

RESEARCH

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THE SCHOOL GARDEN AS AN INNOVATIVE TOOL THAT CONTRIBUTES TO THE SKILLS DEVELOPMENT OF THE COLLEGE STUDENT. A MULTIDISCIPLINARY EDUCATIONAL PROPOSAL

El huerto escolar como herramienta innovadora que contribuye al desarrollo competencial del estudiante universitario. Una propuesta educativa multidisciplinar

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ABSTRACT

The school garden is an educational resource that allows to approach students to the natural environment by designing interdisciplinary experiences that contribute to the development of basic skills. At university level it facilitates also a collaborative learning and the acquisition of social and environmental skills. *L'Hort 2.0* project aims to create a virtual environment in the school garden for the management of ITC content that allows linking the activities outside the classroom with the content of the teaching guides. Working by an active and collaborative methodology in three phases: preparation and design of the web environment in six thematic areas, development of educational materials and evaluation of their usefulness in the classroom and their effectiveness in student learning process. The results obtained show a high student involvement in the learning process and an improvement in the assessment results that allows to integrate all the capabilities of students to better reflect the skills attained.

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KEY WORDS

School garden – Multidisciplinary – Basic skills – Higher education – Innovation – ITC – Collaborative learning

RESUMEN

El huerto escolar es un recurso pedagógico que permite aproximar al alumnado al entorno natural diseñando experiencias interdisciplinares que contribuyan al desarrollo de las competencias básicas. En el ámbito universitario facilita el aprendizaje cooperativo y la adquisición de habilidades socioambientales. El proyecto *L'Hort 2.0* pretende crear un entorno virtual basado en el huerto escolar para la administración de contenidos TIC que permitan enlazar las actividades fuera del aula con el contenido de las guías docentes. Se trabaja mediante una metodología activa y colaborativa, en tres fases: preparación y diseño del entorno web en seis áreas temáticas; elaboración de materiales educativos y evaluación de su utilidad en el aula y su eficacia en el proceso de aprendizaje del alumnado. Los resultados obtenidos muestran una elevada implicación del alumnado en el proceso formativo y una mejora en los resultados de evaluación que permite integrar todas las capacidades del alumnado reflejando mejor las competencias alcanzadas.

PALABRAS CLAVE

Huerto escolar – Multidisciplinariedad – Competencias básicas – Educación superior – Innovación – TIC – Aprendizaje colaborativo

A HORTA ESCOLAR COMO FERRAMENTA INOVADORA QUE CONTRIBUI AO DESENVOLVIMENTO DAS COMPETÊNCIAS DO ESTUDANTE UNIVERSITARIO. UMA PROPOSTA EDUCATIVA MULTIDISCIPLINAR

RESUMO

A horta escolar é um recurso pedagógico que permite aproximar o aluno ao entorno natural desenhando experiências interdisciplinares que contribuam ao desenvolvimento das competências básicas. No âmbito universitário facilita o aprendizado cooperativo e a aquisição de habilidades sócio-ambientais. O projeto *L'Hort 2.0* pretende criar um entorno virtual baseado em uma horta escolar para a administração de conteúdos TIC que permitam enlaçar as atividades fora da aula com o conteúdo das guias docentes. Trabalha-se mediante uma metodologia ativa e colaborativa, em três fases: preparação e desenho do entorno web em seis áreas temáticas; elaboração de materiais educativos e valoração de sua utilidade em aula e sua eficácia no processo de aprendizagem do aluno. Os resultados obtidos mostram uma elevada implicação do aluno no processo formativo e uma melhora nos resultados de valoração que permite integrar todas as capacidades do aluno refletindo melhor as competências alcançadas.

PALAVRAS CHAVE

Horta Escolar – Multidisciplinaridade – Competências básicas – Educação Superior – Inovação – TIC – Aprendizagem colaborativa

1. INTRODUCTION

Since the academic year 2012-2013 an experience of educational innovation (*Project L'Hort 2.0*) is being held at the Universitat of Valencia involving 26 subjects of 6 degrees (Master Degrees in Children Elementary Teacher Children's Teacher, Pedagogy, Geography and Environment, Philosophy and Modern Languages and their Literatures) with the participation of 10 teachers and 1,000 students. The value of the garden as a teaching resource depends on the skill with which it is handled and used in the teaching-learning process, to understand cause and effect relations, practice and apply what is learned, to use it as a laboratory in the different subjects, to take advantage of the environmental resources and simultaneously prepare children for life (Sánchez, Badía & Handal, 2009).

