CONVERGING RESEARCH, SCHOOLCHILDREN'S AND TEACHERS' EDUCATION: AN INTERDISCIPLINARY EXPERIENCE BASED ON EXPERIMENTAL ARCHAEOLOGY

Natàlia Alonso (corresponding author)
Universitat de Lleida, Facultat de Lletres, Departament d'Història, INDEST, GIP-GRAPHA (SGR2014-273)
Pl. Víctor Siurana, 1. 25003 Lleida, Catalonia (Spain)
nalonso@historia.udl.cat

Ramon Cardona
IES Manuel de Pedrolo
Av. Tarragona, 2, 25300 Tárrega, Catalonia (Spain)
rcardona@xtec.cat

Victòria Castells
ZER GuiCiVerVi, Escola de Ciutadilla
C/Afores, sn., 25341 Ciutadilla, Catalonia (Spain)
vcastel1@xtec.cat

Nayra Llonch
Universitat de Lleida, Facultat d'Educació, Psicologia i Treball Social, Departament de Didàctiques Específiques
Av. de l'Estudi General, 4, 25001 Lleida, Catalonia (Spain)
vcastel1@xtec.cat

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Natàlia Alonso
Ramon Cardona
Victòria Castells
Nayra Llonch

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RESUMO

Os métodos arqueológicos e arqueológicos experimentais exploram e aplicam técnicas, métodos e procedimentos de pesquisa de uma variedade de disciplinas das Ciências Naturais às Ciências Sociais, para compreender o comportamento humano e sua relação com o ambiente natural. Todos estes aspectos são instrumentos preciosos para o processo de ensino-aprendizagem.

Uma experiência realizada durante o ano lectivo 2012-2013 no CEP (Catalunha, Espanha) permitiu partilhar métodos arqueológicos e experimentais com alunos e professores da Escola Primária ZER GuiCiVerVi. Este envolvimento escolar ocorreu paralelamente a um maior projeto de pesquisa em Arqueologia Experimental sobre a Idade do Ferro da civilização ibérica.

Com base no espírito deste trabalho, realizamos um outro projecto na Universidade de Lleida. Neste caso, foi posta em prática no âmbito da Faculdade de Educação, em que os alunos participaram de um programa semelhante ao de uma escola primária.

Palavras-Chave: Educação de Professores, Arqueologia Experimental, Interdisciplinaridade, Alunos

ABSTRACT

Archaeological and experimental archaeology methods explore and apply research techniques, methods and procedures from a variety of disciplines from the Natural to the Social Sciences, to understand human behaviour and its relationship with the natural environment. All these aspects are precious tools for the teaching-learning process.

An experience conducted during the 2012-2013 academic year at the CEP (Catalonia, Spain) allowed us to share archaeological and experimental methods with pupils and teachers of the ZER GuiCiVerVi Primary School. This school involvement took place in parallel with a larger research project in Experimental Archaeology about Iron Age Iberian civilisation.

Based on the spirit of this work, we carried out another project at the University of Lleida. In this case, it was put into practice in the framework of the Faculty of Education, in which the students participated in a programme similar to one of a primary school.

Keywords: Teachers' Education, Experimental Archaeology, Interdisciplinarity, Schoolchildren

"A few months ago I was asked about what I knew concerning the Iberian Iron Age civilisation and my answer was a single word: nothing.

Why didn't I remember anything about this civilisation if I had probably studied them during Primary School? Moreover, why don't I even remember studying that topic at school? One possible answer would be that at school the learning methodology used had no connection between the emotive brain side and the cognitive brain side…

… thanks to the Iberians project, I've been able to connect emotion and cognition, so now I have some knowledge about the Iberian Civlisation that I did not have before and I will probably remember for a long time…

… I take the proposal as a methodological referent, with the purpose of avoiding my future students' frustration, the frustration I felt that day nine months ago." (3rd year student of the Primary Education Degree, UdL)

1. Archaeology, Interdisciplinarity and Teaching and Learning

Research for a number of years has expounded the learning benefits of teaching by means of the archaeological method. The application of this method has an intense effect on procedures both inside and outside the classroom, both in the Primary School and in the Secondary School environments. Using archaeology as a teaching tool has been largely increased in the ludic field, in museums, at archaeological sites and it has also been introduced in schools through practice (BARDAVIO and MAÑÉ, 2015; CORBISHLEY, 2011; BARDAVIO and GONZÁLEZ, 2003, 2008; CHOWNE, 2007; SANTACANA and HERNÁNDEZ, 1999; BARDAVIO et al., 1996).

On the other hand, its interdisciplinary character, and what it means in its educational application, has been specifically assessed in several works (e.g. BARDAVIO et al., 1996; CORBISHLEY, 2011). In fact, methodology in archaeological research, in particular that related to prehistory, is one of the examples used by Edgar Morin to consider the development of general intelligence, on one side, by working with the doubt (1999, 24-25): "Enfin, il faudrait partir de Voltaire et de Conan Doyle, puis plus tard examiner l'art du paléontologue ou du préhistorien, pour initier à la 'sérendipidité', art de transformer des détails apparemment insignifiants en indices permettant de reconstituer toute une histoire". And, on the other hand, as already mentioned, for its interdisciplinary character, understood in the sense of interchange and cooperation within several disciplines to become something organic in a common project.

