Develop your PUNC with the Professional UNcertainty Competence Framework *

Stijn Bollinger[ab]* and Ritie van Rooijen[ac]

[a]Research Center for Learning and Innovation, HU Utrecht University of Applied Sciences, Utrecht, The Netherlands;
[b]Department of Law, HU Utrecht University of Applied Sciences, Utrecht, The Netherlands;
[c]Department of Education, HU Utrecht University of Applied Sciences, Utrecht, The Netherlands.

*corresponding author. Email: stijn.bollinger@hu.nl; ORCID: https://orcid.org/0000-0002-6205-4982

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Abstract:
In the complexity of today's world, professionals face uncertainty in their work. This means that higher education institutions must help students develop their ability to deal effectively with this professional uncertainty. In this article we answer the question ‘How can a professional uncertainty competence be developed? This research forms an key part of the Erasmus+ Strategic Partnership project "Professional UNcertainty Competence" (PUNC). The 6 project partners integrated theory-based and practice-based knowledge by using a mixed methods research methodology consisting of two research activities: a transnational literature review and surveys among educators and students from the partner universities. The research findings were included into the PUNC competence framework which, aims to offer a constructive and progress-oriented approach to professional uncertainty. The PUNC competence framework gives educators and learners a tool for acknowledging, exploring, and handling uncertainty in a productive way as it includes a description of the PUNC competence, a three-part flexible strategy (acknowledge, explore, handle) for developing one's PUNC, and a PUNC menu, which serves as a palette of various elements of knowledge, skills, and attitude from which the student can compose his highly personalized PUNC competence. The PUNC competence framework also allows educators to facilitate reflection about learning objectives and through that, the actions that the student can plan and practice. The PUNC competence framework will be included into the subsequent steps in the PUNC project of designing a PUNC toolbox and an e-portfolio in order to develop and monitor one's PUNC.

[1] https://erasmus-plus.ec.europa.eu/projects/eplus-project-details#project/2020-1-PL01-KA203-081940

Introduction

People live, work, and study in a VUCA environment, which stands for Volatile, Uncertain, Complex, and Ambiguous. In a VUCA environment, it is obvious that not everything can be known ahead of time (Codreanu, 2016). 'Not-knowing,' in its widest meaning, can elicit feelings of uncertainty that might be superficial or profound, stable or swiftly shifting (Hillen et al., 2017). Too much uncertainty can make it difficult to take action and can disrupt one's learning-, work-, or personal growth process. Uncertainty, on the other hand, may inspire creativity, contemplation, unconventional thinking, and other positive actions. In higher education, both students and educators frequently experience a lack of knowledge and abilities (as well as a need for resources) to learn to deal with uncertainty productively. To bridge this competence gap, it is critical to understand the nature of the perceived uncertainty, what causes it, and what professionals require in terms of knowledge, skills, and attitude in order to learn to deal with it successfully. The Erasmus+ Professional UNcertainty Competence (PUNC) project brings together six European higher education partners (Turku University of Applied Sciences in Finland, University of Gdansk in Poland, Innocamp in Poland, Valencia Polytechnic University in Spain, Business Academy Aarhus in Denmark, and Utrecht University of Applied Sciences in the Netherlands) to create four interconnected products that address this need:

1) Educators' guide for designing hybrid VUCA learning environments.
2) Competence framework for identifying one's PUNCompetence and for formulating individual and context relevant learning outcomes.
3) PUNC Box with learning activities and tools which support the development of the PUNCompetence
4) E-portfolio that monitors this development.

In this article, we will discuss the PUNC competence framework and how it came to be. The PUNC competence framework assists educational professionals in enabling students in developing their Professional UNcertainty Competence in a specific professional circumstance in which the student encounters this uncertainty and is unable to deal with it productively.

Methodical approach

The PUNC competence framework is the result of a mixed methods research methodology that sought to integrate theory-based and practice-based knowledge while focusing on the research question: What is professional uncertainty competence and how can it be developed? The research itself was comprised of two research activities: a transnational scoping literature review and surveys conducted among a chosen group of educators and students from the partner universities. The findings were incorporated into the PUNC competence framework and debated during national validation sessions.