According to Ruiz (2003) the concept of school garden in the current educational sense comes from the 70s and is the result of the confluence of three aspects: environmental education, education programs for development and projects of the movements of pedagogical renewal. And it is "the combination of the awareness of environmental degradation with the education for proper nutrition and the pursuit of new methodologies" (Ruíz, 2013, p. 25). There is now a flourishing of the school garden that is evident in the many blogs, websites and other publications that deal with it, but not so much from an educational perspective.

The work in the school garden facilitates the development of an educational practice that primarily involves the combination of three dimensions (Ceida, cited in Botella, Hurtado & Cantó, 2014th):

- A) To educate in the environment: researching and working directly in the environment, relating the problems affecting the surrounding environment with more global issues.
- B) To educate on the environment: The garden is an ecological system, and as such should be investigated as a whole, taking into account the elements that comprise the interactions that occur between them, the changes undergone by its organization, and the interdependencies that it has with other systems.
- C) Educating for environmental protection: promoting a set of values and attitudes necessary for a shift toward more respectful behaviors to the environment.

In addition, the school garden is "a privileged setting for an education committed to the transition to more just social models and environmental systems capable of productive regeneration" (Larrosa, 2013, p. 4).

With this educational project they intend to transfer to the classroom the activities in the school garden by creating a virtual environment that allows the teachers, on the one hand, to have teaching resources for the development of their classes and on the other, to establish a connection between the physical world and the digital one,

linking non-formal activities outside the classroom with the content of programs of the teaching guides.

Given the marked technological nature of learning objects to be developed by the students, some of the attitudes that promotes competition to acquire the technological competence are:

- To promote positive attitudes, and also critical to the use of information and communications technology.
- To promote collaboration in educational activities, both among teachers and among students and promote autonomy in the teaching-learning processes among students.
- Use the technologies as enhancing instruments of creativity to generate educational resources.
- To reflect on classroom practices to innovate and improve teaching. To acquire habits and skills for autonomous and cooperative learning and promote it among students.
- To know and apply in the classroom the technologies of information and communication.
- To selectively distinguish audiovisual information that contributes to learning, to civic formation and cultural richness.
- To understand the role, the possibilities and the limits of education in today's society and the main competencies that affect primary schools and their professionals.
- To know quality improvement models.

Moreover, the students acquire other skills related to the theoretical contents of the subjects in which the activities are developed and ICT resources highlighting the mathematical competence are, the interaction with the physical, natural, social and cultural environment, the linguistic competition and artistic competence.

2. OBJECTIVES

The main objective of the project is the acquisition and reinforcement of the general skill level mainly related to the transfer of knowledge and the professional field. For their achievement they have established guidelines aimed at:

- To promote cooperative and collaborative work of students and between schools and universities across the Practicum.
- To promote the teaching quality by creating ICT educational materials and a profound reflection on the evaluation criteria and methodology of work in the classroom.
- To generate new resources with an interdisciplinary and transversal approach that will allow to address effectively learning situations in different contexts applying the new technologies in everyday situations.

In addition, it improves transversal skills through cooperative learning and the acquisition of social skills of integration, equality and solidarity, being an excellent educational resource for the areas of Experimental and Social Sciences (physics,

chemistry, biology, mathematics, geography, environment, agricultural technology) and areas of Linguistics and Plastic and Musical Expression.

Thus, the competence development through this project breaks with the parceling and the academicism stimulating a constructive, creative and of production of knowledge learning, facilitating educational integral development, as Kincheloe, Steinberg & Villaverde (2004). According to Margalef (2005) the teachers give the students the opportunity to link theory and practice, to perform procedural learning and of rebuild their prior learning and reference frames from reflection.

In this context, either the content as the procedures and attitudes can be worked, being an ideal framework for other transversal issues (sustainability, healthy habits, values and citizenship).