It can also be defined as multidisciplinary, meaning an association of several disciplines in pursuit of a common objective or project. What is more, within Archaeology the creation of hybrid disciplines that are gaining their own independence, such as Archaeobotany, Archaeozoology or Geoarchaeology, among others (MORIN 1999, 127-137) is a common occurrence. This interdisciplinary aspect, therefore, permits a wide application in cross-curricular projects, which is broadly exemplified by M. Corbishley (2011, 149-190).

Our interest in this article is the specific application of interdisciplinary and experimental Archaeology. We intend to show and to analyse a particular experience that presents as a novel aspect the integration of three directly interrelated fields: research on experimental Archaeology, primary school and, most innovatively, university training of student teachers. For this reason, we first give a concise presentation of the project *Camp Experimental de la Protohistòria* (CEP, Experimental Protohistory Camp), in Verdú (Catalonia, Spain), followed, in detail, by the application of the experience at the ZER GuiCiVerVi Elementary and Primary School as well as the experience at the Primary School Education Degree at the Faculty of Education, Psychology and Social Work at the University of Lleida, finishing with the results obtained at the faculty from surveys and comments by students.

2. Experimental Archaeology Research in the Iberian Iron Age

Experimental Archaeology, as an Archaeology sub-discipline in the historical approach to knowledge, is becoming a constantly growing activity. An increasing number of projects are being introduced in this research field, for instance, by introducing reconstruction techniques of constructive, productive or transformative activities of which we have evidence from the past. The aim is to achieve a closer interpretation of the activities that form the archaeological record. At the same time, it becomes a vital approach in this re-creation of the past.

The objective of the project carried out at the CEP (Experimental Protohistory Camp) in Verdú (Catalonia, Spain), adjacent to the Iron Age Iberian archaeological site of Els Estinclells, was fundamentally to consolidate an experimental archaeology camp for scientific use and research in the field of Protohistory, as well as to enhance its use by schools and for the dissemination of information (vd. Figure 1). At the CEP the scientific line focuses mainly on three main areas: agriculture and archaeobotany, craftwork and construction systems (MORER et al. 2015).

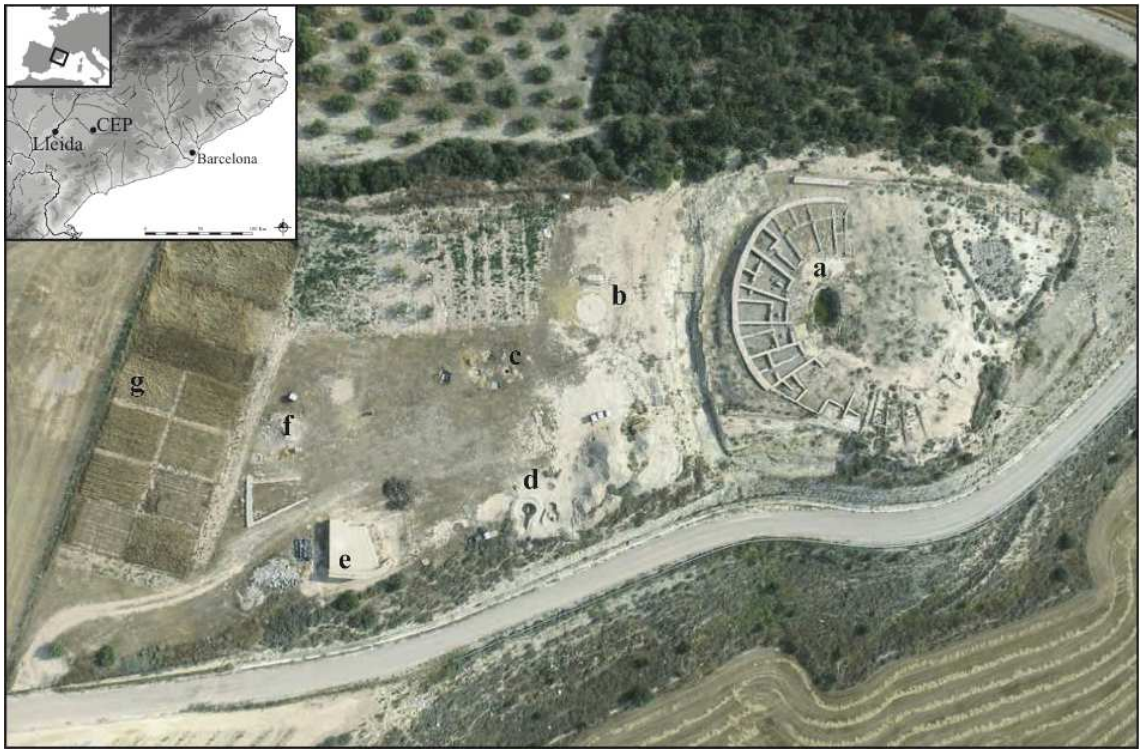

Figure 1. The Experimental Protohistory Camp (Camp d'Experimentació de la Protohistòria – CEP) is adjacent to the archaeological site of Els Estinclells (a). The workshops at the camp include a threshing area (b), a storage area with pits (c), pottery ovens (d), a wine press (e), an area reserved for construction (f), and plots for planting cereals (g). **Source: CEP**

2.1. Agriculture and Archaeobotany

The objectives of the research project on this subject are twofold. The first is more general and directed towards the reconstruction of the agricultural system of the Iron Age, whereas the second is linked specifically to testing a series of hypotheses generated by archaeobotanical research (ALONSO et al., 2013). The interdisciplinary experimental approach leads to the formulation of working hypotheses about crop systems and management, the study of weeds and the means of processing plants. Several activities such as sowing, harvesting, threshing and cereal processes have been carried out according to several hypotheses regarding the fragmentation of rachis remains of cereals, dehusking of hulled cereals or storage in pits.

