DEGREE CURRICULUM

DEVELOPMENT AND TECHNOLOGICAL INNOVATION AT SCHOOL

Coordination: BARBERO SOLA, IVAN RAUL

Academic year 2022-23

DEVELOPMENT AND TECHNOLOGICAL INNOVATION A... 2022-23

Subject's general information

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<tr><td>Subject name</td><td>DEVELOPMENT AND TECHNOLOGICAL INNOVATION AT SCHOOL</td></tr>
<tr><td>Code</td><td>100991</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
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<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Primary Training</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
<tr><td>Double bachelor's degree: Degree in Pre-school Education and Degree in Primary Training</td><td>5</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
<tr><td>Double bachelor's degree: Degree in Primary Training and Degree in Physical Activity and Sports Sciences</td><td>5</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
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<tr><th>Activity type</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>1.8</td><td>4.2</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>BARBERO SOLA, IVAN RAUL</td></tr>
<tr><td>Department</td><td>PEDAGOGIA</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
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Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
AGUILAR CAMAÑO, DAVID	david.aguilar@udl.cat	2	
BARBERO SOLA, IVAN RAUL	ivan.barbero@udl.cat	3	
MARIN JUARROS, VICTORIA IRENE	victoria.marin@udl.cat	1	

Learning objectives

1. Identify the possibilities of technology for educational innovation through STEM assumptions.

2. Analyze STEM educational experiences enriched by technology in elementary education classrooms.

3. Experimenting with digital pedagogies and appropriate technologies to develop STEM skills.

4. Experimenting with inquiry making use of digital technologies and data to solve social problems present to STEM challenges.

5. Create STEM educational scenarios for primary education that make an innovative / transformative use of technology in teaching-learning methodologies.

6. Develop a proactive, critical and responsible attitude to the use of technologies to STEM educational innovations.

Competences

BASIC SKILLS

CB02: Apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

CB03: Gather and interpret relevant data (usually within their study area) to make judgments that include a reflection on relevant issues of a social, scientific or ethical nature.

CB04: transmitting information, ideas, problems and solutions to both specialized and non-specialized audiences)

GENERAL COMPETENCES

CG01. To promote democratic values, with special emphasis on tolerance, solidarity, justice and non-violence, and to know and value human rights.

CG02. Know the intercultural reality and develop attitudes of respect, tolerance and solidarity towards different social and cultural groups.

CG03. Know the right to equal treatment and opportunities between women and men, in particular by eliminating discrimination against women, whatever their circumstance or condition, in any of the areas of life.

CG04. Know the measures that guarantee and make effective the right to equal opportunities for people with disabilities.

CG05. Develop the ability to critically analyze and reflect on the need to eliminate all forms of discrimination, direct or indirect, in particular racial discrimination, discrimination against women, that derived from sexual orientation or that caused by a disability.

CG06. Assume the commitment of personal and professional development with oneself and the community. Adapt the learning proposals to the most significant cultural evolutions.

SPECIFIC COMPETENCES

CE01: Know the curricular areas of Primary Education, the interdisciplinary relationship between them, the evaluation criteria and the body of didactic knowledge around the respective teaching and learning procedures.

CE02: Design, plan and evaluate teaching and learning processes, both individually and in collaboration with other teachers and professionals at the center.

CE04: Encourage reading and critical comment on texts from the various scientific and cultural domains contained in the school curriculum.

CE09: Assume that the exercise of the teaching function has to be perfected and adapted to scientific, pedagogical and social changes throughout life.

CE14: Reflect on classroom practices to innovate and improve teaching work.

CE15: Acquire habits and skills for autonomous and cooperative learning and promote it among students.

CE16: Selectively discern audiovisual information that contributes to learning, civic training and cultural wealth.

CE.17. Understand the role, possibilities and limits of education in today's society and the fundamental competencies that affect primary schools and their professionals.

TRANSVERAL COMPETENCES

CT03: Acquire training in the use of new technologies and information and communication technologies.

CT04: Acquire basic knowledge of entrepreneurship and professional environments.

CT05: Acquire essential notions of scientific thought.