Literature review

The literature review served as the theoretical foundation for the PUNC competence since we sought to characterize the gap between experiencing uncertainty and dealing with it constructively. The 'scoping' literature review (Peters et al., 2020) began with identifying sensitizing concepts derived from relevant (inter)national literature: uncertainty (internal/subjective) in higher educational learning; professional uncertainty (internal/subjective); competence design and development; learning outcomes. Following that, all partners gathered nationally relevant scholarly (full access) articles and other (open access) sources per topic. In addition, for the first two concepts, all partners gathered domain-specific literature from the professional fields they represent: business, education, law, and engineering. All of the partners utilized different search engines and key terms in both English and their native languages. This resulted in 386 potentially related texts. Following an initial reading of titles, summaries, and conclusions, we chose 131 texts for in-depth close-reading assessments. Based on the texts chosen by each project partner, 63 were used to develop a theory-based interpretation of the PUNC competence, a theory-based 'PUNC menu,' and a three-part sensemaking strategy for dealing with uncertainty productively.

Surveys

Based on these theoretical findings, a survey was designed for educators and students to gather practical understanding regarding professional uncertainty. The survey provided answers to two research questions: (1) How do students feel about uncertainty in their learning process? And (2) what is needed to make the experienced uncertainty productive? The survey topics were developed collaboratively by the project partners by a twostep approach, supported with MURAL as an interactive workspace. The aim

was to combine items from the literature review into survey topics according to the various components that comprise the VUCA acronym: Volatile, Complex, and Ambiguous. The U of Uncertainty was treated as the students' perceived internal subjective uncertainty during the learning process. Three open questions were added: a question about the learning environment the respondent works in and two questions that yielded additional information about possible experiences and needs that are not mentioned in the survey.

Table 1: Set-up of the survey for educators and students.

Question structure	Answering categories
I am an educator/student at…	Obligatory indication of type of learning environment.
What do students/you **experience** with regard to uncertainty in their/your learning process within the learning environment? (categories: V,C,A)	5-point Likert scale: obligatory one choice between: "always, often, sometimes, rarely, never".
Please indicate any additional (students') experiences of uncertainty in their/your learning process.	Free to add.
What are students'/your **needs** to handle uncertainty in their learning process within the learning environment? (categories: V,C,A)	5-point Likert scale: obligatory one choice between: "not, a little, moderate, much, very much".
Please indicate any additional (students') needs to handle uncertainty in their/your learning process.	Free to add.

CrowdTech was utilized for the survey, and the data was analysed in SPSS after validating Cronbach's alpha and after recoding some topics.

Theory-based construction of PUNCompetence

We describe the findings of the scoping literature review on uncertainty in higher educational learning and professional uncertainty ("uncertainty in learning and work"), as well as how to construct one's PUNCompetence, in this section.

Emotion and cognition

Uncertainty is a natural component of our emotional and cognitive palette. We frequently equate uncertainty with anxiety and stress, as all of these powerful and frequently negative feelings have an impact on our well-being (EVA, 2018). It is argued that in higher education, students should build emotional competencies in order to manage their emotions and wellness in the context of job and profession (Isacsson, et al., 2019), because acknowledging emotions may assist to understand and utilize them better. Some say that "emotional competence" is a talent that can and should be learned in the workplace (Isacsson, et al., 2019). Others advocate for the development of "uncertainty competences" (Fazlagi, 2016; Tauritz, 2016). Uncertainty, like emotions (Savijärvi, 2016), may be classed as positive (activating, eustress) or negative (inactivating, distress) and has both mental and physiological impacts (Bigdeli, 2010). Uncertainty, for example, might vary during the learning process and manifest itself in patterns: at the start, throughout, or even after the learning process (Arpiainen, et al., 2013). When a student faces a new threshold (waypoint) in their learning process, it creates concern about what is ahead. By taking the risk of entering this liminal place, the student is able to grow and develop. When seen negatively, uncertainty may be perceived as a source of threat, worry, and fear (Majerek, 2018), which can reduce creativity, diminish performance, and cause employees to turn to safe work practices or procedures (Savijärvi, 2016). Uncertainty may be viewed positively as a growth element, a catalyst for creativity and innovation. It is a significant and profitable professional capacity to be able to see uncertainty as a rich source of opportunities, since it may provide the opportunity to establish new ways of thinking and behaving (Joosten, 2021). Positive uncertainty opens up new avenues for action, implying the end of dogmas and restrictive normative frames (Jacobs, 2010). It can even be viewed as a requirement for future development of the ability to cope with open-ended challenges (Muukkonen & Lakkala, 2009).