2.2. Craftwork: Pottery Manufacture

Pottery is an essential element of the material culture of the Iron Age. The study of pottery production techniques, either by hand or by wheel, is essential to deepen our knowledge of these societies. In this respect, the project is centred on three points. The first is the modelling of vessels by hand and their firing in open fires based on ethnoarchaeological experiences. The other two relate to the modelling of vessels using the potter's wheel followed by their firing in scaled replicas of Iron Age kilns. In this case, this experimentation is based on evidence provided by archaeological data from several Iberian kilns that present firing chambers built over combustion chambers with a central pillar that supports a grill that separates the chambers. A craftsman from Verdú has moulded wheel pottery with Iberian shapes found at the site.

2.3. Construction Systems

Iron Age building materials and construction systems are known about due to excavations of archaeological settlements. Certain architectural techniques, nonetheless, remain hypothetical

and require testing by experimental archaeology. The project in this sense worked primarily on a scaled reconstruction of a building brought to light at the site of Els Estinclells that is interpreted as a wine press. Usually, Iberian buildings were built with walls that have a stone plinth and the rest of the wall made of adobe bricks. Roofs were made of wood beams, a reed lattice and a finishing mud layer. The wine press has also been used experimentally to verify the hypothesis formulated about the pressing system.

3. Carrying out the Experience with Pre-School Children, Primary School Children and Student Teachers

As mentioned before, although the main aim of the experimental project is clearly scientific, both its results and its methodology are highly susceptible to being used in a teaching and learning context. In these cases, experiment becomes experience, since it does not have a scientific scope. The purpose, in this case, is to introduce students to scientific methodology first-hand or hands-on that will lead them through a methodology of discovery to gain knowledge about the human past. Our experience with students has two main phases: the first one carried out with school students and the second one with student teachers at the university.

The first was carried out during the 2012-2013 school year with the ZER GuiCiVerVi (ZER = Rural School Zone), an association of rural the Urgell region (Catalonia). It was designed for students from pre-school (3-5 years old) and primary school (6-11 years old) (ALONSO et al., forthcoming). The training programme was structured following four basic lines, three of which correspond to the research project. The initial three were Iron Age construction, handicraft production and agriculture. The fourth was a general introduction to the chronology and geographical range of the Iberian Civilisation. Students worked on each of the subjects independently under the guidance of their teachers. In the workshops, however, students and teachers were joined by members of the archaeological team. The work, nonetheless, was tailored to each educational level, taking advantage of the interdisciplinary perspective to introduce concepts and procedures to the curriculum, in particular in the areas of environmental, social and cultural studies.

Regarding university students, the project was carried out with 3rd year students from the Primary Education Degree of the Faculty of Education, Psychology and Social Work at the University of Lleida (UdL), within the subject “Teaching and Learning Social Sciences and the General History of Europe” during the 2013-2014 and 2014-2015 academic years. Both courses were organized regarding the same thematic blocks used for the archaeological research and the school experience, although with some variations. For instance, a block to analyse the socioeconomic context in greater depth was included. All blocks started with a similar pattern, which was to formulate hypotheses from an archaeological challenge using several “clues”: real artefacts, for the first three blocks, and photography, for the fourth. The general aspects of the different subjects are set out below, following the main lines of activities carried out.

3.1. Agriculture and Bio-archaeology (vd. Figure 2 and 3)

Figure 2. Agriculture and Archaeobotany: research, school and student teacher activities. **Source**: CEP

Figure 3. Archaeozoology: research, school and student teacher activities. **Source**: CEP

Pupils took part in the treatment and recovery of tiny archaeological remains by means of a flotation machine. They noted how the lighter residues from the archaeological samples were separated by this method and how they were classified according to size in the different sieves. Once the samples were dry, they separated the bioarchaeological materials from other types of remains and each student retained one sample and sorted the archaeobotanical from the archaeozoological remains. The primary students and student teachers were not informed as to the nature of the different seeds they had selected. They were provided with reference sets to help them identify the different species.

Once identified, we started the experience of finding out how some of cereal species were sowed (bread wheat, durum wheat and hulled barley). In order to work with the children, fifty plots had been staked out in a field near the site, which were designated with the names of different groups. The plots were prepared differently depending on the school cycle, tilled with a hoe and sowed. The same procedure was carried out by the student teachers on a plot close to the faculty. While the crops were growing during the winter and spring, they made some scarecrows to watch (see below) and identified and studied the weeds growing on the plots. Finally, in June the students gathered the ears of the ripe grains.

