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RUBRIC TO ASSESS THE COMPETENCE OF INNOVATION, CREATIVITY AND ENTREPRENEURSHIP IN BACHELOR DEGREE

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Abstract

Innovation has a special value for the survival and development of organizations, especially in a changing context. To develop the innovation, creativity and entrepreneur-ship capacities in students enhances their skills. A competency describes what training participants should be able to do at the end of the training. The competence is acquired through various learning outcomes to be achieved. Competition in innovation is closely related to the ability to propose and implement creative ideas to solve problems, ability to create and maintain connections work, etc. In this article is presented a method for measuring the competence of innovation, creativity and entrepreneurship in bachelor degree by introducing different levels of scope.

Keywords: Rubric, competence, innovation, evaluation

1. INTRODUCTION

This article is part of an innovation and educational improvement project (RECICRE), focusing on the definition and implementation of evaluation mechanisms for the acquisition of competence innovation, creativity and entrepreneurship and the learning objects project (OAICE), oriented to facilitate the acquisition of such competence. The defined rubric can be transferable to different subjects in different bachelor degrees.

The project has been developed in collaboration with the European IDEA Tempus project which aims to improve the integration of knowledge in the interdisciplinary area of Engineering, Design and Business in higher education from an industrial perspective, improving innovation and as improving education-industry relations. The motivation for this proposal is to contribute to systematic evaluation mechanisms to ensure the acquisition of competence dimension, innovation, creativity and entrepreneurship.

2. INNOVATION DEVELOPMENT

The overall objective was extended in several detailed objectives. Each of the detailed objectives was carried out by one or more activities developed by the research team. Activities sequencing has allowed interactions between them to complete the desired objective. One and two activities followed the literature review process for learning outcomes related to innovation competence for bachelor degree and master. It was conducted via Google Scholar (scholar.google.es) and Scopus; also including the preliminary list of learning outcomes of the sciences institute of innovation (Ice, 2013) and results of the Tempus project (Tempus, 2014).

For the development of the rubric (activity three) and following the similarity that they have with maturity models, the methodology defined in (Cuenca *et al.,* 2013) was applied. Key areas (in this case learning outcomes) and the description of each one of the scope levels were identified. The development of the activity three (definition section) can lead to rethink the definition and/or writing learning outcomes, and the results of the activity four (validation) may imply a better definition. Finally the review and closing allows evaluating the results and proposing actions to improve the validation and/or definition of the rubric.

3. FINDINGS

The results obtained in the project are directly related to the activities and have allowed assessing their compliance.

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The rubric was designed to assess the learning outcomes in bachelor degree associated with innovation, creativity and entrepreneurship competence. We have established the relationship between competencies, learning outcomes and learning objects (Fig. 1).

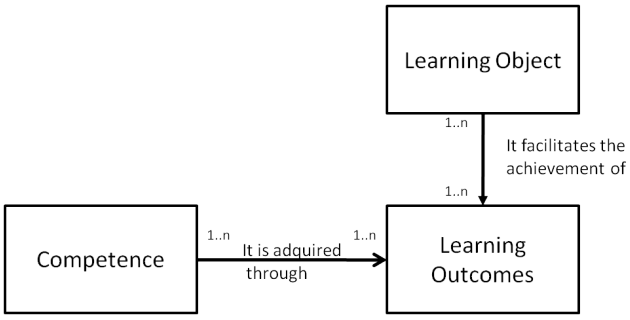

Figure 1: Structural model of competences (adapted from Cuenca et al., 2015)

Learning outcomes have been classified into different outlooks. The learning outlooks are: creativity, enterprising, integrating and forecasting. Important elements associated to innovation (Bapat *et al.,* 2014).

Creativity

Generating Ideas (GI): Coming up with a variety of approaches to problem solving.

Critical Thinking (GT): Logically identifying how different possible approaches are strong and weak, and analyzing these judgments.

Synthesis/Reorganization (SR): Finding a better way to approach problems through synthesizing and reorganizing the information.

Creative Problem Solving (CPR): Using novel ideas to solve problems as a leader.