Uncertainty as 'not knowing'

Uncertainty is frequently viewed as 'not knowing' in the workplace and classroom (Tauritz, 2012). Professionals face uncertainty when they lack specific knowledge that appears to be required at the time. This knowledge can be cognitive, emotional, tacit, explicit, embodied, actionable, and so on

(Markauskaite & Goodyear, 2017). Uncertainty is defined by Tracey and Hutchinson (2016) as a lack of appropriate understanding about events that may occur in the future or have already occurred. Hillen et al. (2017) replace the term "lack of knowledge" with the more general term "ignorance". This signifies that the student and professional are dealing with difficulties that are beyond their area of competence (Muukkonen & Lakkala, 2009). Others, such as Jordan (2015), characterize uncertainty as a type of metacognitive awareness in which a person is aware of his or her lack of understanding. As a result, one becomes uncertain not so much because of a lack of information as a result of being conscious of this shortcoming.

Sources of uncertainty

This realization of one's lack of knowledge might have a variety of causes. In the context of time, uncertainty is defined as the subjective sense of not knowing how the future will develop, what the present means, or how to interpret the past (Jordan, 2015). A teacher, for example, is never certain how his interventions effect the outcomes of his students (Kelchterman, w.d.). And a railroad engineer must build a long-lasting, strong, and secure structure without knowing how it will perform under unforeseeable future conditions (Havik, et al., w.d.).

Hillen et al. (2017) distinguish three types of origins of uncertainty perception: ambiguity, probability, and complexity. When something is ambiguous, we are unsure if it is true or not. This is referred to as truth uncertainty by Lane and Maxfield (2005). Probability relates to randomness or unpredictability, as we do not know what will happen in the future or how actions will affect us. And complexity refers to circumstances that are difficult to understand because to a multitude of causes, factors, perspectives, or diverse meanings of a phenomena. According to Hillen et al. (2017, p. 70), 'probability, ambiguity, and complexity each produce uncertainty once individuals perceive them – that is, when they become aware of them as sources of ignorance'.

Individual features such as personality traits and lack of character qualities such as resilience and curiosity, as well as other environmental, cultural, or societal influences, moderate this impression. Other causes of uncertainty include variability and knowledge limitations (Van Asselt, Van 't Klooster, & Van Notten, 2003). Variability refers to the unpredictable, chaotic, and changeable character of processes, nature, human behaviour, technology, society, paradigms, and so on. Imperfect precision, a lack of measurements, observations, impracticability, contradicting information, and irreducible ignorance are all examples of inadequate knowledge. Some information will never be acquired.

Uncertainty as part of the decision making process

Uncertainty – or not knowing – is an element of both the learning and professional processes (Arpiainen, et al., 2013; Bigdeli, 2010). It is widely recognized across various professional domains and is commonly associated with knowledge intensive jobs (Teknologisk Institut for IDA, 2013) in which decision making is central (e.g. education, management, law), jobs that aim for innovation through new (digital) technologies (technique, design, education) (Bahl et al., 2020; Pérez Gómez, 2019), and jobs that focus on the future (e.g. engineering, construction, education) (FDI, 2018).

The function of decision making appears to be closely tied to uncertainty across all professional fields. Decisions are always made with the goal of producing a result that must be relevant to an uncertain future and so has unknown implications (Pérez Gómez, 2019 Not knowing the consequences means taking risk (Rodriguez & Estévez, 2005). As Raaphorst (2017) demonstrates, the decision's implications are related to the availability of meaningful information:

- uncertainty of information: can one find enough information to support one's decision?
- uncertainty of interpretation: especially when 'rules of decision making' give little support?
- uncertainty of action: how to act on the spot, based on the available limited knowledge?
- uncertainty of result: what will be the outcome or impact?

Example: decision making in innovation

Professionals and students pursuing innovation face ongoing change, danger, and unpredictability (Fazlagi, 2016). Students learn that information is required to lessen the uncertainties associated with these aspects and to allow for decisions, even if this knowledge is provisional (Savelsbergh, 2019), especially when they work between an existing and familiar present and an unknown future (Havik, et al., w.d.). Thus, in the 'meta-field' of innovation, acceptable outcomes must be provided despite insufficient knowledge of the unknown past, the unknowable future, and the unpredictability of the present (Marchau, 2013). Innovators face "deep uncertainty". In terms of the future, positive ambiguity facilitates decision making in the face of an unknown future. Especially when one can accept that the future is what it is.

