

InovSafeCare



Output 1 – InovSafeCare Model

Developing and defining *InovSafeCare Model*

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0 – INTRODUCTION

To educate is more than a science, is an art ...
that involves human beings, ... feelings,
thoughts, decisions, personal values...
(Joseph Novak)

The Higher Education System constitutes a path through which the students acquire and develop their education, critical thinking and analytic abilities, while establishing their own civil, social, academic and research personalities.

Therefore, Higher Education Institutions (HEIs) should aim to define their practice by standards of excellence in all dimensions of educational processes, supported in proactive research, combined with original, critical, creative and innovative thinking. Conceiving, designing, and implementing these processes have to be reflexive and integrated, due to the well-known close relationship between Academia and Society, which will lead to a substantial impact of this process results on the construction of a knowledge-based society. Consequently, competitive challenges, use of innovative technologies, improvement of social cohesion and quality of life, will also be impacted by this whole process (Videgor & O'Farrell, 2017).

Concomitantly, the evolution of the individuals, of the culture and society, contribute with new challenges for the Academy, in a dynamic of enduring (ex)change that stimulate bilateral progression and development. Over the past decades, there are several areas where this reality has a very meaningful visibility, with profound changes, in all the aspects mentioned. Different behaviours and lifestyles, evolving digital technology, social and economic changes, among other, affect contemporary way of living, give origin to new determinants of health and influence 21st century academia, creating new needs and demands for citizens, students, and academics.

One of these fields is healthcare education, namely nursing area. Nursing Educational paradigm is centered on the acquisition of knowledge, aligned with students' individual interests and development of competences. Directive 2005/36/EC (2005) regulates nursing educational process at European level, defining its development, proportionally in theoretical and practical learning environments, in most of the 29 original European member countries of the Bologna Process (Lahtinen, Leino-Kilpi & Salm, 2014), organized according to tuning cycles (Gobbi & Kaunonen, 2018), covering three, three and a half or four academic years (Lahtinen, Leino-Kilpi & Salm, 2014; Salminen et al., 2009).

Due to this, nursing education allows a dichotomy of theoretical and practical knowledge acquisition along with its application in practice, with a straight approximation between the academic learning contexts and nursing current practice, challenging both contexts to face the constant evolution of health/disease process and the reality of healthcare.

One of the core areas where this has a high relevance is in healthcare-associated Infections (HCAIs) field. In fact, HCAIs are currently a healthcare priority that acquire special significance with the more and more frequent infectious pandemic episodes. According to WHO, on average, one in every ten patients is affected by HCAIs worldwide. In acute care hospitals, 7% of the patients in developed countries and 15% in developing countries will acquire at least one HCAI. In unites like intensive care this goes even higher, with up to 30% of patients being affected by at least one HCAI in high-income countries, frequency that is at least 2/3 times higher in developing countries (2016; 2017; 2020).

These challenges have to be analysed and strategies defined to strengthen national and international capacity to improve practices and change behaviours, to make healthcare safer, of higher quality and free from avoidable infections, what can be achieved through the integration of people-centeredness, knowledge and innovation (WHO, 2016; 2017; 2020).

Aligned with this, WHO has been suggesting the effort of Universities and Schools of Health Sciences to improve patient safety learning and teaching in their existing curricula (WHO, 2011). This implies the creation of challenging and engaging learning environments where students are challenged by the teachers while critical thinking is stimulated. This organization defends that, for patient safety to result in safe practice and improved outcomes, it needs to be meaningful to students (2011) and this learning approach tends to create more effective conditions to acquire and apply knowledge, simultaneously developing the needed skills and competences.

In Higher Education nursing curricula is one of the structural areas with the obligation to respond to these identified challenges, by providing strategies and dynamic learning environments that promote the acquisition of new competencies. These will be necessary in solving significant real-life problems, essential for nursing intervention in contemporary healthcare providing. Is a subject that needs a wide-world address, in face of a clear international apprehension for the repercussions that HCAIs have on the health of the general population, reflecting the quality of care provided and Quality Standards of a Nation's Healthcare System. In face of this, HEIs have to be capacitated to produce pragmatic responses that enable a real convergence between countries, especially regarding the European Union, assuming their competitive roles as poles for the creation and distribution of innovative products, contributing to this reality beyond the usual dimensions of knowledge and competences acquisition/development (Simão, Santos & Costa, 2002).

Aware of this reality, and willing to contribute to innovation and exchange of good practices for higher education, this European Consortium of HEIs designed InovSafeCare Project¹. This project proposed to conduct an explicit analysis of existing pedagogical concept(s) and practical method(s) implemented in HCAIs' prevention and control nursing education, taking into consideration the specificities of different European teaching/learning systems and realities. Supported on an empirical study, the review of best practices related to HCAIs and pedagogical approaches, one of the outcomes of this project is *InovSafeCare Model*², comprised of innovative pedagogical practices for nursing students, focus on developing their competencies in the field of HCAIs prevention and control. Furthermore, aims to facilitate learning of good practices in this area, raising awareness and

¹ European Consortium, led by ESEnfC (Portugal) with Finish (Savonia), Polish (PWSZ), Portuguese (IPSantarém) and Spanish (Universidad D' Salamanca) partners, developed an ERASMUS + Key Action 2 Project- Cooperation for Innovation and the Exchange of Good Practices; KA203 - Strategic Partnerships for higher education (ID: 2018-1-PT01-KA203-047453).

² *InovSafeCare Model* is the Intellectual Output 1 of the Project.



encouraging them to critically reflect on practices and develop innovative solutions for their resolution.

The process of designing, testing and integration of the results of Agile Piloting of the Model will be presented in upcoming chapters, along with the structuring concepts that underlie the conceptualization and operationalization of *InovSafeCare Model*. For this, the theoretical and empirical basis of the Model will be described and discussed, followed by the explanation of the Model in all its dimensions.

1 - TEACHING... AND LEARNING IN HIGHER EDUCATION

Education can be considered the development of the ability to think, something children do and wish to continue doing 'forever'
(Jean Piaget)

Teaching in Higher Education needs to address the full spectrum of graduate attributes, understood as the qualities, skills and understandings a university community agrees its students should develop during their time with the institution, and not just concentrate on the knowledge domains (Bowden et al., 2000; Videgor & O'Farrell, 2017). A definition student-centered, as is this person who will perceive and understand the world, giving it meaning, and changing along the way (Fry, Ketteridge & Marshall, 2014).

Any educational process is a shared action, that seeks to exchange meanings and feelings between the student and the professor, who have different ways of seeing the five key-elements involved in this process: the teacher, the learner, the knowledge, the context and the assessment, all interacting to frame the significance of the experience (Novak, 2010).

