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Augmented reality and geographical content in educational itineraries. Didactic proposal for its valorisation in the training of Primary Education teachers: the landscape of Las Villuercas

Educational itineraries are a resource that has been frequently used in the teaching of geography. It offers the possibility of bringing students closer to the territorial context and enabling them to analyse the elements that compose it in contact with them. The implementation of didactic itineraries can contribute to the development of a transversal methodology in which the contents of several subjects can be integrated. Educational pathways are a good instrument for activating prior knowledge which will function as a basis for the integration of new knowledge based on experience and active participation. In addition, there are positive effects that contact with nature can have on the creation of environmental awareness. The didactic itinerary is not only useful for teaching content, but also for acquiring a series of skills and for developing feelings and values related to the conservation of the natural environment and cultural heritage. In this way, didactic itineraries become an outstanding didactic instrument that allows students to work with the contents of geography, being of special interest for the work we are dealing with the contents related to the landscape and its evolution.

In addition to the advantages already mentioned, from the point of view of landscape teaching, didactic itineraries facilitate transversality and the incorporation of content from various subjects during their development. In this sense, transversality is favoured in the study of landscape, as the student is faced with a scenario composed of a multitude of elements that interact with each other, which present a logical order and which the students have to decipher in order to be able to internalise it.

In this way, not only is the learning process of Geography set in motion, but other subjects such as History, Economics, Natural Sciences, etc. are also involved. Likewise, this didactic resource can be complemented with new technological didactic tools that are closer to the students, for example, mobile technology.

The teaching-learning processes in Geography, as in other sciences, have been evolving due to theoretical, methodological, didactic, technological and societal changes. The emergence of new pedagogical trends together with the incorporation of information and communication technologies (ICT) means that teachers have to know how to adapt to new conditions and resources effectively and incorporate them into the process to make the most of their potential. This evolution does not mean that all traditional teaching is obsolete, but rather that current and more recent trends must be combined with those that have been proven to be valid in the past, depending on the needs of both the students and the subjects to be taught. If these usual didactic resources such as excursions are combined with the instruments that come from ICT, we will be able to offer students a learning experience that is closer to their technological reality. In short, the incorporation of ICT, like the incorporation of other instruments, seeks to improve both learning and teaching practice. Thus, this document aims to provide a didactic proposal that combines two tools used in the teaching and learning processes of Geography and in which, in addition, the landscape is the thematic thread: the didactic itinerary as a traditional resource in the teaching process and augmented reality (AR) as an example of the cur-

rent trends that focus their approaches on mobile learning. To this end, a didactic itinerary will be designed for Las Villuercas Massif. It will include a series of explanatory stops where the AR will be the complementary tool with which students will learn about the landscape, its elements and its possible evolutionary dynamics. This union between the two didactic trends aims to contribute to the improvement of the teaching process of landscape through contact with the environment, cooperative work, autonomous learning, etc.; in short, to provide students with tools to ensure the proper development of the seven key competences and, thus, contribute to the configuration of their professional competence.

Augmented reality is a technology that is increasingly finding a place in the classroom, regardless of the stage or level of education and the subject or discipline in which we find ourselves. Numerous authors have determined that it is an instrument that contributes to the improvement of learning and facilitates the understanding of certain concepts and processes, as it provides the student with support in the form of graphic information superimposed on the real environment. Likewise, the incorporation of this technology into teaching-learning processes based on a mobile platform contributes to an improved learning experience that is more highly valued by students. Studies show that this type of technology facilitates the individualisation of the teaching process. Thus, each student will have an information base that is contextualised according to his or her needs. But not only does it offer the possibility of working in an individualised way, AR is also an excellent complement to work in the classroom in a collaborative way in which students deepen the teaching process among peers. It is also possible to see how this technology provides the opportunity to address teaching according to the needs of the group-classroom. For all these reasons, AR is a technology that is easily adaptable to teaching needs, although with a minimum knowledge base. The teacher has to master the technique to be able to plan and programme the activity appropriately. In addition to the contributions that AR can make to the teaching process, from the point of view of learning, it also contributes significantly to it, improving it both in terms of the acquisition of content and the development of competences. In this way, the use of AR will have a direct impact on students' meaningful learning. Focusing on the subject of landscape, there are increasing references to studies that focus on the value of the use of this technology in the teaching-learning processes of landscape in a specific way. Several studies are committed to augmented reality

and 3D modelling as instruments for teaching landscape and geographical space. They also highlight the added value of AR as a tool for teaching and explaining the elements and complexities of landscape. AR, in addition to providing notions about its elements, makes it possible for students to interpret the landscape and analyse its evolution autonomously through the implementation of different tools implicit in augmented reality and the notions provided by the teacher.