Subject contents

Topic 1:Technology and engineering in education

1.1. Resolution of STEM challenges through engineering. Mechanisms and operators of specific engineering.

1.2. Artificial intelligence in education (AIEd) and the internet of things.

1.3. 3d print. Drones

Topic 2: STEM educational scenarios with digital technologies

2.1. Maker methodology.

2.2. Gamification. Virtual or hybrid escape rooms.

2.3. Augmented and virtual reality.

2.4. Personalization of learning. Chatbots.

2.5. Open data. Data repositories. Data journalism.

2.6 Repositories and STEM software. STEM educational experiences.

Topic 3: Development of computational thinking

3.1. Programming languages.

3.2. Computational thinking. Computational thinking unplugged.

3.3. Educational robotics.

3.4. Creation of mobile apps. Creation of videogames.

Methodology

- Case-based learning
- ICT use
- Individual works
- Tutorships
- Practices
- Collaborative / Cooperative
- Project / problem-based learning
- Readings / bibliographic consultation
- Personal study
- Oral communication and / or work debates / didactic proposals
- Monitoring of individual / group work
- Written tests / performance of work

Development plan

TOPIC 1

Week	Activity
1	Initial activity of solving STEM challenges through engineering. Identify STEM elements.
1	Resolution of real problems from the design and use of programmable machines.
2	Analysis of different apps for 3D printing.
2	Initiation activity to 3D printing and drones.

TOPIC 2

Week	Activity
3	Maker Methodology. Analysis of experiences.

3 Analyze / Observe different creations of virtual scape rooms. Design a virtual escape room.

4 Initiation activity to augmented reality. Analysis of virtual reality experiences.

4 Initiation to chatbots by personalization. Possibilities of the AIEd.

5 Initiation to inquiry based on open data.

5 Study and investigation of the different spaces, digital resources, apps and STEM programming.

5 Identification and analysis of STEM educational scenarios with technologies.

TOPIC 3

Week Activity

6 Introduction to computational thinking. Materials and resources to develop computational thinking in the primary education classroom.

6 Introduction to programming: introduction to the different programming languages (Scratch, blocks, etc.).

7 Introduction to educational robotics. Design and implementation of robotics projects.

8 Mobile application design. Initiation to 3D video game design.

Evaluation

- **Proposal for educational innovation with technology at school (individual): 40%**

A guide will be provided at the beginning of the course and there will be different moments of delivery or follow-up in tutorials before the end of the course. The format will be a written report of 10-15 pages in length.
Evaluation criteria: 1) title and summary of the project, 2) approach, context and justification, 3) objectives of the innovation, 4) design of the action plan, 5) resources, 6) criteria and levels of evaluation of the project, 7) final considerations, and 8) formal aspects and linguistic correctness.

- **Practical classroom activities (individual and group): 50%**

Includes a total of 5 activities

- 3D Model (5%)
- Escape Room (10%)
- Educational Chatbot (10%)

- Creation an educational app (15%)
- Robotics (15%)

- **STEM Portfolio (individual): 10%**

The process of developing the STEM portfolio is important and includes personal and individual selection of assessable and non-assessable practical classroom activities, as well as reflection on their contribution to one's own learning, STEM teaching potential and one's own professional identity as a STEM teacher, among other aspects.

ALTERNATIVE ASSESSMENT

Students who meet the alternative assessment requirements will have to carry out the same activities, individually. The weighting criteria are those established for each activity. The delivery dates and assessment criteria are the

same as those applied to continuous assessment students.

In the case of practical classroom activities that require physical manipulation (such as educational robotics), an alternative practice of research and educational design will be carried out with the corresponding technological elements.

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Sánchez-Vera, M. del M., & González-Martínez, J. (2019). Pensamiento computacional, Robótica y Programación en educación. *Revista Interuniversitaria de Investigación en Tecnología Educativa*, (7). https://doi.org/10.6018/riite.407731

Official Documments

Generalitat de Catalunya (2017). *Pla STEMcat d'impuls de les vocacions científiques, tecnològiques, en enginyeria i en matemàtiques*. https://projectes.xtec.cat/steamcat/wp-content/uploads/usu1760/2019/09/pla-stem.pdf

Generalitat de Catalunya (2017). Currículum educació primària (competències bàsiques). https://agora.xtec.cat/ceiparturmartorell/wp-content/uploads/usu99/2016/04/curriculum-educacio-primaria.pdf

Interesting webpages

https://projectes.xtec.cat/steamcat/categoria/pla-stemcat/

https://projectes.xtec.cat/programacioirobotica/

https://ildeplus.upf.edu/makersalesaules/pg/lds/makersbrowse

http://www.scientix.eu/

https://www.siemensstemday.com/

https://educacion.stem.siemens-stiftung.org/