Education deals with students, diverse in all aspects and who are always changing; and with specific purposes and contexts that differ from each other. In these conditions, for teaching to be effective has to be predicated on the understanding of students learn and the objectives of the activities have to bring about learning, along with the insight and knowledge about learners' needs (Fry, Ketteridge & Marshall, 2014b).

Remembering WHO's (2011) position, for patient safety to result in safe practice and improved outcomes, it needs to be meaningful to students, totally in line with the previous reflections about teaching and learning in Higher Education, at this point is important to contextualize nursing learning and teaching process in Higher Education.

1.1 – Nursing Learning and Teaching Process

Nursing Education, regulated by the Directive 2005/36/EC since 2005, is organized according to the philosophy of Tuning Cycles, to make levels of learning measurable, comparable and compatible across Europe. However, and following the *Tuning* perspective, Universities should not look for uniformity in their degree programmes, or any sort of unified, prescriptive or definitive European curricula but simply for points of reference, convergence and common understanding (González & Wagenaar, 2008).

To implement this, academics from nursing area have developed cycle/level descriptors stated in standings of learning outcomes, which are expressed in terms of the level of competences to be

obtained by the learners. Competences are here seen as a combination of cognitive and meta-cognitive skills, knowledge and understanding, interpersonal, intellectual and practical skills, and ethical values. They are developed in all course units and assessed at many different stages of the program. Some of them are generic and others are subject area related. Nevertheless, according to Tuning philosophy, they should be developed together, and fostering these competencies is the object of all educational programmes (Gobbi & Kaunonen, 2018).

To achieve this, nursing educational programmes seek to accomplish the definition of the professional profile related to the needs of society in healthcare area, implementing the orientation of a learning and teaching dynamic that integrates both theoretical and clinical settings as learning environments. At European level, general nursing degree lays on the requirement of 4600 hours of theoretical and clinical approach, with the theoretical dimension representing at least one-third and the clinical at least one half of the minimum duration of the degree course (WHO, 2009).

An educational reality that allows a dichotomy of acquisition of theoretical and practical knowledge, along with its application in practice, promoting acting and reflecting upon action.

This gives origin to a variety of demands that imply the definition of both academic and professional profiles (González & Wagenaar, 2008) as these students learn with professors that are exclusively from the university, that work both in the university and in healthcare settings or that are nurses at full time.

Aware of this, WHO (2021) defined as a policy priority for nursing the design of education programmes competency-based that, among others, can contribute to education accreditation, while primarily an accountability mechanism to ensure institutions meet quality standards, to identify and address areas to improve student's competencies through updated and contextually relevant curricula. These accreditation standards should reflect emerging trends in health services, which will influence future health practice, including changing burdens of disease, namely patient safety and the use of technologies.

A teaching and learning dynamic, integrated in the proposed conception of the Bologna Process, that challenges the Academy to propose new educational Models to accompany the evolution, both of higher education and of the reality of care in present health/disease process that, in HCAs area has been gradually becoming of high impact not limited to healthcare settings but increasingly becoming a social burden.

By combining the vision for learning, principles for excellence in learning and teaching and high impact teaching strategies, pedagogical Models support schools to build teacher excellence through the stimulation of discussions about current teaching practices, helping to build a high-performance learning culture and, ultimately, improve student achievement and engagement (Department of Education and Training, 2020). Furthermore, they allow to answer questions facing all teachers: *What should be taught? How should we teach? To whom and according to what purposes, conditions and resources?.* This questioning doesn't include students only, but also the training of teachers: *how to prepare them to develop a certain curricular approach with their students?* (Lopes da Silva, 2013), *how to plan learning and teaching activities and develop curricula?* (Stefani, 2014).



By providing a common language and guidance on improving the quality and consistency of teaching practice, also enable school leaders, teachers and students to foster shared instructional leadership so that all intervening parties involved in the process contribute to co-designed and connected learning (Department of Education and Training, 2020).

Embedded in this philosophy, *InovSafeCare Model* is a theoretical framework based on an operative structure that arises from the premise of student-centred learning, aligned with the perspective of learning to learn and lifelong learning.

2 - THE DESIGN OF THE *INOVSAFECARE MODEL*

*For patient safety to result in safe practice and improved outcomes,
it needs to be meaningful to students
(World Health Organization)*

Learning is a long-term process, which has its own specific stages, connected with engagement as well as motivational, emotional and intellectual processes. In the course of creating a pedagogical Model, such aspects need to be considered along with the individualities of the people that the Model is aimed at. The feedback, the response from the people that the Model is targeted at should also be provided for.

Searching for the best evidence to support *InovSafeCare Model*, a mixed-method study was developed starting with a literature review about the best pedagogical methods, HCAs prevention and control guidelines, recommendations and protocols (from European Union in general and from partner countries in specificity). An empirical study involving all the actors that participate in this process, namely students, professors, tutors and/or mentors followed this revision. With the aim of understanding how learning of these competencies can be integrated into nursing courses, in a dynamic and innovative perspective, the *InovSafeCare Scale* was developed and applied to 1326 students from all the consortium institutions, along with a qualitative study involving 79 participants (teachers, including responsible for the degree courses, pedagogical and scientific councils, mentors and tutors that orientate students in clinical practice) representing all the partner institutions as well. Data obtained were submitted to a triangulated analysis and the results contributed to the design of the Model.

Beside the presentations, discussions and validations among peers along the development of the process and by the Project's Steering Committee, the first draft of *InovSafeCare Model* was piloted. An Agile Piloting was conducted, involving 70 students from all partner institutions, with the main objective of identifying any deficiencies or inadequacies of the Model, in result of the enabling of easy reactions in result to the piloting strategy.

The integration of the analysis of these results allowed the development of several drafts and due refinement giving origin to the *InovSafeCafe Model* that is described and justified hereafter.

2.1 – Objectives and Learning Outcomes

The learning and teaching process has been associated with the evolution of the undergoing changes of the environment, culture, scientific thinking and society in general, tending to become consensual that education must promote students' competence to manage their learning processes, adopt increasing autonomy in their academic path, along with intellectual and social tools that

enable them to continue lifelong learning, with a perspective of acquiring skills and competences and not just closed knowledge or programmed skills (Simão, 2004).

In line with this perspective, the main objectives of the *InovSafeCare Model* are:

- To provide a student-centered learning environment that capacitates to intervene in HCAIs prevention and control process
- To enhance learner's awareness and involvement in the process of HCAIs prevention and control
- To develop creative and critical thinking in clinical decision-making, evidence-based supported, to prevent and control HCAIs
- To foster lifelong learning attitude in what concerns HCAIs prevention and control.
- To encourage learner's entrepreneurship towards innovative approach perspectives in HCAIs prevention and control.