When uncertainty exists, one might be a proactive rather than a reactive decision maker (Gelatt & Gelatt, 2003).

Example: decision making by legal professionals

The example of legal professionals demonstrates how decision making may occur in the face of uncertainty. Legal professionals experience uncertainty in their decision-making because they face proof uncertainty (not knowing for sure in the present) and prediction uncertainty (not knowing the effect in the future). This area in which they make a decision is referred to as "discretionary space" by legal professionals (Raaphorst, 2017; Severijns, 2015). Discretionary space is utilized to generate potentially useful patterns to deal with the limited time and resources available. Rationing, focusing on successful instances, or disregarding challenging situations are examples of these patterns (Geenen, et al., 2017). They emerge as a result of heuristics, cognitive scheduling, and logical deductions from pertinent data (Goderie & Bouttelier, 2009). Heuristics are rules of thumb that help a legal professional to make a quick decision in the face of ambiguity by using selective observation and productive omission. They respond by gathering knowledge to minimize information uncertainty to an acceptable degree, by scrutinizing the rules, by scrutinizing the organizational discretionary space, and by being impacted by personal ideas, experiences, and beliefs (Severijns, 2015; 2019). This management of discretionary space for decision making necessitates a willingness to accept uncertainty and the patience to defer judgment (Van Donkersgoed, 2019). Finally, a judgment is acceptable when it has a suitable fit with the practical situation rather than simply being logical or statistically correct (Hildebrand, 2011).

Making uncertainty productive

Although uncertainty can be experienced as an unwanted emotional state that many professionals try to avoid or resolve (e.g., Bar-Anan et al., 2009; Nevalainen et al., 2010), several authors argue that it can also be an aspect that is most potent for innovation and change and can be regarded as an essential dimension of professional competences (Attard, 2008; Lane & Maxfield, 2005). Uncertainty motivates us to examine our premises and hypotheses, as well as analyse our capabilities and resources for a certain goal or activity (Fields, 2011). Uncertainty, when perceived as doubt, might inspire us to seek out errors or alternatives, transforming uncertainty into a source of information (Locke, et al., 2008). Furthermore, it is a fundamental component of creative processes such as writing (Carabine, 2013), and if embraced, it fosters continued professional inquiry (Attard, 2008). Lingard et al. (2003) refer to this handling of uncertainty as "the art of uncertainty," implying that professionals must understand that some types of uncertainties may be beneficial to the quality of their work. This viewpoint provides professionals with the opportunity to learn how to manage uncertainty in their professional performance in a productive manner (Bollinger & Van Rooijen, 2016).

Uncertainty as 'not knowing' can serve as a catalyst for sensemaking (Cramer et al., 2004; Weick, 1995). When typical routines and mental systems fail to fathom - make sense of - reality, one might respond via inquiry, study, and contemplation (www.kommunikationogsprog.dk, 2021). As a result, uncertainty can aid in the adoption of new beliefs, values, and conceptions, as well as the facilitation of innovative problem-solving (Jordan, 2015). A "dynamic degree of certainty" aids in the preservation of ethical fibre and the development of a critical thinking mindset (Bauman, 2008). Many more options are uncovered (and sometimes ignored) in the quest for credible solutions and relevant information (Attard, 2008), and serendipitous learning is encouraged. Uncertainty can thus serve as a sensemaking stimulus for innovation (www.kommunikationogsprog.dk, 2021).

Developing the ability to deal with uncertainty productively may be viewed as a continuous, creative, sensitive, and reflective process in which a person 'makes sense' of his or her experiences in a given scenario (Weick, 1995). Individuals generate meaning from their own viewpoint, history, culture, and context while making sense of an event. Instead of dismissing or avoiding uncertainty, it must be embraced, investigated, and potentially even reframed into a new narrative that is appropriate for, and possibly even essential for, that particular scenario or learning experience. It must be made sense of before it can be productive. So in summary, Table 2 presents dominant elements of distress and eustress:

Table 2: The theory-based elements combined in the PUNC Menu

Elements of Eustress	Elements of Distress
Sensemaking	Denial
Investigative behaviour	Impedes learning

Doubt	Reduces creativity
Testing	Avoiding risks
Experimenting	Falling back on trusted methods / patterns

We contend that the balance between these elements must favour eustress in order to avoid freezing and to stay flexible and sensitive enough to embrace experienced uncertainty and make it useful. This approach is aided by the Professional UNcertainty Competence Framework.

