Universitat de Lleida

DEGREE CURRICULUM

DEVELOPMENT AND TECHNOLOGICAL INNOVATION AT SCHOOL

Coordination: BARBERO SOLA, IVAN RAUL

Academic year 2021-22

Subject's general information

Subject name	DEVELOPMENT AND TECHNOLOGICAL INNOVATION AT SCHOOL
Code	100991
Semester	1st Q(SEMESTER) CONTINUED EVALUATION

Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Primary Training	4	OPTIONAL	Attendance-based

Course number of credits (ECTS)	6

Type of activity, credits, and groups	Activity type	PRAULA	TEORIA
	Number of credits	1.8	4.2
	Number of groups	1	1

Coordination	BARBERO SOLA, IVAN RAUL
Department	PEDAGOGIA
Important information on data processing	Consult this link for more information.

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

- **Design and development of a STEM challenge, technology of choice** (group): 25%
- **Proposal for educational innovation with technology in school** (group): 25%
- **Classroom practical activities** (individual and group): 40%
- **STEM Portfolio** (individual): 10%

Bibliography

Arabit-García J. & Prendes-Espinosa, Mª. P. (2020). Metodologías y Tecnologías para enseñar STEM en Educación Primaria: análisis de necesidades. *Pixel-Bit. Revista de Medios y Educación, 57*, 107-128. https://doi.org/10.12795/pixelbit.2020.i57.04

Atenas, J., & Havemann, L. (2015). *Open data as open educational resources: case studies of emerging practice*. Open Knowledge, Open Education Working Group. http://dx.doi.org/10.6084/m9.figshare.1590031

Barrera Lombana, N. (2015). Uso de la robótica educativa como estrategia didáctica en el aula. *Praxis & Saber*, *6*(11), 215 - 234. https://doi.org/10.19053/22160159.3582

Cabero, J. & Barroso, J. (2016). The educational possibilities of Augmented Reality. *Journal of New Approaches in Educational Research, 5*(1), 44-50. https://doi.org/10.7821/naer.2016.1.140

López Simó, V., Couso Lagarón, D., & Simarro Rodríguez, C. (2020). Educación STEM en y para el mundo digital: El papel de las herramientas digitales en el desempeño de prácticas científicas, ingenieriles y matemáticas. *Revista de Educación a Distancia (RED)*, *20*(62). https://doi.org/10.6018/red.410011

Piñero Charlo, J. C. (2019). Análisis sistemático del uso de salas de escape educativas: estado del arte y perspectivas de futuro. *Revista Espacios, 40*(44), 9-19. https://www.revistaespacios.com/a19v40n44/19404409.html

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 Documents

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/