Is a constructivist theoretical-conceptual perspective that places the students as the group who interacts with the professor, the mediator, who brings them closer to the contexts of reality, being learning a desirable event (Laureano-Cruces et al., 2010). This learning event has to be defined to the student, through a specific learning outcome, the statements of the knowledge, skills and abilities students should possess and can demonstrate upon completion of a learning experience or sequence of learning experiences.

Expected learning outcomes of *InovSafeCare Model* are:

- Ability to understand the chain of infection

The student is able to

- . define healthcare infection including microbe sources, reservoir in healthcare facilities environment and transmission
- . relate the immune defense systems to organism microbe exposure
- . explain the ways of transmission, control, healthcare infection prevention and control, including healthcare associated environment flora

- Ability to acquire, understand and mobilize knowledge in the field of HCAIs

The student is able to

- . describe and visualize “the map of healthcare-associated infections”
- . identify regulations and guidelines of HCAIs in national and international levels
- . explain the core concepts of HCAIs prevention and control in theory and practice
- . recognize the skills to apply knowledge on prevention
- . identify the competences to prevent and control HCAIs

- Ability to recognize and understand the problems and risks associated to HCAIs within the process of nursing care for the person/family in different contexts of practice

The student is able to

- . identify the consequences of resistance to micro-organisms and its devastating consequences for patient

- . recognize the importance of support measures, namely basic contact precautions and national vaccination programme
- . comply with the basic contact precautions implementation
- . explain the mechanisms and proceeding in cases of blood infection, systemic infection hospital-acquired pneumonia, urinary tract infection and fungal infection
- . describe basics of antibiotic treatment

▪ Ability to guarantee safety of care, particularly in handling equipment and infection control

The student is able to

- . recognize the need to repeatedly follow procedures in nursing care
- . distinguish cleanness and aseptic concepts while transposing from theory to practice
- . comply with the aseptic and antiseptic procedures
- . predict the effects of non-compliance with the aseptic and antiseptic techniques
- . identify the skills to handle the proper equipment related to HCAs prevention and control such as using the protective gloves and clothing
- . comply with the isolation procedures

▪ Ability of problem solving and decision making in clinical case analysis based on research and analysis of information from scientific sources

The student is able to

- . apply the knowledge and skills to search resources related to procedures on HCAs prevention and control
- . critically evaluate and synthesize a range of information and data sources to make sound clinical judgments
- . to use the information, data sources and clinical judgments to ensure quality standards are met and practice is evidence based

▪ Ability to work individually and in groups on clinical case analysis/problem situations and during the practice of nursing techniques/procedures

The student is able to

- . recognize the importance of cooperative work with others on a team
- . develop the capacity and desire to work cooperatively on a team
- . develop creative and critical thinking and take adequate decisions

▪ Ability to analyze situations and propose viable solutions to solve problems

The student is able to

- . use available technology to access and respond appropriately to HCAs requirements
- . develop creative and innovative solutions to fulfill patient care needs
- . develop innovative strategies as proposes to respond to healthcare demands

▪ Ability to identify, understand and reflect on the ethical-deontological problems inherent to caring for the person/family/community

The student is able to

- . identify and respect patients/ families' differences, values, preferences and expressed needs
- . recognize and apply communication and interrelationship techniques while providing information to the patient/family
- . mobilize informed consent principles while caring in HCAs area
- . develop an ethical-deontological critical thinking and take adequate decisions

2.2 - Conceptualization

Subjacent to *InovSafeCafe Model's* design is the perspective to contribute to mature and stimulate the *Minds for the future* (Gardner, 2006), developing competencies that comprise the ability to master one's subject, profession or discipline (disciplinary mind), the ability to integrate ideas into a coherent whole (synthesizing mind), the ability to uncover new problems, questions and knowledge (creating mind), the ability to seek to understand, to appreciate differences and work with others (respectful mind) and the ability to fulfil oneself as a citizen/worker (ethical mind).

In line with this, preparing students for lifelong learning is one of the primordial steps to address when the subject is HCAs prevention and control: to equip them to learn beyond the academy, once the infrastructure of professors and courses is no longer available (Boud & Falchikov, 2006). Preparing students to the permanent actualization required because the currently participants/ observers will be the professionals of the future, themselves facilitators of the learning process of new students.

This student-centered perspective follows a constructivist theoretical conceptual orientation that considers the student as the central focus, as a person who interacts with the professor and co-constructs his/er learning process. As the respondents of the empirical study that supports this Model say: "*...the student is the center, is an active actor...*"³.

This point of view of an educational partnership between students and professors, as named by Videgor and O'Farrell (2017), must integrate student's individuality, as a citizen who has his/er characteristics, life experience and expectations that will certainly influence and condition the learning process.

Students must mature a sense of moral understanding, viewing the learning and teaching process as an opportunity to develop social and cognitive skills, to internalize the need for peer cooperation and mutual respect, as well as self-motivation. Although many of these characteristics are intrinsic, professors should encourage its development inside the learner(s). So, teaching and learning become an integrated whole, in a constructivist environment (Wilson, 2011; Yurrebaso-Macho et al., 2021).

As the students that participate in the quantitative study demonstrated, motivation, self-efficacy, awareness and high ethics are key players in the learning and teaching process. *InovSafeCare Ecosystem Model* shows a vectorial relation between theoretical approach (result of teachers'

³ All the citations presented are from the qualitative study developed. The sources are not identified, as the privacy of the responses and consequently the ethical issues could be compromised.

intervention) motivation and students' attitude and, consequently, on self-efficacy perception (Yurrebaso-Macho et al., 2021), as seen in figure 1.