The goals of this paper focus on the use of augmented reality in the teaching-learning process of landscape in teacher training. To this end, the aim is to design a didactic itinerary through a mountain area (Las Villuercas Massif) in which AR is the complementary method to teaching explanations. Specifically, a series of complementary objectives are proposed: to provide an example of the use of different techniques for implementing augmented reality in fieldwork (3D blocks, slides, gifs, comparative photography, etc.); to define the type of content that can be incorporated into the process (adapted to the training of primary school teachers); to explain in detail the development of the educational itinerary and the actions to be carried out at each of the stops that structure it.

Methodologically, the present work is articulated by a total of seven phases that allow the design of a didactic itinerary aimed at students of the Degree in Primary Education: bibliographical and documentary analysis; fieldwork; curricular analysis; selection of the places of didactic interest; construction of the AR materials; pilot test; final design of the didactic itinerary. The first phase is focused on the identification of reference bibliographic documents for the study of the geographical characteristics of the space selected as a case study, as well as the materials that allow working with an educational tool based on mobile technology such as augmented reality. Likewise, in this first phase, a curricular review has to be carried out to identify all those contents that belong to the area of Social Sciences and to combine them with the key competences. The second phase focuses on fieldwork. At this stage, an inventory is made of all those places that offer didactic interest and that meet at least the following criteria: theoretical example of one or more of the contents present in Primary Education; easy access on foot; an accessible place for Primary Education students; location close to a safe space that allows a bus to stop. Possible routes linking the greatest number of points of interest and suitable for a large vehicle are also designed. Once an inventory of the places of interest is available, it is time to implement phases three and four. In this case, the curricular contents have to be related to the selected

places in order to develop in them the teaching-learning process of one or several didactic contents. These phases will allow the pedagogical justification of the stop on the itinerary. Then, the fifth phase is aimed at the implementation of AR techniques to be used as didactic tools. To this end, one or more AR techniques will be selected at each stop to allow the teacher to complement the explanations, analysing which technique offers the best didactic conditions according to the content to be dealt with. Sixthly, it is advisable to conduct a small pilot test in which all the instruments to be used during the development of the itinerary are put into operation, especially those related to AR to identify potential problems and implementation errors. Once this phase has been completed, we would be able to define the final design of the pathway. During the implementation of the itinerary, each student will be provided with a document so that they can have the AR triggers that will give them access to complementary information at each stop. For this purpose, a material has been designed for the student which is made up of a triptych in which all the stops and the AR activators appear, organised according to the order of use. The materials used for the design, construction and implementation of the didactic itinerary are of four types: bibliographic and normative; cartographic (maps and orthophotographs); technological (geographic information system and mobile phone); field work. The bibliographic materials are made up of scientific papers and scientific texts related to the subject. In this block, a reference normative document on educational matters has been included: Royal Decree 126/2014, of 28 February, which establishes the basic curriculum for Primary Education. The cartographic material required (design, construction and fieldwork on the educational itinerary) is: 1/200000 map of the province of Cáceres; MTN50 680- 681-707; DTM of each of the topographic sheets; orthophotographs from the National Aerial Orthophotography Plan of its Historical series (1956-1957) and its Maximum Actuality series. Among the technological resources used, one has been dedicated to the construction of the materials necessary to conduct the didactic itinerary (geographic information system) and the other, the mobile platform, for use during the development of the activity in the field with the students as a device that houses the AR. Finally, a series of fieldwork days have been conducted, which have allowed us to recognise in situ the basic geographical and landscape characteristics of this territory and to identify those places that have the best didactic conditions for introducing the associated contents into the teaching-learning process.