Although the research project did not foresee direct archaeozoological experimentation, it did introduce this discipline to students (vd. Figure 3). The particularity of these workshops was that they focused on the anatomy, taxonomy and nutrition of animals based on the observation of archaeozoological remains. Starting with some skeletal reconstructions, by consulting a skeleton reference set of different species (dog, goat and rabbit), the students determined and identified the different bones and placed them on a life-size drawing. Next, we worked with the types of bones and the animals to which they belong. The groups of students classified the types of bones from an archaeological assemblage according to a reference set.

3.2. Craftwork: Pottery Manufacture (vd. Figure 4)

Figure 4. Manufacturing ancient pottery: research, school and student teacher activities. **Source**: CEP

In this case, the starting point is several pottery fragments of different types that students have to analyse in groups so they get to know several types of protohistorical pottery craftwork (mainly those already mentioned: hand-made and wheel-made pottery). Sample classification permits the group to recognize different types of clay, firing, shapes and decorative patterns.

Once archaeologically recognized, we proceed to experience crafting and firing. As we have said, the archaeological experimental project works in both hand-made and wheel-made pottery. The teaching and learning activity focused primarily on the former, a simpler technique, but the students did have the opportunity to observe a potter's wheel in action and visit replicas of Iron Age kilns.

All the students modelled a ceramic vessel based on Iron Age Iberian models. The vessels dried over one or two weeks and once the pottery was dry, each student placed their vessels in the open-fire kiln. Once firing is finished, the results can vary greatly due to inexperience.

3.3. Building (vd. Figure 5)

Figure 5. Early construction: educational and research activities. **Source** CEP

Construction material used by Iberian societies was analysed, as were houses, measurements, compartmentalization, urban planning, etc. At the Els Estinclells site these archaeological elements were analysed together with the reconstruction of the building containing the wine press, already reconstructed during the development of the research project.

Once these elements are known, the manufacture of adobe bricks and the raising of a wall followed by coating it with clay drew the students nearer to the ancient construction techniques of the Iberian civilisation, as well as to the traditional rural architecture of western Catalonia.