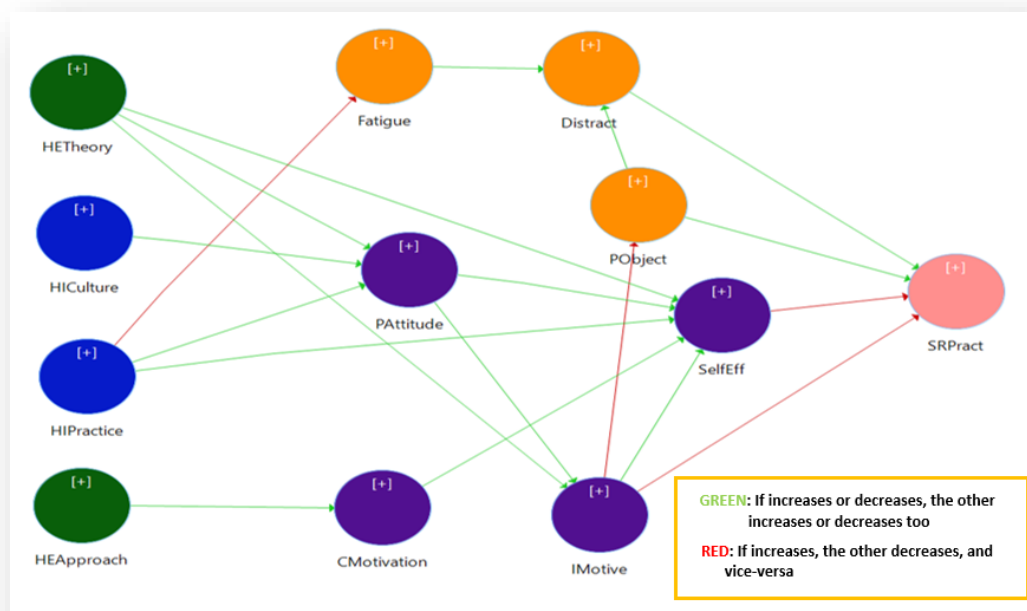


Figure 1 – Educational Institution-related dimensions (Adapted from Yurrebaso-Macho et al., 2021)

The vision and identification with this line of thought, contextualizes the first dimension of *InovSafeCare Model* design – the **Learning Environment**, a known important variable that affects students' learning process in general (Aldridge & Fraser, 2011; Fraser, 2012), understood, in our perspective, as the diverse physical locations, contexts, and cultures in which students learn (The Glossary of education reform, 2019).

Aligned with Bologna's Process and Tuning methodology already mentioned, nursing's learning environment has a bidirectional dynamic, comprising academic and practical contexts. Both academic and clinical settings will welcome students at different stages of their learning process, in most cases in a back-and-forth movement between the two contexts, in a gradual process of developing competences along the 4600 hours of the nursing degree.

Professors from the academia and tutors from nursing practice will interact with these students along this formative path that begins with the acquisition of knowledge (knows), progresses to the understanding of how the knowledge can be applied (knows how) sideways with the demonstration of how it is done (shows) and advances to the implementation of the knowledge acquired (does), increasing autonomy along the acquisition and development of metacognitive competences (Miller, 1990; Witheridge, Ferns & Scott-Smith, 2019; WHO, 2012).

Integrating all these dimensions, *InovSafeCare Model* advocates a constructivist learning environment, focused on the student, where learning is a search for a meaning and parts are understood in the context of wholes, developed in an **active learning environment** (Fields et al., 2021; Nyback & Vickström, 2017).

In face of this reality, *InovSafeCare Model* defends this active learning environment can help students handle present and future challenges, increasing **citizenship**, arouse and encourage **engaged, reflexive and critical thinking**, enhance **creativity** and support **self-directed learning**, while stimulating their **entrepreneurial spirit**.

Recent times have seen continuing increasing of student numbers, further internationalization and wider diversity in the prior educational experience of students, based on their own diversity as citizens, which bring different backgrounds and expectations to learning (Fry, Ketteridge & Marshall, 2014b). From this starting point, *InovSafeCare Model* defends the development of competences that allow **active citizenship**: adapt to new situations, have the ability to analyse situations and work in groups, have communication skills, sense of responsibility and discipline, capacity for decision-making, openness to risk, sense of initiative and creativity, excellence and sense of service (Rodrigues, 2014).

As an active citizen, with these increased soft skills, within this active learning environment (inside school or in clinical settings) the student will be enabled to face the HCAs Prevention and Control issues learning about it, developing skills and competences that will empower them to make decisions, analyse and adapt to new situations engaging their creativity. This perspective will lead to activities that will encourage students to participate in learning approaches which will involve them with cooperative activities that promote active engagement by making learning personally relevant for the learner, connecting teaching activities within school to out-of-school experiences, engaging students in authentic tasks, which, by definition is **active learning** (Ovbiagbonhia, Kollöffel & Brok, 2019).

The current use of these methods also contributes to **critical and reflexive thinking** skills acquisition and development, also very useful beyond the classroom (Achen & Dodd, 2015; Adkins, 2018; Artioli et al., 2021; Cavanagh, 2011; Limpkin et al., 2019) and fundamental to decide when HCAs are the subject. As we've seen, cathedra education or training focusing on knowledge alone is not sufficient for behaviour change and HCAs prevention and control safe intervention imply the capacity to critically analyse the surrounding reality: *"... a critical reflection about what they [the students] observe, (...) what aspects they would like to mobilize and that they feel that are not integrated (...) also helps them to have a more critical sense when they get to health care"*

Furthermore, the act of reflexion involves purposeful thinking in the form of contemplation of thoughts, feelings and experiences related to a specific event and the development of these competencies is recognized as a vehicle that assists nursing students to analyse where they are, in regard to their practice development, and identify the areas they need to further develop (Adkins, 2018; Artioli et al., 2021; Carter & Creedy, 2017; Jiménez-Gómez, et al., 2019; Kennison & Misselwitz, 2002; Levett-Jones, 2007; Parrish & Crookes, 2014; Rees, 2013).

The combination of engaged, reflexive and critical thinking, with the inherent higher-order cognitive outcomes, stimulates the capacity of autonomy in learning, transforming the information in knowledge. This autonomy implies an active student attitude towards the acquisition of knowledge, as well as a number of skills that will allow this acquisition (González Hernando et al., 2013). According to these authors, it is necessary to be a strategic learner, and a way to become

one, is using **self-directed learning**, that can allow the transformation of mental skills into academic knowledge. This is a process in which the individuals take the initiative in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies.

From this arises the **creative thinking**, the ability to design fluent, flexible and unique proposals, easily and conveniently applicable to nursing care (Ku, 2015; Nyback & Vickström, 2017), a dimension that *InovSafeCare Model* aims to promote and stimulate as well, all contributing to arouse students' **entrepreneurial spirit**.

Considering that entrepreneurship has several dimensions (social, cultural, environmental and economic) the knowledge, skills and attitudes underline an entrepreneur spirit include elements such as: creativity, opportunity identification, self-efficacy, self-confidence, communication, leadership, decision making, innovation, responsibility, collaboration, idea generation, problem solving, autonomy, negotiation and networking (Alves, Felgueira & Paiva, 2018).

In fact, one of the major focuses for designing this Model is to enhance the innovative spirit of nursing students by providing them with the necessary skills to transform their innovative solutions in more than mere ideas, exploring other professional opportunities in the labour market by, for example, presenting their innovative ideas or devices to local companies and enterprises in the technological and healthcare areas.

After this first reflexion, the structural concepts that support this operative Model were theoretically sustained and are schematically outlined in the figure below.