The Professional UNcertainty Competence Framework

Based on the above we present the Professional UNcertainty Competence Framework, which consists of 1) the definition of the PUNCompetence; 2) the three-part sensemaking strategy to develop the PUNCompetence and 3) the PUNC Menu.

1) The PUNCompetence

First, we describe the Professional UNcertainty Competence as:

The ability to acknowledge, explore and handle uncertainty in a productive way.

PUNCompetence is a sort of transversal competence that enables the development of other professional and domain-specific competences. Uncertainty can lead to anxiety, which stifles learning and the development of other skills. As a result, when appropriately addressed, the individual may learn to make the encountered uncertainty productive, diminishing its limiting effects and allowing for the development of other competences. Furthermore, the PUNCompetence is highly individualized and personal, and it is based on the person's professional situation when confronted with this uncertainty. Because people experience uncertainty in many different ways, the PUNC competence framework focuses on the user's self-defined specific needs.

2) Three part sensemaking strategy

Second, we provide a three-part sensemaking strategy for developing PUNCompetence and effectively dealing with uncertainty. This sensemaking technique consists of (1) acknowledging, (2) exploring, and (3) handling uncertainty. When combined with ongoing reflection, this method aids in making sense of one's uncertainty and, as a result, making it productive.

Part 1: Acknowledgement of uncertainty as an inherent part of professional life

The first part is to acknowledge that there is uncertainty in professional practices. To recognize and accept uncertainty as a given, an opportunity, a source of information, and a potential driver of action, entrepreneurship, and innovation. In other words, to recognize and accept that uncertainty also can be a term with positive connotations, aids in enduring and coping with uncertainty without panicking, giving up, or failing to learn. Acknowledging also entails admitting that one must become able to access information and gain skills in order to cope with the situation at hand. It entails determining whether one is capable of doing it on their own or whether support from others is necessary. It also means to accept that 'not knowing' what, why, how, or when to perform, can lead to uncertainty feelings. Character, particularly courage, is an important element in this phase of acknowledgement, according to Fadel et al. (2015, p. 88):

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 are uncertain due to 'not-knowing' do not immediately quit, sit back, or get paralyzed, but rather feel capable of performing. According to Innovation Pedagogy, a student requires an inspirational as well as safe environment in order to do so (Konst, 2017). Using educational tools that aid students in making sense of their uncertainty is one technique of dealing with uncertainty and producing safety (Bollinger & Van Rooijen, 2018).

Part 2: Exploration of one’s individual uncertainty

The second part, 'exploration,' focuses on growing acquainted with one's uncertainty by acquiring a deeper understanding and learning what is required to become competent of coping with the experienced uncertainty constructively. Depending on aspects such as self-regulation, the urgency of the situation, and the desire for answers, students' methods to sensemaking can range from superficial to in-depth. Education may assist in this circumstance by making the link between diverse knowledge areas and experiences more apparent (Fadel, et al., 2015). Collaborative learning may occur when skills are shared and experiences are interpreted collectively. Meeting a variety of peers (e.g., other students, teachers, friends) on a regular and spontaneous basis may be advantageous to this exploration stage since they may serve as companions and critical friends with whom one can collaborate, discuss, disagree, and get support (Konst, 2017).

Part 3: Handling of uncertainty in a productive way

Students consistently improve their capacity to deal with their uncertainty experiences and to acknowledge, explore, and handle uncertainty in new contexts or circumstances throughout the third part by reflecting on the outcomes of their efforts. During this part of the sensemaking strategy, students develop new or reinforce current adequate strategies that may be used effectively. Critical reflection, a type of metacognition, is an essential component of the learning process (Fadel, et al., 2015; Wesselink, et al., 2007).

Reflection

The meta-competence reflection supports these three parts, as well as their results in terms of needs and actions. Reflection is an important part of professional development and learning – of making sense. Educational tools and approaches may also aid to support a learning process and provide students with challenging opportunities (Konst, 2017). The sensemaking process is also facilitated in authentic, demanding, and hybrid settings or contexts in which students take charge and supervision (e.g., teachers, instructors) is adapted to the student's needs. According to Fadel et al. (2015) education needs to be four-dimensional to prepare students for the 21st century labour market. Students must acquire relevant knowledge, develop professional skills and character and meta-learning to deal with uncertainty. This means that each approach requires uniquely tailored elements of knowledge, skills, and attitude that are relevant to both the circumstance at hand and the learner's personal requirements in order to provide particular and individualized learning results.