3.4. Everyday Life, Clothing (vd. Figure 6)

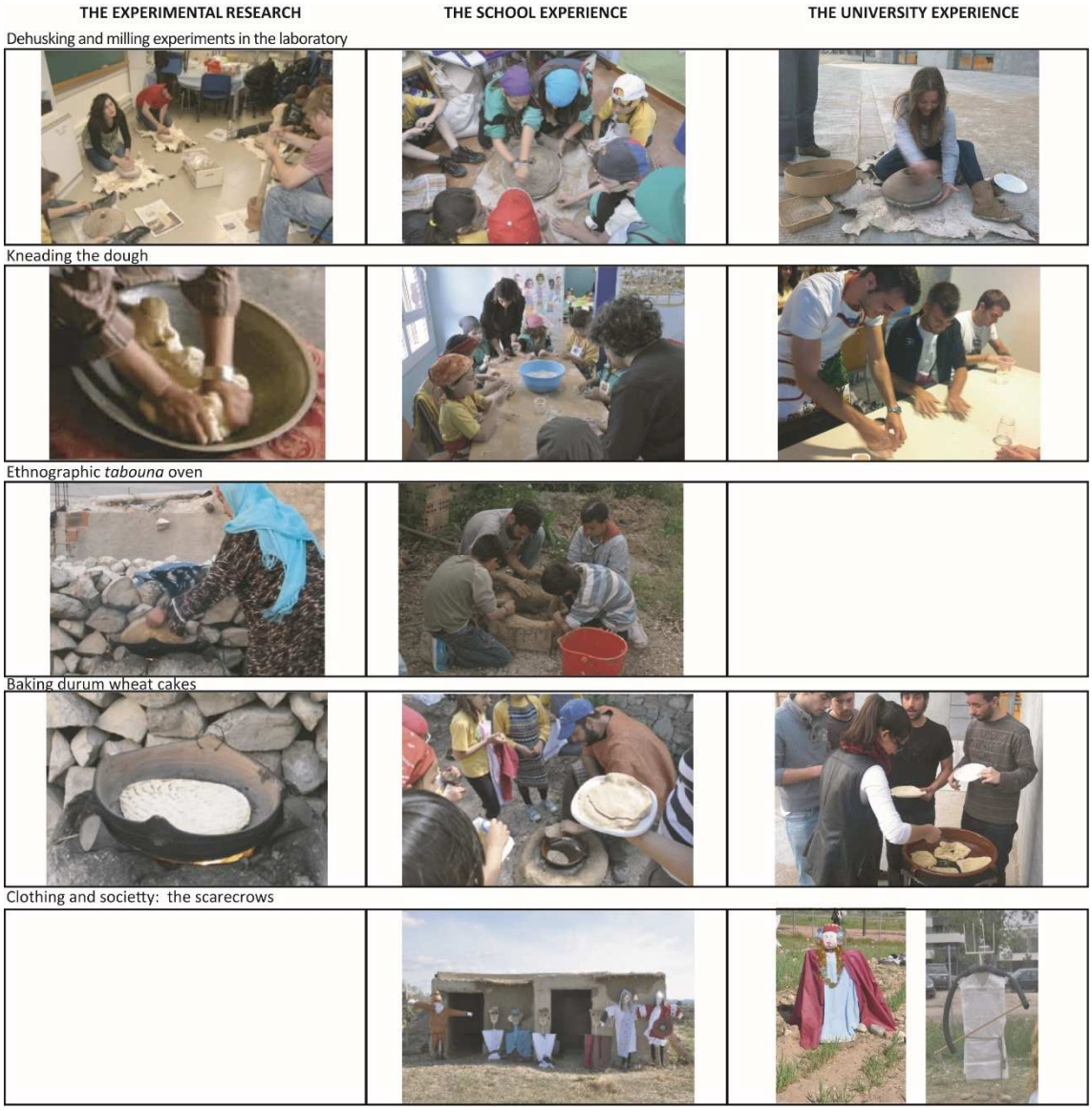

Figure 6. Early life and society: research, school and student teacher activities. **Source**: CEP

Related to everyday life, a workshop on baking was held. Wheat grains were milled with ethnographic rotary querns and the flour yielded by these mills was then kneaded and baked as cakes in "tabouna type" ovens made from clay by the children themselves, in the case of the school experience. In the University, the use of these ovens was not possible and the cakes were cooked in portable stoves. Finally, the baked cakes were eaten.

Furthermore, the subject of clothing in the Iberian Civilisation was added to the teaching and learning project. Both school children and University student teachers built several scarecrows and also dressed them so as to represent characteristic members of Iberian Civilisation society, an activity that raised the issue of ancient social groups. The second year of the project, student teachers built their scarecrows in the framework of the Art module, introducing the theory of human representation thanks to the collaboration of professor Jesús Mauri.

3.5. Learning by teaching (vd. Figure 7)

Figure 7. Teaching experience. **Source**: CEP

To finish the teaching and learning school project, a new experience was added based on the fact that in the didactic pyramid model, the highest percentage of learning is attained when teaching others. In this sense, the students of the ZER GuiCiVerVi School were charged with describing what they had learned throughout the project to their families in an "Iberian Civilisation fair". The didactic concept was therefore reversed, and the experimental workshops were no longer considered to be "for children", but taught "by children" to their families.

On several occasions, these children also described the project and their own personal experience to visiting students of the University of Lleida Faculty of Education, some of whom were also carrying out the project. This activity has proved very useful both to the young students as well as to the future teachers.

4. Results of the Project with the Student Teachers of the UdL: Contents and Voices

A different strategy was designed for the project carried out with university students with the aim of analysing whether their knowledge of the Iberian Civilisation increased "spontaneously" with only the workshops and without studying specific texts for an exam. To do so, at the beginning of the course we carried out an initial test in order to judge the previous knowledge of 206 students. It was a ten-question questionnaire, five related to some work we would do in the teaching and learning experiences, and five related to aspects we would work on from "clues" and some bibliographic work. They also had to write a short text about anything they knew about Iron Age Iberian Civilisation and they had to create a concept map based on those ideas or knowledge. The same "exam" was repeated at the end of the course, without telling them, so they could only answer and write what they had learned during workshop and classroom sessions. Comparing the results between the initial test and the final test permits us to evaluate whether the experience generated not only knowledge about one kind of methodology, but also about the historic contents. Finally, we also collected their voices through another final questionnaire to find out their impressions of the project and through a text

written either individually or in groups, in which case we have the opinion of 125 students. Results of the different aspects evaluated can be considered positive:

4.1. Evaluation of the Experience: the Contents

Regarding test results, as we can see in the chart in Figure 8a, it is possible to confirm that the percentage of correct answers clearly increases in the final test. There is an increase of almost 30% in each question. Moreover, in the final test 6 of the 10 questions reaches between 80% and 97% of correct answers (questions 3, 4, 5, 7, 9 and 10). There is only one question (question 19 that does not obtain 50% of correct answers, neither in the initial test nor in the final test. This led us to consider that the possible answers offered could be confused. So, regarding student's' knowledge about Iberian Civilisation achieved through teaching experiences we believe that we can be satisfied, especially taking in account that it was an improvised test.

Regarding the concept maps, they were used with the purpose, in the first test, of evaluating the student's' capacity to connect their knowledge about Iberian Civlisation, no matter how poor it was, whereas, in the final test, they were used to understand whether the previous knowledge had changed and whether it had been connected to new knowledge achieved during the course (MARKAM et al., 1994; NOVAK, 1990).

To corroborate and evaluate the progress made in student's' conceptualization and reciprocities we take in account the following aspects of the concept map, according to whether they were right or wrong: number of concepts; number of connections; amount of branching and number of cross-links. Concepts represent ideas expressed by students. Connections correspond to those lines that connect words related to concepts or that connect to examples, and they indicate the degree of knowledge. Branching represents the progressive differentiation in this knowledge command and cross-links mean the extent of integration and knowledge synthesis (MARKAM et al., 1994).

To analyse concept maps they were sampled randomly to select one of every 5, so we worked with 43 concept maps. In the initial test the ability to create an almost complete concept map was limited, as can be observed in the charts in Figure 8. Regarding valid concepts (vd. Figure 8b), the upper limit in the initial tests was not more than 15, whereas in the final tests was almost 50. In fact, very nearly 70% of the final concept maps done by the students had an increase in valid concepts between 60% and 100% in comparison with the initial concept maps. Nevertheless, some cases were really poor (no more than a 30%). The rise in relationships among these concepts is even more significant, since 42% of cases had increased connections by more than 90% (vd. Figure 8c).