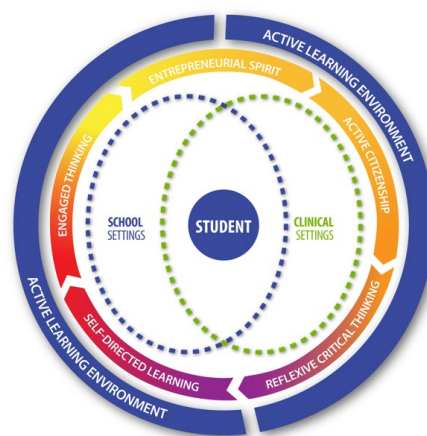


Figure 2 – Explicative diagram of the *InovSafeCare Model* structural concepts

In this stage, it can be said that the major finality of the *InovSafeCare Model* is to promote innovative teaching and learning, enhancing student-centred learning of HCIs prevention and control. Furthermore, to develop metacognitive skills and competencies through constructivist thinking, engaging and motivating learners to design relevant and real-world learning activities, promoting learning without borders, creativity and innovation, stimulating entrepreneurship.

But, for this to be accomplished, according to the results of the empirical study that supports this Model, the educational interaction has to be supported in evidence-based practice and innovative teaching and learning strategies and tools that encourage reflexive thinking and entrepreneurial potential, using problem-based learning and simulation-based learning.

Indeed, pedagogical strategies are considered needed to overcome contextual barriers to students' engagement (Theobald, Windsor & Forster, 2018), to enhance students' abilities to organize and synthesize information (Barrett et al, 2018), helping them to become actively engaged in their learning opportunities (Nyback & Vickström, 2017; Shin et al., 2015) and, consequently, promoting proactiveness and innovation, that allow them to become entrepreneurs in the field of HCAs.

2.3 – Pedagogical strategies

To be a professor who promotes in students the development of self-directed learning competences requires a challenging and critical role as it encompasses providing motivation, a conducive environment, goal orientation and foster a sense of self-efficacy and of self-mastery for the student, the main responsible for defining his/her learning objectives, what knowledge must be gained and how to gain it (Benson, 2011; Yasmin & Sohail, 2017; Yasmin, Naseem & Masso, 2019).

Within this way of viewing learning, several studies recognize the appreciation of valuable teaching experiences, lengthways with professors' knowledge, enthusiasm, approachability and friendliness. In fact, personal and cognitive characteristics of the professors are valued beyond the traditional symbol of knowledge expert (Baeten et al., 2010; Elder et al., 2011; Sancar, Atal & Deryakulu, 2021; Videgor & O'Farrell, 2017; Voss & Gruber, 2006; Yair, 2008). Being sensitive to students' needs, help to decrease uncertainty, suspicion or disengagement and encourage to raise innovative ideas, along with leading them to self-discovery, are as well desirable characteristics of the professors (Chireshe, 2011; Hampton, Welsh & Wiggings, 2020; Yair, 2008).

The professor embedded in this philosophy is expected to emphasize conceptual understanding, present and discuss recent developments in the field of the subject, present origins of ideas, discuss points of view other than his/her own, clarify thinking by identifying reasons for questions, ask students to apply concepts and demonstrate understanding, as well as present facts from other fields (Elder et al., 2011; Hampton, Welsh & Wiggings, 2020; Uitto, 2012; Videgor & O'Farrell, 2017;).

And this professor has innovative strategies used in teaching and learning in Health Higher Education, propitious to the acquisition and development of competences and skills, that allow students to become entrepreneurs in the field of HCAs, seeking innovative ways to collaborate with patients, communities, populations and other agents of change and innovation in healthcare (Gobbi & Kaunonen, 2018).

Following this line of thought, revisiting the structural concepts of the Model, is important to remember that learning process focuses on primary concepts, not isolated facts and betake the mental Models that students use to perceive the world and the assumptions they make to support those Models. This philosophy directly influences lecturing, by focusing on making connections

between facts, fostering new understanding(s), and has impact on the curriculum as well, as preconizes the abandonment of standardization (Hampton, Welsh & Wiggings, 2020; Sanela et al., 2021; Wilson, 1996; 2011).

In addition, evidence-based research has been showing academia must prepare students to carry out the HCAs control measures, regardless of the area of activity, improving practices for infection control as future healthcare professionals, sensitized and informed about risks and practices, since this area of learning implies changes in behaviours, and is consisting with successive approaches with the object of study (Massaroli et al., 2018). Nevertheless, as mentioned before, evidence-based research about HCAs prevention and control constitutes an extremely specific field, with a growing body of evidence that brings constant new challenges to healthcare organizations and professionals worldwide.

A challenge that has to be embraced by HEIs, while assuming their essential role of engenderment of active learning processes in settings where nursing is taught: to facilitate the transformation of information into knowledge in the classroom, in different laboratories, according with the objectives of the activities, namely skills training or simulation, or in clinical location.

As such, *InovSafeCare Model* doesn't propose any prescription of contents' approach, although a generic suggestion can be seen on table 1. The fundamental is that these approaches are supported on **evidence-based** updated information, according to the newest scientific research results on the subject, using an effective method for presenting information to students: **active lectures**.

Table 1- Integration of HCAs prevention and control topics

[adapted from WHO, Patient Safety Curriculum Guide: Multi-Professional Edition, 2011]

Topic	Subjects that could house HCAs topic
Minimizing infection through improved infection control	Microbiology Procedural skills' training Infectious diseases Clinical placements Pharmacology Therapeutics
Being and effective team player	Orientation programmes Communication skills' training (interprofessional) Emergency disaster training
Patient safety	Ethics Introduction to the clinical environment Clinical and procedural skills' training

Active lectures are effective for presenting information particularly when the professor integrates content(s). It allows the presentation of up-to-date evidence, explanation of complex concepts and clarification of confusing points to students. With this strategy, professors can highlight key points to remember, provide examples of how those concepts relate to patient care (Bristol et al., 2019) and enrich them with experiences from the context of practice. In these active lectures is expected from the professor the creation of significant zones of proximal development, as well as cognitive bridges which approximate theoretical approaches to the future context of practice and promote significant and significative learning (Brandon & All, 2010; Masika & Jones, 2016; Theobald, Windsor & Forster, 2018).

