy, ryzyko, kształcenie przedsiebiorców, liderów zmiany, kadry na niepewne czasy; Education: rezyliencja, budowanie prężności, radzenie sobie z niepewnością, edukacja zmieniaczy, changemakers , odporność na porażkę; Engineering: ryzyko, kształcenie innowatorów, inżynierów, zarządzanie zmianą i niepewnością w przemyśle , praca w środowisku VUCA; Budowanie kompetencji zmiany, efekty kształcenia, kompetencje społeczne,

UPV: VUCA, Universidad, Incertidumbre, Educación Superior, diseño de competencias, resultados de aprendizaje,

TUAS: VUCA, learning outcome, epävarmuus, ammatillinen epävarmuus (incl. Tekniikka, insinööri, liiketalous, opiskelija), yrittäjämäinen asenne, entrepreneurial attitude, entrepreneurial learning, ammatti-identiteetti, insecurity, risk pedagogy/riskipedagogiikka, tunteet ja korkeakouluopinnot, emotionaalinen minäpystyvyys, jännittäminen, itsetunto, riski

Approach on selection:

We used only articles/books with the access to full text mode. After reading of titles, summaries and conclusions a particular article was selected for in-depth analyses through close-reading.

Findings in quantity:

Number of texts before selection: HU 72; INN 36; BAAA 100+ TUAS 90+; UG 65; UPV 23

Number of texts selected: HU 53; INN 15; BAAA 28 TUAS 9; UG 16; UPV 10.

Number of texts used in this review: 63