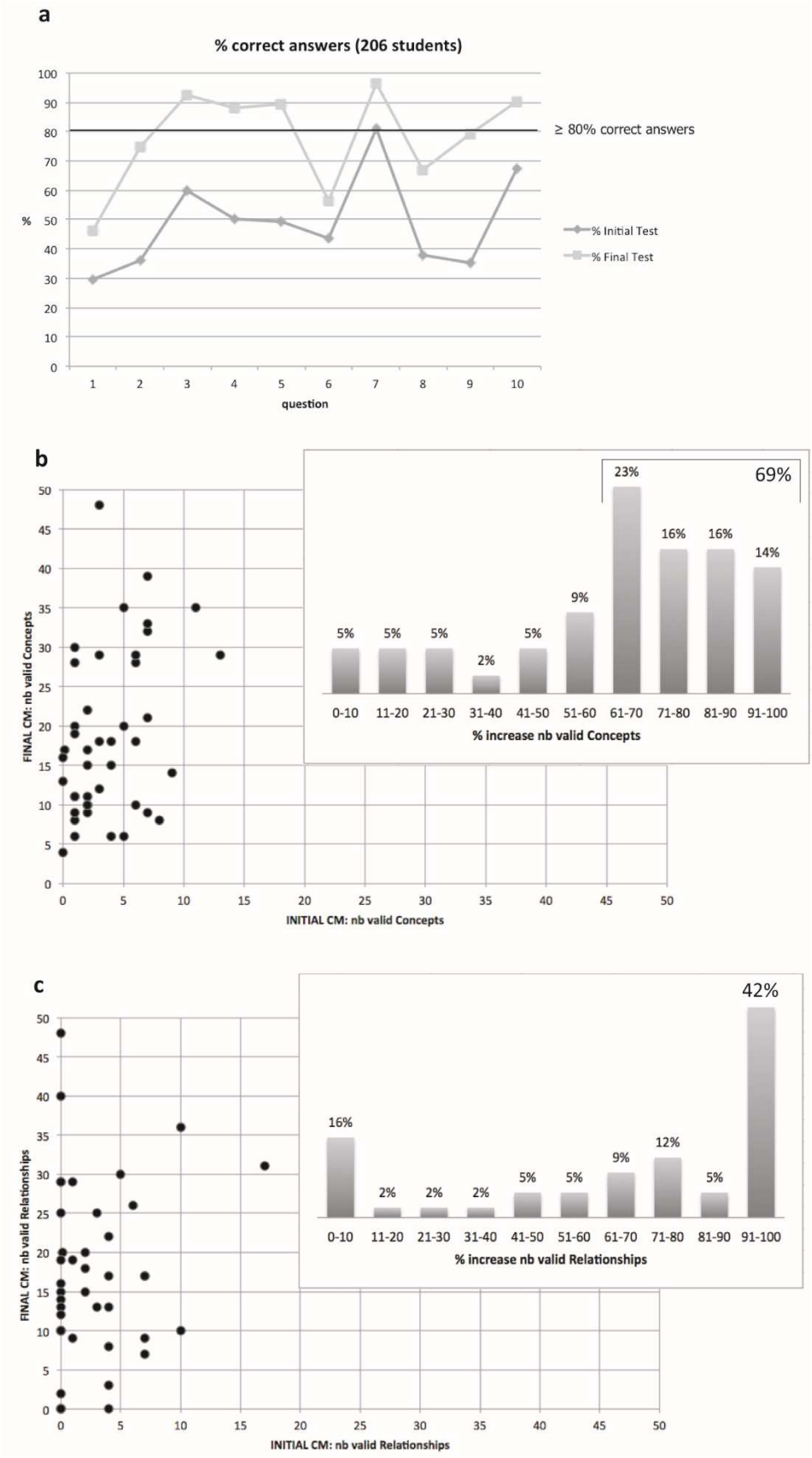

Figure 8. Evaluation of the student teachers' experience: (8a) Comparison of the percentage of correct answers in the Initial and Final tests; (8b) Concept maps, increase in number and percentages of valid concepts; (8c) Concept maps, increase in number and percentages of valid connections. **Source**: The Authors

Thanks to this contrast we can also observe how students' initial knowledge about Iberian Civilisation did not determine their ability at the end of the experience to build a map with the most correct concepts and valid relationships (vd. Figures 8b and 8c). Those who had the highest number of valid concepts or relationships in the initial concept map were not those who had the highest number in the end. Unfortunately, numbers of branching and cross-links are really limited, which means that students do not reach a sufficient level of interdisciplinary integration and systematization of the knowledge gained.

4.2. Evaluation of the Experience: the Students' Voice

Similar results to those reflected by quantitative analysis of the responses to the questionnaire and of the concept maps can be seen through some comments written by the students. Their opinion was also taken into account through several evaluation answers that can be observed in Figure 9. In this test, on a scale of 1 to 5, they had to evaluate several aspects related to the project: whether they considered it innovative, useful for working contents, useful for their future professional expertise, enjoyable, complicated, and appropriate for this module.