Beyond this interaction between the student and the professor, that can be presential or at distance, depending on the programming of course unit, other strategies and tools can be used. Dearnly, McClelland and Irving (2013), in their research about *Innovation in Teaching and Learning in Health Higher Education*, identified teaching and learning innovative strategies as technological and non-technological⁴. Although this distinction is important, is not too relevant for *InovSafeCare Model* framework, as emphasis is on the need of all the process of teaching and learning about HCAs prevention and control must be evidence based, supported on the latest knowledge produced. For this reason, in the proposed Model, selected strategies must congruently interrelated, with the purpose of promoting active learning in an active learning environment, enabling students to be engaged in critical and reflexive thinking, self-learning, with an entrepreneurial attitude, as the active citizens they are expected to be (see figure 3).

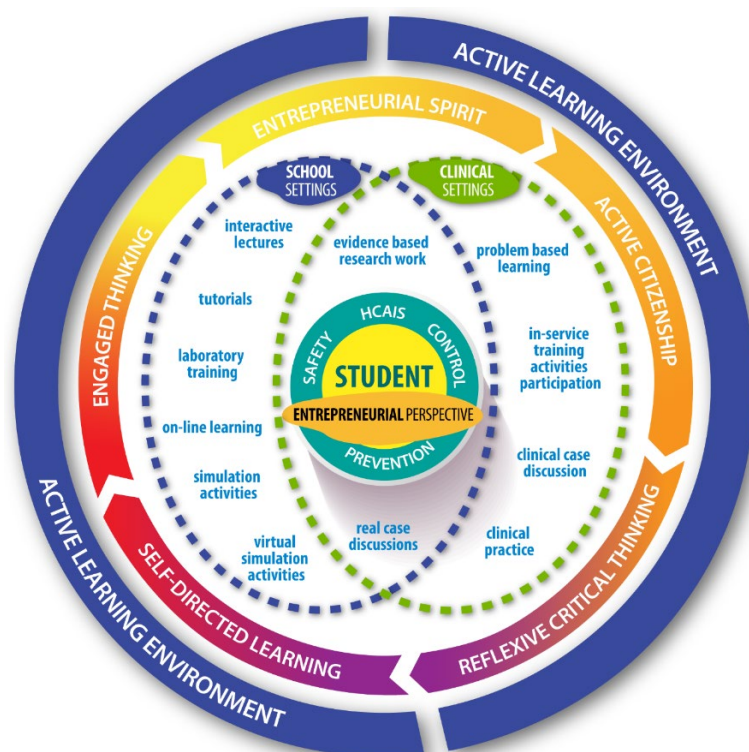


Figure 3 - Explicative diagram of the InovSafeCare Model

Following this line of thinking, one of the first strategies that can be mentioned is **online learning**. Created with several objectives, online learning environments meet demands of a digital society, of greater flexibility and individualization so that the learners have the opportunity to adapt the learning process to their own needs and specific life phases (Barnett, 2014; Muller & Mildemberger, 2021). Supported in the new technologies resources and implemented didactically in an online or blended

⁴ Non-technological innovations are related with new training and teaching that allow the development of clinical judgement skills such as: utilization of concept mapping; service user involvement, since it can illustrate challenges through lived experience; use of high-fidelity simulation in teaching and assessing, as increases student confidence and clinical competence and can also give emphasis to healthcare ethics; mobilization of reflection processes that enable students to cope with emotionally challenging situations; use of storyboard technique which promotes deeper reflection; recourse to active learning assignments and quizzes as a strategy; using gaming workshops; utilization of problem-based learning or peer learning. Technological innovations include simulation, digital teaching aids, online teaching and assessment, e-learning, virtual learning environments, social media and mobile technologies.

learning environment (Andrade & Alden-Rivers, 2019; Muller & Mildemberger, 2021), it may have positive effects on knowledge gain, skills acquisition and student perception (Chen et al., 2018; Muller & Mildemberger, 2021), with the added value of higher degree of freedom for learners, as students can participate in sessions in classroom or study more independently of time and space and determine content and learning pace individually (Muller & Mildemberger, 2021).

In the specific context of *InovSafeCare Model*, has two main objectives and reasons to be included in this Model's proposal. First, focusing on the students, the flexibility should enable them to take more personal responsibility for the learning process, while gives HE institutions the need to provide the educational services on offer that allow student's the decision on what, when, how and where they learn (Higher Education Academy, 2015).

Secondly, focusing on the professionals of tomorrow, students of today, they ought to be introduced as well into the principles of lifelong learning, one of the primordial steps to address when the subject is HCAs prevention and control: to equip them to learn beyond the academy, once the infrastructure of professors and courses is no longer available (Boud & Falchikov, 2006). Beyond this, online learning responds as well to the demand of people active in various occupational fields during their lifetime, that have to expand their skills in the sense of continuous lifelong learning (Muller & Mildemberger, 2021). In this specific case, the nurses that want and need to expand their knowledge on HCAs prevention and control measures.

In connection and or in complementarity with lectures, whether presential or at distance, **tutorials** can be another strategy in teaching and learning about HCAs, in written or videotaped format. Providing written tutorials about some of the issues related to procedures, guidelines, research instructions, among others is a way to help students to study, follow or facilitate their own learning. The use of videos provides a visual demonstration of clinical skills in a simulated close to real setting and allow students to experience performance of skill by linking classroom (face-to-face) learning to clinical practice. This strategy is particularly useful as a revision tool and could be a good preparation method for practice since allows self-management of the study. The students can appreciate the freedom to pause, rewind and replay, as they need (Bokari et al., 2021; Forbes et al., 2016). Another advantage of the strategy described is it may be preparatory to laboratory practices, which are expected to be used in the learning process of HCAs prevention and control, more related with technical skills training, associated to development of abilities to execute (Bokari et al., 2021; Srand, Nåden & Slettebø, 2009).

Many procedures associated to HCAs prevention and control have the potential to harm patients, especially when learners are still lacking in experience and the knowledge, skill and behaviour of the person performing the procedure can help to minimize some of the potential risks for patients (WHO, 2011). With **laboratory practices** students can improve knowledge, practical skills, bridging the gap between 'knowing' and 'doing'; develop communication abilities; improve self-confidence, and develop a more reflective and critical mode of thinking (Hardie et al., 2021; Srand, Nåden & Slettebø, 2009). But to achieve this, four steps should be observed, known as the 'Peyton's four-step approach'. On the first step, *Demonstrate*, the professor carries out the procedures without any explanations; during the second step, *Talk the trainee through*, the

professor applies the corresponding procedure and clarifies each sub-step in detail; on third step, *Trainee talks trainer through*, professor accomplishes the procedure for a third time, and on fourth Step, *Trainee does*, is the learner who does the procedure by him/herself (Awad & Mohamed, 2019; Krautter et al., 2015; Lapucci et al., 2018).