3) The PUNC Menu

Individuals experience uncertainty in a variety of ways and forms, particularly when the situation is characterized as VUCA (Hänti et al., 2021). Uncertainty can also be caused by a person's social or organizational environment. Because personally experienced uncertainty is closely tied to an individual's professional situation, the need to develop one's PUNCompetence must be seen in this light as well. The environment in which the PUNCompetence is required, as well as the personal expectations that must be met in order to perform well in that setting, heavily influence how one constructs the personalized PUNCompetence. As a result, it is vital for a person to be able to develop his or her own personal PUNCompetence.

In addition to the PUNCompetence, we present a theory-based "PUNC menu". This menu includes theory-based knowledge, skills, and attitudes that aid in bridging the competence gap between perceived uncertainty and coping with it constructively. We consider knowledge (being aware of...) to be a layered construct made up of cognitive/hard knowledge (knowledge parts), understanding (constructs of various knowledge parts), and embodied/tacit knowledge.

Skills are considered skills (being able to...), whereas attitudes are considered conscious intents (being willing to...). The user can blend components from these three categories to generate a unique and customised learning outcome for an uncertain situation. The fourth component, meta-learning through reflection, is the activity that monitors and analyses the combined effect of knowledge, abilities, and attitude in a given learning outcome.

The offered "menu" (see table 3) is made up of numerous key PUNC elements. This menu is comprehensive, detailed, and practical in use. Any synthesis of the separate elements into more broad themes may result in meaning generalization and a limitation in the user's choice. Furthermore, the individual elements are not specified or defined further. A concrete definition may also result in a possible limitation of meaning for an individual since a user may choose to assign a different meaning to a certain element than how we specified it. As a result, it is possible for a menu item to appear in more than one of the categories of knowledge, skills or attitude. As a result, in terms of both the quantity and quality of the presented material, we seek to be as inclusive and inviting to the user as possible. This also means that the menu is not prescriptive in any way. A user can make relevant combinations from the three categories, but not all aspects must be nurtured in order to build one's PUNCompetence. A user may also add his or her own items to the PUNC menu as necessary for the growth of his or her PUNCompetence.

Table 3: The theory-based elements combined in the PUNC Menu

Theory-based PUNC Menu

Knowledge: *having knowledge of…*	*Skills:* *being able to…*	*Attitude:* *being willing to…*
Uncertainty as a phenomenon in learning and working	Assess a situation	Embrace doubts
The benefits of capitalising on uncertainty	Investigate sources of uncertainty	Show feelings
The importance of causal relationships	Ask questions	Endure
One's self-efficacy or that one needs support from others	Think divergent / lateral	Learn
Where to find relevant information	Think critically	Experiment
Best practices in reducing uncertainty	Find, value, interpret and use or share relevant information and resources	Take initiative
The importance to develop vision	Take initiative	Take responsibility for choices and actions
One's intuition as a source of information	Prioritize	Take leadership
One's experienced uncertainty in a specific situation, context, or task	Understand causality	Take ownership
	Explore in-depth	Take risks
	Deal with incomplete information adequately	Understand and to make sense of uncertainty
	Apply decision makings skills (based on incomplete info)	Empathise with different perspectives
	Connect socially	Gain information
	Engage in a supportive network	Discover new strategies for problem solving

	Apply communication skills	Visualise future alternative scenarios
	Deal with open-ended problems	Be mindful
	Solve problems creatively	Be enquiring
	Deal with problems beyond own expertise	Be self-aware
	Operate between an existing and familiar present and an unknown future	Be courageous
	Accept not knowing what will happen	Be ingenuous
		Be fortuitous
		Be curious
		Be ethical
		Be agile
		Be adaptable and open to change
		Be receptive
		Be flexible
	REFLECTION	

Practice-based additions to the PUNC menu

In this part we present the general outcomes of the survey that aimed to complement the PUNC menu as part of the Professional UNcertainty competence framework. The survey was filled in by 109 educators and 141 students of the partner universities.