Enterprising

Identifying Problem (IP): Pinpointing the actual nature and cause of problems and the dynamics that underlie them.

Seeking Improvement (SI): Constantly looking for ways that one can improve one's organization.

Gathering Information (GI): Identifying useful sources of information and gathering and utilizing only that information which is essential.

Independent Thinking (IT): Thinking 'outside the box' even if this sometimes may go against popular opinion.

Technological Savvy (TS): Understanding and utilizing technology to improve work processes.

Integrating Perspectives

Openness to Ideas (OI): A willingness to listen to suggestions from others and to try new ideas.

Research Orientation (RO): Observing the behavior of others, reading extensively, and keeping your mind open to ideas and solutions from others. Reading and talking to people in related fields to discover innovations or current trends in the field.

Collaborating (C): Working with others and seeking the opinions of others to reach a creative solution.

Engaging in Non-Work Related Interests (ENWI): Being well-rounded and seeking information from other fields and areas of life to find novel approaches to situations.

Forecasting

Perceiving Systems (PS): Acknowledging important changes that occur in a system or predicting accurately when they might occur.

Evaluating Long-Term Consequences (EC): Concluding what a change in systems will result in long-term

Visioning (V): Developing an image of an ideal working state of an organization.

Managing the Future (MF): Evaluating future directions and risks based on current and future strengths, weaknesses, opportunities and threats.

Managing Change perspective is also included in Bapat's model, but in this case there is not any outcome learning associated.

The following table shows the rubric defined.

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Table 2. Rubric to assess the competence of innovation, creativity and entrepreneurship in bachelor degree (Source: The author(s) own)

	Learning out-look/Results		Level 1	Level 2	Level 3	Level 4
CREATIVITY	GI	Providing suggestions about ideas, situations, cases or existing problems.	Suggestions have not-been forth-coming.	A few suggestions have been provided but they are only relevant in specific cases.	Some suggestions have been made. They are quality appropriate and relevant in several cases.	Suggestions have been made which show good quality and can be widely applied.
	CT	Evaluating the real-life scenario where the new method crops up	It has not-been evaluated.	A brief assessment has been carried out at a low level of detail.	A number of evaluations have been carried out to an appropriate detail level.	A broad evaluation has been carried out to a high detail level.
	GI	Finding new methods and processes to do things	New methods and processes have not-been found as yet.	The newly discovered methods and processes are restricted.	The newly discovered methods and processes are quality-appropriate.	The newly discovered methods and processes are of good quality.
	CRS	Experimenting with new processes.	Trying new ways of doing things has noteven been considered.	A process that could be executed in different ways has been identified but the potential alternatives are only described categorically.	The activities that could be changed have been identified defining a new process and the potential alternatives.	New processes have been outlined and also a way to measure their efficiency.
	GI	Familiarising yourself with the tools and techniques of ideas generation	Idea generation tools and techniques are unknown.	There is a vague understanding about idea generation tools and techniques.	There is a deep understanding about the most relevant idea generation tools and techniques but they haven't been used.	There is a deep understanding about the most relevant idea generation tools and techniques and most of them have been used.
	S/R	Embodying the generated ideas formally	The generated ideas are not comprehensible because they have not-been expressed clearly.	The generated ideas are comprehensible but the way in which they have been described is unsuitable.	The generated ideas are comprehensible. The way they have been described is suitable but lacking precision.	The generated ideas are comprehensible and they have been described in a suitable and formal way.
	GI	Proposing ideas and innovative solutions in terms of both content and procedures for applying them.	No ideas or innovative solutions have been proposed.	The content of some idea or innovative solution has been proposed but the process of applying them hasn't been specified.	The content of various ideas and innovative solutions has been proposed as well as the outline of the process to apply them.	The content of various ideas and innovative solutions has been proposed and the application process has been clearly outlined.
	CPS	Utilising creativity techniques to provide and reason good quality ideas which are original or unconventional.	Creativity techniques are not utilised to analyse and solve problems.	Creativity techniques are utilised at times. On less than 50% of occasions.	Creativity techniques are frequently utilised. On more than 50% of occasions.	Whenever necessary, creativity techniques are utilised to analyse and solve problems.