Another essential dimension of laboratory training for teaching programs in healthcare area, with high importance in nursing (Nyback & Vickström, 2017), is the safe training environment, as it offers a protected and mistake-forgiving training environment, where students can practice skills on mannequins, prior to their skill performance on real patients (settings) (Awad & Mohamed, 2019), and ethically it is necessary for students to master basic procedures prior to practising on patients (Awad & Mohamed, 2019; Hardie et al., 2021; Srand, Nåden & Slettebø, 2009).

Cases can be used to organize any of the previous activities, applicable both in school and clinical settings and used across the curriculum (Bowman, 2017). **Case studies (whether they are created or real case) discussion** provide student-centred education and motivate them through active involvement. This strategy provides a path for using problem solving skills and promotes development of critical thinking. Depending on the way and setting where it is used, promotes decision making in a non-threatening environment, gives students the opportunity to link theory to practice (Dutra, 2013; Liberman, 2021; Popil, 2011).

When used during clinical practice, as a supplement to the clinical experience, students can be challenged or can feel the need to deepen and analyse a specific situation they are in contact with (Bowman, 2017), related to HCAs prevention and control – **clinical case discussion**. At clinical settings students have contact with real situations, normally complex, while they are caring for real persons, with individual needs, and this could be a stimulus to deepen their knowledge. Confronted with a new situation, students need to redefine the existing knowledge structure, but this process depends how new knowledge is perceived as meaningful, and it comprises motivation, orientation, integration and action. The student learns when he/she integrates the information and develops an action, in a context of evaluation and control, this process can be self-direct and hetero directed (Abreu, 2007).

InovSafeCare Model advocates the integration of real case discussions or clinical case discussions of study cases discussions as this strategy encourages student-professor interaction and collaboration, as there is a transfer of responsibility of learning from professor to learner, and this inspires and enhances lifelong learning for nursing students (Dutra, 2013; Liberman, 2021; Popil, 2011). Moreover, when the discussion is about real/clinical cases, students have the opportunity to transfer what they previously learned to the discussion, mobilizing critical thinking, evidence-based knowledge, make meaning of knowledge in practical settings, debate ethical and deontological issues related to the care, and discuss their work with the nursing professionals (Dutra, 2013; Popil, 2011).

These moments of discussion may also arise problems, issues that stimulate the innovative and creative spirit of the students, giving origin to debates about new solutions to the identified problems or, at least to the problematization about the subjects.

This strategy can also be used associated with simulation (presential or virtual). Associated with high-order educational outcomes, health professionals' education and training institutions should

use **simulation** methods (high fidelity methods in settings with appropriate resources and lower fidelity methods in resource limited settings) of contextually appropriate fidelity levels in the education of health professionals. The principal aims of simulation as a teaching method are to improve quality of care and ensure patient safety (WHO, 2018).

In line with this, *InovSafeCare Model* pretends to mobilize this pedagogical strategy, that uses one or more educational methods or types of equipment to provide a simulated experience to promote or validate students' progression from novices to experts, allowing them to understand the experience through apprehension (concrete experience) and comprehension (abstract conceptualization) (WHO, 2018). This strategy allows students to develop different competencies, in different dimensions, which lead them to clinical judgment, as they can perform technical actions, apply knowledge, collect and process information, make decisions, adopt attitudes (Meakim et al, 2013; WHO, 2018). By permitting students to do this training before being in contact with patients, it allows the non-instrumentalization of the person/patient and guarantees nursing care even when caregivers are in the process of learning (Martins, 2017).

The use of simulation has different benefits. Technical skills are also developed with simulation, as attitudes, namely ethical attitudes and behaviours, by applying ethical principles in clinical practice. Simulation contributes to structure nursing student's identity and stimulate relationships with their peers (Baptista et al., 2016; Berragan, 2011; Foronda et al., 2013; WHO, 2018). Another benefit is the increase of students' motivation, satisfaction and self-confidence, because it places their needs at the centre of attention and creates conditions for the best teaching practices, which allow the achievement of expected learning outcomes. Leadership, efficiency and effectiveness are also considered as benefits from the utilization of simulation in the process of education of students. Promotes self-confidence to lead, team communication, teamwork, organization, moral judgement, processing and use of information, definition of priorities, decision-making (Martins, 2017; WHO, 2018).

The reflexive capacity is developed with this strategy, when students are led to analyse their actions, they became aware of the difficulties, limitations and capabilities, and the effects of their decisions on patients (Baptista et al, 2014). The reflexive and critical thinking is developed and improved.

Another reason for this proposal to be included in *InovSafeCare Model's* framework is the complexity of skills development necessary to progress from more basic skills to the higher-level clinical judgment and reasoning ability used in decision-making for safe, effective practice, that is totally aligned with the structural concepts of the Model (see figure 4).

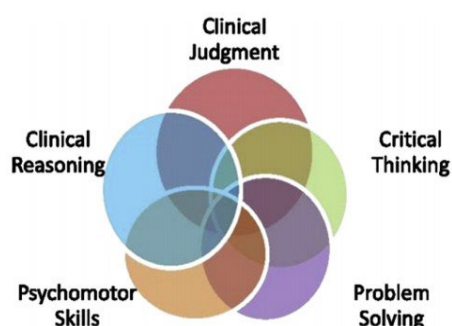


Figure 4 - Skill Development and Clinical Judgment © in (INACSL Standards Committee, 2016)

As preconized in *InovSafeCare Model*, the five dimensions identified in the figure (psychomotor skills, problem-solving, clinical reasoning, critical thinking and clinical judgment) will interact and affect one another what will contribute to develop and consolidate students' knowledge, because they can apply previously acquired knowledge, put theoretical notions into practice, reflect on the action and identify necessary changes to improve subsequent actions. They can also transfer this knowledge to clinical settings (WHO, 2018). Likewise, as simulation practice improves patient safety, and the Model proposed is related to infection control, it becomes evident that simulation is one of the strategies that should be used in its operationalization.

In addition to school-based simulation, **virtual simulation** is suggested. Virtual simulation is computer-based, therefore, available outside the laboratory location, which allows a flexible learning environment that is not tied to place or time (Nyback & Vickström, 2017). It captures students' intrinsic motivations and satisfaction, permits the application of foundational knowledge, allows a competency-based education and assessment that consequently enables a deep level of learning and the development of clinical expertise. Clinical virtual simulation can contribute towards reducing clinical error and improving the safety and quality of health care (Padilha et al., 2019).

Combining the learning of new information, knowledge acquisition, skills and competences development, while developing critical thinking and clinical reasoning allows students to achieve two relevant goals: really caring for patients and preparing them for the role of professional nurses, while maintaining the safety and well-being of the patients (Vitale, 2014), and **clinical practice** is a significative contribute to this step of the pathway of nursing degree.