Experiences

The 28 topics that referred to the first question "what do students experience with regard uncertainty in their learning process?" showed that to a certain level, all educators recognized the experiences as mentioned in the survey. The average score was 2.999 with a minimum of 2.459 and a maximum of 3.862. Also all responding students recognized the experiences as mentioned in the survey (av. 3.013; min. 2.319, max. 3.851). Both educators and students reported that in their learning process students often feel being judged and that they are curious. Educators expressed that students also often feel vulnerable and show a drive to learn. Students reported often to be overwhelmed, to feel stressed, to avoid risks and to cling to fixed strategies. They also feel excitement and fascination and they expressed to be aware of their own strengths and weakness in their learning process. Both educators and students stated that students rarely ask questions, do feel safe, do receive feedback, have a perspective on the overall purpose of the learning process and experience conflicts during collaboration.

Educators and students differed in some topics. This underlines the argument that uncertainty is a highly individual experience and context specific. Educators reported that students rarely experience discouragement, feel lonely or have a sense of direction of the process they are in. Students expressed to rarely experience that they are patient, feel in control, take responsibility or think that they are capable to continue. The educators' answers of the open-end question with regard to students' experience of uncertainty in their learning process are divers. In general the educators gave examples of students uncertainty experiences related to the context like peer pressure, or:

> 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,

And like unclear judgements:

> Uncertainty about what they have done wrong with too little or unclear feedback from teachers.

The students' responses to the open-ended question are likewise varied, and mostly mentioned by a single student. The responses demonstrate numerous examples of 'not-knowing,' such as unclearly formulated assignments, expectations from others, how to approach learning activities, whether something is good enough, where and from whom to obtain answers to queries and missing information.

Needs

The next 29 topics referred to the second question 'Which elements of knowledge, skills and attitude do students need to make the experienced uncertainty productive?. All educators recognized to a certain level the needs as mentioned in the survey (av. 3.928; min. 2.917; max. 4.284). All responding students also recognized to a certain level the needs as mentioned in the survey (av. 3.702; min. 3.248; max 3.936). In order to handle uncertainty, 80 % of the educators and 70% of the students reported that students in a VUCA learning environment need to be aware that they need support from others in terms of scaffolding and encouragement, and need to experience success, to receive positive feedback, to be challenged, to do something meaningful, and that they experience the need for room for initiative and to have self-confidence. Important to the need for skills, according to the educators and students, is the need for the ability to prioritize, to ask questions and feedback, to be capable of making own choices and the need to take ownership of their learning process, to be resilient, to be able to make social connections and to think critically. About the need for attitudes there are only three topics that 80% of the educators and 70% of the students mentioned: the need for acceptance of failures, for courage to take risks and for to be flexible. The educators' answers of the open-end question with regard to the needs were divers. In general the educators gave examples of students needs related to the context and educators:

> 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.

The students' answers of the open-end question with regard to the needs were also divers. Students often gave suggestions about the support, encouragement, time and dialogue they need from educators and peers. Some students reported the need for more motivation, more time to process information, and clarity about tasks.

Additions

The outcome of the survey yielded practice-based elements of knowledge, skills and attitude that supplement the theory-bases PUNC menu in the following manner (see *cursive* additions in Table 4) The theory-based and practice-based outcomes were combined to form the PUNC competence framework, which includes (1) a description of the Professional Uncertainty Competence, (2) the combined PUNC menu, and (3) a three-part sensemaking strategy for developing one's PUNC, which includes acknowledging, exploring, and handling of experienced uncertainty in the professional context.

Table 4: The *practice-based* and theory-based elements combined in the PUNC Menu

Theory- and Practice-based PUNC Menu

Knowledge: *having knowledge of…*	*Skills:* *being able to…*	*Attitude:* *being willing to…*
Uncertainty as a phenomenon in learning and working	Assess a situation	Embrace doubts
The benefits of capitalising on uncertainty	Investigate sources of uncertainty	Show feelings
The importance of causal relationships	Ask questions	Endure
One's self-efficacy or that one needs support from others	Think divergent / lateral	Learn
Where to find relevant information	Think critically	Experiment