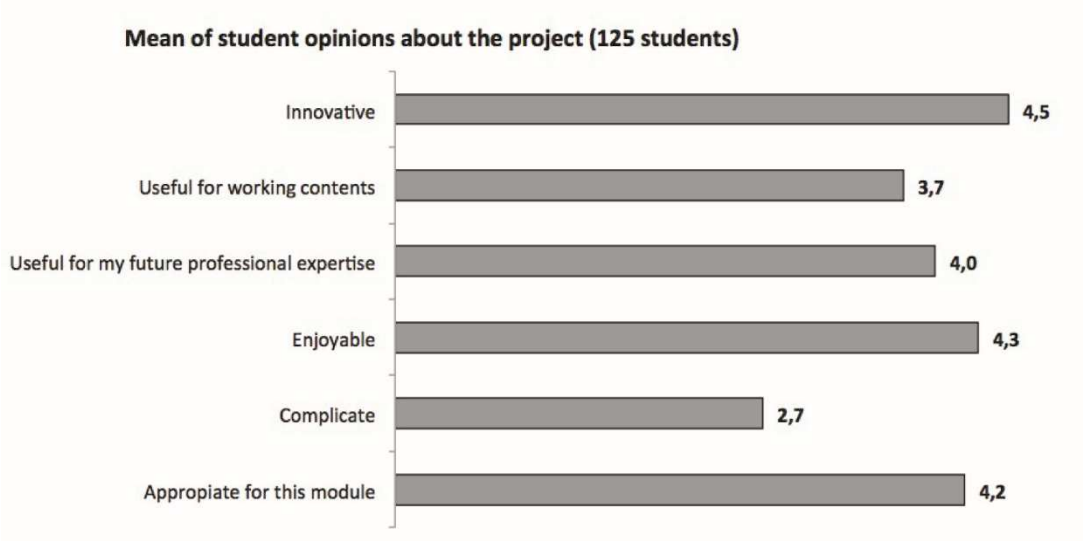

Figure 9. Evaluation of the student teachers' experience: mean of student opinions about the project. **Source**: The Authors

As we can see, the evaluation was very positive, mainly in those aspects related to innovation, appropriateness for the module and enjoyability (means of 4.5, 4.2 and 4.3 out of 5). Although it is still considered highly positive (4), the perception of the usefulness it may have for their future professional expertise is not as well valued as the other three aspects already mentioned. Also low is usefulness for working contents (3.7). Finally, almost half of the students consider that it is complicated to carry out, which is the most negative aspect (2.3).

As said before, this general evaluation of the project is also reflected in their own words, as well as other considerations that can be extracted concerning different aspects such as methodology, their university experience as well as their school experience. Although students were completely free to express their own impressions it is possible to classify them into several themes. We have selected one or two comments for each topic.

4.2. 1. Improvement in Contents Knowledge

- "I only have to compare the concept map I did at the beginning of the course and the final concept map I did just few days ago, at the end of the subject. Results are more than clear: they are patent. In the first test I barely did one single connection: Iberian peoples are from Ancient times. However, in this last test, I have been able to make connections about houses, food, professions, ways of subsistence, monetary system, how they made pottery… I believe that all this have been the result of significant and practical learning."

4.2.2. Scientific Methodology, Experience, Learning Outdoors

- "It is an interesting teaching and learning experience, since contents are not only theory, as we are used to. Almost all knowledge comes to light in a slow process of discovery and of experimentation in hands-on activities. All this permits significant learning, which lasts for a longer period of time, since it allows you to remember the experience and therefore what has been learned."

- "A project like that allows working both from inside and outside the classroom in an experimental way, permitting students to 'discover' their own knowledge. This methodology increases students' motivation while making them willing to learn in a different way. On the other hand, it also permits teachers to gain experience with those methodologies that they will be able to use in different contexts."

4.2.3. Interdisciplinarity

- "The project carried out during the academic year within this subject helps me to confirm first-hand that working transversally is possible… And doing so through History, is even more interesting to me, since I always perceived it as a boring subject, difficult to understand, and even a little tough and disconnected from other areas (very immovable)… I realise that working on History from another perspective is possible and that it allows connecting past facts or events with current realities… and in doing so it changes our perception of this subject."

- "… I would have never realized the multiplicity of options that working through History offers if it had not been for the stimulus we received while working on the Iberian Civlisation during this year… Experimental archaeology was a challenge to me, a challenge that made me open my mind and find a potential tool for innovative teaching that can be used to work with primary school students in a transversal way".

4.2.4. Thinking, Cognitive Process

- "… Working that way makes you realize the way children can work and even think, since we have to act as if we were them and travel back to our own childhood… we saw that working in an experimental way isn't that mad and that learning can be possible by making scarecrows, firing pottery or making bread. I'm sure that I won't forget about types of Iberian pottery or about the way they ate or dressed."