In fact, the clinical setting by itself is a motivating context for undergraduate students, as it combines the learning of new information with practice of skills in real situations, which is a stimulus for students' learning. About this area, *InovSafeCare Model* advocates clinical practice as a fundamental element of nursing curricula because students have contact with clinical personnel, seen as highly influential contributors to undergraduate nursing student learning (Vitale, 2014). Additionally, these settings are expected to provide the possibility of transferability of knowledge, acquired during theoretical teaching (mobilizing different strategies) to clinical practice, that is, the articulation of theoretical knowledge, supported by scientific evidence, with the practice of care, specifically in the prevention and control of HCAs. The relation between theory and practice implies reflexive skills.

In these contexts, specific learning needs may emerge (both theoretical and practical), that will imply students must deepen the knowledge, train both the decision-making process and/or the techniques inherent to the process of care related to HCAs. Is important to remember that the attitudes of health professionals are examples or Models that students experience from observation, meaning there is a need to develop a culture of safety by the health services, because, their commitment to safe practices will have a great influence on the construction and consolidation of the skills to control HCAs by the students who have contact with them, through the practical activities and internships (Massaroli et al., 2018).

In line with this, clinical wards tend to organize learning moments and students may be invited to participate in a more or less active way, depending on the objective or the subject in discussion. In

fact, to develop a culture of safety, is fundamental to **have permanent education programs** in healthcare institutions, so that day-to-day practice is consistent with the most recent recommendations. The participation of students in these moments, along with the nurses, tutors or not, allow students to have an experience of theory as a reality of the environment of healthcare (Massaroli et al., 2018). They can participate as learners, but they can also be (in collaboration) active promoters of new knowledge, participating in healthcare institution projects, accepting challenges that are posed by supervisors and teachers or, in the spirit of entrepreneurship that *InovSafeCare Model* advocates, propose innovative and creative ideas and areas for research or devices creation.

About this, the participants in the empirical study that contributed to this Model, state that the student “... slowly, is able to change, he can contribute to the behaviour change within the team” and “...research information on their [students] own anyway. Entrepreneurship contributes to development [of practices and educational strategies]”.

About this, Vitale (2014) identified as an innovative clinical teaching Model for nursing practice Problem-Based Learning method in nursing education, the last proposed strategy in *InovSafeCare Model's* framework. Transversal to both settings the utilization of **problem-based learning**, offers a structured methodology in which teaching and learning could occur in a systematic manner, facilitating the success of acquisition of general and specific competencies in diverse areas (Pinto, Costa & Monteiro, 2017).

This strategy promotes active learning, improves the critical thinking and develops problem solving skills, while develops students' ability to critically apply the cumulative knowledge to actual clinical problems, which reinforces motivation to learn, develops clinical reasoning skills, and enhance self-directed and life-long learning (Cattaneo, 2017; Pinto, Costa & Monteiro, 2017; Sharma, 2017).

It is intended to challenge learners to pursue authentic questions, wonders and uncertainties in a focused way, which enables them to construct, deepen, and extend their knowledge and understanding. Problems must be complex enough that there is a need to seek many perspectives on the issues, to engage in collaborative inquiry, and to generate multiple possible solutions (UNESCO International Bureau of Education, 2013). This strategy opens space to creativity and could develop entrepreneurial spirit, which are aspects that the implementation of this Model intends to promote.

Coming to the end of the theoretical conceptualization of *InovSafeCare Model* is important to remind the context of international transversality in which is founded, what implies and implementation under this premise and, therefore, vision wide, comprehensive and integrative, while respecting the culture of development and implementation of both Academic and Clinical care real dynamics.

2.4 – Final recommendations

Globally, to promote a culture of safety, improving the quality of education and caring related to HCAs prevention and control, implementation of the *InovSafeCare Model* implies a compromise between the different institutions in which the learning and teaching process is taking place (School

and Healthcare Institutions), as well as between the different main actors involved (students, professors and healthcare professionals).

In addition, it is essential for all intervening’s deep knowledge about objectives, competencies to be achieved and/or developed and expected learning outcomes, always integrating students’ maturity (Yurrebaso-Macho et al., 2021), known to change along the educational pathway (Yasmin et al., 2019, Yurrebaso-Macho et al., 2021) and self-development of efficacy and mastery (Yasmin et al., 2019).

Gathered these conditions, *InovSafeCare Model’s* implementation has, as first and transversal focus, the acquisition of knowledge about HCAs (see figure 5). Is a “... *question of reorganisation; it is not a question of increasing anything [hours]*”, combined with the application of educational innovative strategies, in theoretical-practical articulation, according to proposed learning outcomes, in straight relation with the selection of contents organized in a module with a Curricular Unit or even in “...*an autonomous Curricular Unit...*”.



Figure 5 – *InovSafeCare Model* application principles

Second stage will enlarge the focuses beyond “... *information (...), more [on] training in the sense of the asepsis, disinfection, hygiene...*” allowing the development of competencies on HCAs prevention and control, merging cognitive and meta-cognitive skills, practical skills and ethical values. For this stage, *InovSafeCare Model* proposes the intensification of dynamic pedagogical strategies that promote student analysis, reflection and entrepreneurship skills development. An excellent example to illustrate this proposal is simulation implemented in a way that permits the integration of entrepreneurial stimulation methods into the analysis of proposed situations. This will rouse students to the importance of engaged thinking, innovation and entrepreneurial perspective.

The final stage(s) of the courses will focus on the integration of Attitudes, Knowledge and Skills. Attitude towards HCAs prevention and control is one of the factors of *InovSafeCare Ecosystem*, identified by students (Yurrebaso-Macho et al., 2021). Professors and mentors mention a lack of “...*awareness throughout the course, about attitude change (...)* it also seems (...) *there is more information than properly a concern with attitudinal change...*”.

The approximation to effective practice, which occurs mainly in these stages, provides the opportunity for students to encounter real problems what can contribute to the students’ development of a proactive attitude, supported by critical reflection about the reality of care and the perspective of technical caregivers. Beyond that, can enable an integrated and meaningful

systematization of theoretical and practical knowledge, promote autonomy and develop negotiation and networking skills, essential characteristics/ attitudes of an entrepreneur spirit (Alves et al., 2018).

Altogether, aligned with Tuning philosophy, this will lead to the construction of *InovSafeCare Competencies Profile*, giving privilege to nursing and complementary scientific areas, integrating the specificity of HCAs prevention and control in a transversal way, along all the course, no matter the syllabus in use, the curricular units lectured or the length of the nursing course, focusing on promoting innovation, improve quality and security in healthcare practice, potentiating the interaction between scholars and clinical contributes, in an entrepreneurial perspective.

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