To Escanilla (2008) the competence approach is based on four principles: sociological, psychological, epistemological and pedagogical, that show us *why* we should work the skills, *what* identifies them and *how* to develop them through projects. If we take the definition of competence of Lasnier (2000), a competence is a complex know-how resulting of the integration, mobilization and adequacy of skills, abilities (can be of cognitive, affective, psychomotor or social order) and knowledge (declarative knowledge) used effectively in situations that have a common character (similar situations, not generalizable to any situation). Regarding this definition, the project involves both the use of cognitive skills such as emotional and of relationships, but its potential as a teaching resource will depend on the skill with which it is handled and used in the teaching-learning process. Thus, it helps students and teachers to develop learning skills that are grounded on structures of solid knowledge, and on the other, offers a wide range of skills including, among many others, the capacity for effort and personal improvement, the obligation to interpret and adapt information, teamwork, enhance personal initiative, solve unexpected situations, live in groups and resolve conflicts properly (Minstrel, Hurtado & Gavidia, 2013).

This role of the students toward their own learning process requires a new educational evaluation strategy seen as a personalized, student-centered assessment and their abilities. Moreover, the evaluation should be improved moving toward a learning process with an active and responsible student body in their learning, according to Bowden and Marton (2012), and a faculty with an interactive and sequential role according to Bembenutty (2009). Proper use of *feedback* on formative assessment improves learning and student outcomes (Aranda, 2013).

3. METHODOLOGY

Following Bogan and Taylor (2000), the methodology employed has been the qualitative as a method that produces descriptive data. The design of the experimental activities in the school garden from discovery learning invites students to use the ideas and previous knowledge about the tasks to be performed in each activity (Vera, 2015). The recording of the process by competences is done by case study because it allows to track students during the different stages of implementation. In the words of Paula (2004, p. 243), the design of the case studies "is part of the logic guiding the successive stages of collection, analysis and

interpretation of data from qualitative models, with the peculiarity that the purpose of the research is the intensive and thorough study of one or a few cases of a phenomenon. "

It is an integrated educational approach that encourages autonomous and committed student learning through a methodology that is synthesized in three aspects according to Botella, Hurtado Martinez & Talavera (2014b):

- Research activity: it is intended that the students raise questions, formulate hypotheses, design experiments, connecting their knowledge with new sources of information to draw their own conclusions.
- Collaborative work: the student organizes his own work and that of the group by the allocation of tasks, the exchange of information and the commitment with the rest of his classmates.
- Comprehensiveness: the disciplines interact with each other by establishing flows of exchange where everything is related.

Through an active and collaborative methodology, the students have had to prepare and structure their activities in a web environment, covering a total of six thematic areas: experimental sciences and health, environment and territory, mathematics, language and literature, plastic arts and music and education in values and citizenship. In such an environment (www.uv.es/hort) the various ICT learning objects have been hosted designed and related to the contents of the subject matters of the grade.

The design of learning objects used in the classroom has been performed using free software. Among the developed objects should be highlighted: activities and teaching materials with interactive games (Jclick, HotPotatoes), blog, wiki, webquest ...; making videos of laboratory practices (volumetry, fluids, rocks, ecosystems ...); editing audio files for the development of language and musical competence; concept mapping elaboration with CmapTools; design of materials for PDI; development of thematic mapping and photo interpretation; etc. As an example, some of the materials made by the students have, for each area, the following:

- ICT: PDI, audiovisual programs operation and authoring systems and collaborative work in web 2.0.
- Science and Mathematics: teaching suggestions (guides, interactive games, activities), theoretical content (conceptual maps, games, videos and *webquest*).
- Environment and Social: natural processes (videos), scale (digital mapping), heritage and cultural (videos and games), responsible environmental attitudes (good practice guides), resource management (fact sheets)
- Plastics and Music: shapes, colors, materials, sounds, musical structure (interactive scores, videos and audio files with garden themes)
- Language and Literature: grammar and vocabulary (phonetic videos and audio, and inter mat multimedia games), literature (readings, audio poems, literary itineraries)
- Values and Ethics: attention to diversity (RPGs, etc.)

4. DISCUSSION

Among the results obtained in the *L'Hort 2.0* project we include the implementation of two new subjects that have developed in the Faculty of Education at the University of Valencia in the Primary Master degree courses during 2012-2013, 2013-2014 and 2014-2015.