Best practices in reducing uncertainty	Find, value, interpret and use or share relevant information and resources	Take initiative
The importance to develop vision	Take initiative	Take responsibility for choices and actions
One's intuition as a source of information	Prioritize	Take leadership
One's experienced uncertainty in a specific situation, context, or task	Understand causality	Take ownership
The need for being challenged	Explore in-depth	Take risks
The need for dialogue	Deal with incomplete information adequately	Understand and to make sense of uncertainty
The need for doing something meaningful	Apply decision makings skills (based on incomplete info)	Empathise with different perspectives
The need for encouragement	Connect socially	Gain information
The need for experiences of success	Engage in a supportive network	Discover new strategies for problem solving
The need for positive feedback	Apply communication skills	Visualise future alternative scenarios
The need for room for initiative	Deal with open-ended problems	Be mindful
The need for scaffolding	Solve problems creatively	Be enquiring
The need for self-confidence	Deal with problems beyond own expertise	Be self-aware
The need for support from others	Operate between an existing and familiar present and an unknown future	Be courageous
	Accept not knowing what will happen	Be ingenuous
	Apply conflict solution skills	Be fortuitous
	Ask feedback	Be curious
	Ask questions	Be ethical
	Be resilient	Be agile
	Connect socially	Be adaptable and open to change
		Be receptive
		Be flexible
		Acknowledge vulnerability
		Accept failures
		Be courageous to take risk

Theoretical and practical implications

The PUNC competence framework adds to the body of knowledge about professional uncertainty. Its theoretical foundation and practical enhancements give an international perspective on how professional uncertainty is perceived in a variety of professional fields and international contexts. The PUNCompetence and PUNC Menu also bring a new viewpoint on how a transversal competence like PUNC might be made operational for usage by educators and students. The PUNC competence framework, in combination with its three-part strategy, can help to raise awareness of the necessity of developing one's PUNCompetence as well as its practical implementation in European HEIs.

On a practical level, the PUNC competence framework allows educators to assist their students in making their professional uncertainty productive. Because it gives expression to uncertainty and facilitates discussion about uncertainty in a professional setting, the framework may be used as a tool for discourse and reflection. It assists students in being aware that uncertainty occurs in a professional context, that there is no consistency in feeling uncertain, and that you may learn to cope with it rather than dismissing or rejecting it. It takes a positive attitude, stating that dealing with uncertainty is something that can be learnt and developed.

The PUNC competence framework is also beneficial to educators. Educators, like any other professional, face uncertainty, and they frequently seek knowledge and tools to aid in their own development in dealing with it. In terms of pedagogy, it may be particularly valuable for a teacher to actively engage with the PUNC competence framework in order to better assist their students.

This PUNC competence framework can be used independently, but it is intended to be used in conjunction with the other PUNC project products: the teacher's guide for designing a VUCA learning environment, the PUNC toolbox that supports the development of one's PUNCompetence, and the PUNC E-portfolio that documents this progress.

Conclusion and further study

Educators and students (where possible) from all partner institutions reviewed the PUNC competence framework during national validation workshops. The validation's goal was to talk about the PUNC competence framework's overall recognizability, understandability, usability, and functionality, as well as its individual components. The questions used to focus the validation sessions were: How do the participants comprehend the PUNC competence framework's goal, and what are their overall opinions about the PUNC competence framework? The data received from all parties was analysed and synthesized, resulting in the conclusion that the PUNC competence framework may be a useful and relevant tool for educators and students to develop the ability to acknowledge, explore and handle uncertainty in a productive way.

The PUNC competence framework also acts as the foundation for the PUNC toolbox, since it offers information on what PUNC is, why developing PUNC is important, and what one's individual 'uncertainty gap' may be and what is necessary to overcome it. The framework helps students and educators choose relevant resources from the PUNC toolbox or create their own. The three-part strategy and the PUNC Menu can also be added to the PUNC toolbox as tools. Finally, many of the improvements suggested during the validation sessions will be included into the design of the PUNC toolbox as design principles for (tools of) the PUNC toolbox itself. All efforts are directed on supporting students and educators in growing their PUNCompetence and, as a result, emerging into dynamic and robust professionals capable of turning uncertainty into productivity while working in a VUCA environment. Some suggested improvements, however, require additional research. Especially with regard to: uncertainty as a bodily experience in addition to an emotional one; how the PUNCompetence as a transversal competence can serve to support the development of other domain specific competences; how to find the correct fit for the PUNCompetence within or next to the competence profile of an existing education program; how does the highly individual PUNCompetence cohere to the professional context (people, systems, politics, organizational structure) in which this uncertainty originates; and how can the present version of the PUNC competence framework be modified to European cultural characteristics to contribute to a culturally acceptable approach of developing one's PUNCompetence?

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