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	GI	Putting forward good quality and suitable contributions to tackle situations and problem solving.	Suitable contributions have not been provided.	Suitable contributions have been provided and some are good enough to tackle potential problems.	Suitable contributions have been provided and they are good enough to tackle existing situations.	Suitable contributions are provided to high quality level and correlated to existing situations and problems.
	CT	Finding the constraints and weak points in their processes and working methods.	Only a description of the working processes and methods is provided.	A critical analysis is undertaken.	Constraints and weak points are identified.	Constraints and weak points are understood.
ENTREPRENEURSHIP		**Learning outlook/Results**	**Level 1**	**Level 2**	**Level 3**	**Level 4**
	SI	Analysing an existing situation and identifying areas for improvement.	The analysis of the situation was limited and areas for improvement were not identified.	The analysis of the situation was appropriate but the identification of areas for improvement was limited.	The situation was appropriately analysed and the identification of areas for improvement was completed.	The analysis of the situation and the identification of areas for improvement was completed and increased over time.
	SI	Searching new procedures and methods in order to do things.	Current procedures and methods have been identified but new procedures weren't sought.	The search for new procedures and methods is limited, unfinished and lacks in detail.	The search for new procedures and quality methods shows an adequate quality.	New procedures and methods were searched that were constant in time and duplicable.
	SI	Thinking up new ways of doing things.	New ways to make things haven't been identified.	A new way of doing things has been described, although the pros and cons are not yet understood.	Two or more new ways of doing things have been described, but not all the pros and cons are understood as yet.	Two or more new ways of doing things are described and all the pros and cons are understood.
INTEGRATION		**Learning outlook/Results**	**Level 1**	**Level 2**	**Level 3**	**Level 4**
	C	Expressing to someone else the generated ideas.	There is nota predisposition for expressing new ideas.	The generated ideas are expressed at certain times and in reduced group sizes.	The generated ideas are expressed in most cases in more extended groups.	The ideas generated are always expressed to and amongst all groups.
	RO	Incorporating knowledge from a variety of disciplines, sources or fields in order to develop innovative ideas to apply in current or future situations.	Acquired knowledge from other fields is not integrated, preventing the development of innovative ideas.	A few innovative ideas have developed as a result of integrating a variety of disciplines and fields.	Most of the innovative ideas have developed as a result of integrating a variety of disciplines and fields.	Knowledge from a variety of disciplines, sources and fields is always integrated resulting in the development of innovative ideas.
PREDICTIONS		**Learning outlook/Results**	**Level 1**	**Level 2**	**Level 3**	**Level 4**
	EC	Identifying the innovation results.	The innovation results are not identified.	Some innovation results are identified but they are limited and lacking in detail.	The identified innovation results are complete and show good quality.	The identified innovations results are complete, show good quality and show an increase over time.

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	EC	Considering who is going to be affected by the innovation, and in what way(s).	Is rarely considered who and how is going to be affected by the innovation.	At times is described who and how is going to be affected by the innovation.	In most cases is described who and how is going to be affected by the innovation.	In all cases it is described who is going to be affected by the innovation, and in what ways.
	MF	Assessing innovation risks and benefits.	Some risks and benefits are identified in a limited way.	An assessment is carried out to analyse the probability and potential repercussions of each risk or benefit.	An integral assessment of risks and benefits is carried out.	Risks and benefits are prioritised.

4. CONCLUSIONS

Rubrics facilitate the measurement of student performance in those areas that are complex to evaluate, through a set of graduated criteria for assessing learning, knowledge and/or skills gained by the student. The main advantage of this technique for students is to show them the different levels of achievement that can be achieved in a job, providing the aspects that must be met to achieve higher skill levels. Moreover, rubrics allow teachers an objective, fair and impartial evaluation by a scale that measures the skills and student performance. The innovation strategy followed in the project is highly transferable because address one of the generic competences and is not centered in the particular case of a subject. Finally it should be noted the importance of developing appropriate learning objects to facilitate the student's acquisition of skills, activity that is being developed under the educational innovation project OAICE.

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