- "At the beginning I didn't see any sense in what we were doing because I couldn't understand why we had to do those activities. It was entertaining and I had good fun… but after doing several activities I got the clue: the idea is to interiorize concepts and theory by practice. It was then that I realised that it was true that without any forcing my memory I could remember the entire practical sessions we had taken and that I could remember even the theory thanks to the practical stimulus. The aim of this practice is to internalise all those concepts taught in the

classroom. That was when I realised this is true, for I could remember all practical lessons without making pushing my memory, and so, all the theory I had learnt in these practical lessons"

4.2.5. Curiosity and Emotion

- "... besides the analysis I can perform from a teaching perspective, I have also been able to feel linked to the school and even relive the curiosity, imagination, creativity, motivation etc. I used to feel when I was a little child."

- "... I've received inputs from different sources, I've asked myself questions, I've looked attentively and investigated, I've made predictions, I've felt moved thanks to discovery, I've overcome some challenges and I've failed some others, but, definitely, I've taken an active part in the learning process… by means of the Iberian project I've connected emotion and cognition so now my knowledge about the Iberian Civilisation has increased and, moreover, I'll probably remember it for a long, long time…"

4.2.6. Teacher Skills, Teacher Effort, Designing Curricula

-"... talking about the teachers' role, I can say that this kind of methodology needs more effort from teachers, but at the same time it's more motivating since results become really good, both in learning and interaction. Since the project is not standardized or limited by didactic guidelines, the teacher is clearly free when carrying it out. Each one sets out the planning taking into account learning and the group-class involvement."

4.2.7. Reflections about Teaching and Learning at the University

- "I must admit that in the beginning, when I was told that project-based is a proper methodology for the primary education period, I asked myself why we are not being taught to be teachers through this method. Why wasn't I given the chance to be exposed to a subject where I had to work by projects? This moment hasn't arrived until we've reached the third year of our degree and, after having experienced it, I can say the project-based method has fulfilled my expectations."

- "Another aspect to consider about the methodology used in this subject is the fact that theory leads to practice, that is to say, besides learning about a methodology, we have put it into practice. In this way, we have been given a model we can use when we are teachers. We haven't just enjoyed a written model but we have lived it."

We must say that most of evaluations are positive, but it must be taken into account that some students may not dare to criticize some points they considered negative. In any case, the same students have displayed a critical attitude on other occasions, and therefore we can consider their current evaluation is honestly positive.

5. Discussion and Conclusions

As mentioned in the introduction, the use of Archaeology, and experimental Archaeology, in different areas and in a cross-curricular manner, is widely recognized in primary and secondary education spheres. In this sense, we consider the success of our school experience quite evident. However, we do not know any example of its use in teacher training other than in the teacher training put into practice in the UdL.

The article shows that a research and teaching interactive experience carried out in two different learning contexts can lead to good global results. Researcher-archaeologist involvement is basic,

which is both positive and encouraging, but on the other hand this leads us to question whether a project like this would be possible without their involvement. This reflection could be replied in two ways. One answer is related to the need for suggesting and strengthening direct interrelations among researchers of several subjects and the school environment. The other is related especially to student teachers and has to do with the fact that this project is conceived as a practice model that is not intended to be replicated identically. On the contrary, it is conceived to be adaptable to their professional future, to their own possibilities as future teachers and to the educative projects they will be working on.

From a global point of view, the project presents a precise and indicative sequence that begins with the archaeological experience, in which archaeologists use their own knowledge, methodology and enthusiasm to generate ideas to make their discipline more appealing to those who are inexperienced; the schoolchildren. The next step is to define and shape it in a school project through primary school involvement, and finally, this experience is applied to an even more original experience in university teaching. The same team of archaeologists is involved in both experiences, with children and teachers as students. Moreover, both children and UdL students learn in an enjoyable and active way, also applying the scientific method, establishing interdisciplinary links and getting and approach to traditional technology.

The results obtained in the university experience clearly show an improvement regarding students' knowledge about the contents of the Iberian Civlisation they worked on. This is reflected both by the quantitative analysis provided by questionnaires and concept maps and by students' voices, where in some cases they clearly verbalize their own impressions. Numerous students consider, in addition, that they have experienced significant and practical learning that, from their point of view, could not have been possible using traditional methods.

The most highly valued aspects are the development of several scientific abilities, interaction, responsibility, and the fact that knowledge is gained by discovery little by little, that it is hands-on knowledge and the feeling that it will remain for a long time. We can also conclude, given some students' comments, that they were amazed at the fact that ZER GuiCiVerVi school students could explain to them the project they had carried out at school (an explanation that was given during one of the university students' visits to the CEP) and at the fact that they were able to remember clearly the school project they had worked on one year before.

Other ideas are valued, such as motivation, emotion and the return to a child's spirit of curiosity, imagination and creativity. And even more valuable from our point of view is the transformation in their regard for History as a subject (a vision inherited from their own school experience) and that we hope they will transmit in their professional future.

By the same token they recognize the complexity involved in such a project regarding its planning and management. What is more, some students voice their doubts about their ability to carry out something similar, whereas other students, optimistically, consider themselves already qualified enough.

Finally, they value highly the opportunity to experience a methodology first-hand and in practice that, despite being explained in theory by several university teachers, they had never experienced it in practice. Therefore, either through Archaeology or any other interdisciplinary practice, those students, both school and student teachers have experimented hands-on, integral and significant learning. And, why not also say that the researchers have learned from the interaction between children, teachers and student teachers.

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