4.1 Design (3rd year) educational materials:

The course is aimed at four groups of students in the ICT itinerary (145 students). The goal is the acquisition of technological skills in the use of multimedia applications (video, audio ...), web 2.0 (blog, wiki, webquest ...) and authoring systems (*Jclick, HotPotatoes* ...) for the design of educational materials.

The structure of the subject matter is organized into six sections: management of educational materials, networking, PDI, cooperative learning (*wiki, webquest*), communication environments in the classroom (*blog, networks*), authoring systems, virtual environments (*Moodle*). In each block the students performed an activity related to the contents taught in a group as well as individually. The exemplifications and tutorial programs were made using materials designed in *L'Hort 2.0* project. These teaching materials were evaluated by the students through the implementation of a logbook and a final report on the subject matter in which they gave their critical opinion about the process, the materials and the difficulties observed.

For the development of activities with authoring systems an outing to the garden was done, where they took graphic material (videos and photographs) used in the design. On the other hand, they made a critical reflection on the potential of the school garden as an educational resource for the development of basic skills of the compulsory stage.

The evaluation was carried out taking into account in a weighted way all the activities done both inside and outside the classroom, as well as the participation and interest in the subject matter through observation, the logbook and the final report.

4.2 ICT as a teaching resource in science and mathematics (4th year):

The course is aimed at three groups (95 students) with two different profiles: students of the itinerary of Sciences (28 students) who had already designed multidisciplinary proposals but lacked knowledge about ICT tools and students of the ICT itinerary (67 students) and they did not know how to raise a didactic proposal with contents of science and mathematics. The first sessions served to homogenize the groups by introducing the knowledge they lacked and could start from a common point in the other sessions.

In the following sessions the students, divided into groups of 3, designed an educational proposal on computer support (*blog*). The blog should be framed in a context chosen by each group and should contain at least three blocks in which they selected content of science and mathematics from the curriculum of a particular elementary level, also selected by them. In addition, the blog should contain a justification of the proposal, tools and evaluation process, possible crosswise shortcuts and a guide for the teacher, in order that these proposals could be shared

with other educational professionals. Given the technical nature of the subject the students were asked to design their own educational materials using free software and authoring systems (*Jclick, HotPotatoes, Geogebra ...*) and performed a thorough and critical search on existing digital educational resources on the web.

The didactic proposals were developed largely during school hours to facilitate *feedback* with the teacher who showed materials designed at *L'Hort 2.0* project as an exemplification of some of the content (use of software and Internet tools, a model of didactic proposal, selection of content on the web ...).

Among the features of the proposal, it should contemplate content in science and mathematics to be developed in the school garden. To facilitate the development of the activities, two visits to the garden were performed. In the first with the aim of collecting information (digital and written): size, distribution, crops ... with which to design activities and the second in order to implement one of the activities designed and thus test its feasibility. In this second outing each group conducted an assessment of the activities proposed by their peers. In this way the students were part of the evaluation process of the subject.

During the development of the subject groups they presented the work process and an assessment of the exhibitions in which all students contributed ideas and improvements in the work of colleagues. At the end of the course each group performed a final presentation as a mode of communication and with a reduced time (10 minutes) in order to observe and evaluate their ability to synthesize, the presentation and justification of the proposal.

In the evaluation of the students all phases of learning were taken into account, being assessed individually and in groups: the participation, a control of content corresponding to the first session, the tasks performed in class, the activity of the garden and peer assessment, a presentation of the proposal and the final outcome of the blog.

Moreover, it also includes the various proposals made by the participant under the subjects that are part of Project students. In order to carry out their presentation and to share the experience, it was organized at the end of June 2015, the "First Day of students *L'Hort 2.0: educatives propostes multidisciplinàries*". Here the results were presented and various multidisciplinary practical implementations made by students in the following areas were analyzed:

- Thematic Area of Math and Science:
 - Developing a Wiki on a proposal of contextualized science and mathematics: Hortipedia.
 - Design of a multidisciplinary activity focused on a visit to the Bioparc of Valencia.
 - A proposal of science and mathematics contextualized in a rural setting: Moli del Pas.
 - A proposal for multidisciplinary science in the context of the school garden.
 - A contextualized blog in the space station as a support of a proposal of science and mathematics♣
- Area of the thematic of Social Sciences and Education in Values:

- Paraula a llauraor
- L'Incontro with Vincent, one che microstoria racconta one intera comunità
- The cor de l'horta of the coast
- Integrity and cooperation, the forgotten of the XXI century?
- The blog as a resource in the transmission of experiences on school organic garden
- The exodus. A generation in search of better land where to carve out a future
- Thematic area of Arts Education:
 - What hides the music of Haydn?
 - The hearing, a gateway to knowledge
 - Que ha vist l'arbre? The pas del temps in the region of l'Horta de Valencia
- Subject area of Language and Literature:
 - Aprofitament Didàctic de l'entorn escolar: La Marjal Pego-Oliva
 - La Rondalla va per l'Horta
 - L'hort 2.0 i la literatura Valenciana: Ruta Carles Salvador
 - A riu regirat: Itinerari per l'antic camí del Pouet Campanar
 - Route historicoliterària per Silla i l'Albufera

Thus, it was possible to cover much of the goals outlined in the Project, apart from providing a framework for disclosure and assessment of the didactic proposals developed by students in the matter of educational innovation, encouraging at the same time, the collaboration and involvement of students in the learning process and the development of the subjects of the grades, as well as their participation in educational innovation programs.

5. CONCLUSION

Undoubtedly, the experience that has implied the implementation and development of the project *L'Hort 2.0*, has been a success because it allowed to establish a connection between the physical, social and digital world, linking non-formal activities outside the classroom (itineraries and visits to the school garden) with the content of the programs of the educational guides of the grade subjects designing exploration activities, introducing concepts, structuring, modeling and implementation in a virtual environment based in the school garden .

The use of technology to design ICT materials is an enhancer tool of the creativity and improve the teaching work by promoting the autonomous and cooperative learning of the student. However, although students adapt easily to the use of ICT tools, they find many difficulties when preparing multidisciplinary materials. In addition, often they propose resources difficult to implement in primary classrooms and lose sight of the timing, as well as the evaluation of proposals.

As for the evaluation of educational resources used by the teacher, most of the students have perceived them as adequate but have expressed some difficulties to follow the tutorials when they use computers at the Faculty. This is due to the configuration of the equipment of the computer rooms of the Faculty that cannot

retain personal settings or update the software used. Most of the incidents are due to technical difficulties in using the programs.

In addition, the large number of proposals and the fact of having them in a certain place where they stayed and shared, has been very well received by students, since it involved a start value of work performed. Through the final reports pupils have issued some evaluations and suggestions on the methodology of the subjects showing their dissatisfaction with the workload and the difficulty of activities and valuing very positively to promote self-employment and the increase of skills and abilities. As for the formative evaluation they show satisfaction in the diversity of tools used by the teacher and greatly appreciate the work done in group activities outside the classroom.

We think that the proposal has fostered cooperative student learning and their involvement in the development of teaching materials as a fundamental part of the learning process and as an element of development of skills, for example, participation in designing itineraries, visits to the garden and development of educational proposals and ICT projects, conducting virtual tutorials, forums and thematic blogs or the interactive evaluation between teacher-student through quality questionnaires about the teaching materials prepared by the teacher (suitability, applicability, accessibility ...). Thus, students have been part of the selection process of activities and of their organization and overlapping within the elaborated teaching materials.

Moreover, collaborative learning has helped to practice differentiated strategies of purely expository master class. Thus, the subject has not only become the place of transfer of knowledge but also the ideal place to exchange experiences related to teaching. Besides the presentation of works, fundamental part of the process of collaborative work, has become a unique event in which all implicated parts, creators, teachers and classmates are benefiting. It has sought to convert the classroom -what better place for it- in a discussion forum focused on education, on the pedagogical renewal and, as far as possible, in a place of research focused on the process of teaching-learning where knowledge is generated cooperatively.

Finally, the project of educational innovation *L'Hort 2.0* has allowed the teachers involved to have a teaching resource that encourages student involvement and his responsibility for the learning process, thus facilitating the implementation of formative assessment methodology that takes into account all aspects of learning.

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