Using the geographical characteristics that singularise and individualise the Las Villuercas Massif, a didactic itinerary is proposed that is pedagogically oriented to students of the Degree in Primary Education and is developed within the framework of the subject of Didactics of Social Sciences. To do so, we will take as a reference the normative document that specifies the contents to be incorporated into the teaching-learning processes in the Primary Education stage (Royal Decree 126/2014, of 28 February, which establishes the basic curriculum of Primary Education). It should not be overlooked that this is a resource that will be used in the training of future teachers and whose main purpose is to provide a series of knowledge, skills and abilities on the tasks that they will have to carry out in their future teaching. This itinerary has been designed to be developed during a day of fieldwork lasting about 11 hours, alternating walking and bus journeys. It has a total of 9 stops; at one of them, there is a walking route of about five kilometres in length. All of this provides an overview of the landscape of Las Villuercas, analysing in situ the physical (biotic and abiotic) and anthropic characteristics of the territory. The itinerary has a total distance of 115 km, of which 110 km would be covered by bus and the remaining 5 km on foot (see Figure 1). The didactic objectives pursued are centred on the learning of theoretical and practical knowledge in Social Sciences that will enable them to acquire the skills and competences determined for this stage. Concerning didactic content, this itinerary has a total of 30 sets of content which are distributed among the four blocks of curricular content which make up the Primary Education subject of Social Sciences (see Table 1). Of these thirty sets, twelve belong to the first block (*Common contents*), which include techniques and strategies for the development of habits and competences related to Social Sciences, the promotion of reading, values for living in society, etc. These contents will not be worked on in a formal way but will be taught in a more practical way. These contents will not be worked on directly by designing specific activities for their treatment, but rather they will be incorporated into the teaching-learning process in a transversal manner throughout the didactic itinerary. In the second block of contents, *The world we live in*, a total of nine sets of contents have been selected, among which those dedicated to the physical aspects of the territory and the use of cartography stand out. This second block will be the one with the greatest representation of the stops that make up the didactic itinerary. From the third block, *Living in society*, a total of eight groups have been selected, among which the territorial administrative organisation, demo-

graphic dynamics and economic resources and activities stand out. From the block called *The traces of time*, only the contents that form part of the set *Our historical and cultural heritage* has been taken into account.

In the north-western quadrant of Las Villuercas mountain range, an educational itinerary has been designed with a total of 9 stops; one of them consists of a pedestrian route along a dirt track heading towards the Carbonero peak. All of them, as well as the connection between them, represent an outstanding example of the basic geographical characteristics of this territory, among which teaching processes can be undertaken on issues centred on the biotic and abiotic elements of the mountain range, as well as on the distribution of the population and the organisation of uses and exploitation and the landscape characteristics. The didactic itinerary begins in the classroom through a previous session in which the itinerary, the space in which it will take place, the basic characteristics of the activity, the objectives pursued, etc. are discussed. Likewise, an introduction to AR will be made and the student's material will be provided. This same session will also be dedicated to the activation of prior knowledge. The aim is for students to have an overview of the activity, the pedagogical objectives, the way of proceeding, the contents involved, etc., as well as the planning and programming guidelines that go hand in hand with this activity. It should not be forgotten that this is a proposal that, in addition to contributing to the acquisition of theoretical content, also aims to intervene in the development of the professional competence of future teachers.

The development of this work has made it possible to design a didactic itinerary aimed at the training of future teachers (students of the Degree in Primary Education) with which it is intended to work, in addition to the acquisition of knowledge, on the development of their pro-

fessional competence. It is a proposal that has not been put into practice and in the future, it would be convenient to make a detailed presentation of the results obtained after its application. This itinerary has an innovative didactic instrument based on mobile learning and which complements the teacher's interventions: augmented reality. Immersed in the knowledge society and in a situation of constant technological evolution, pedagogical proposals must adapt to the new needs of students, offering a quality educational response that combines traditional systems with the latest technological innovations. Thus, within this framework, a didactic itinerary has been constructed in which contact with the environment is combined with the incorporation of complementary information through augmented reality.

It has been decided to combine both didactic instruments (didactic itinerary and augmented reality) and to design a didactic itinerary through a medium-sized Mediterranean mountain area (Las Villuercas Massif) in which augmented reality occupies a prominent place in the pedagogical process. Made up of a total of 9 stops, it provides an overview of the area from a physical and anthropic point of view with a conceptual and content base that focuses on the curricular document that specifies the contents to be worked on by Primary Education students in the subject of Social Sciences. This itinerary has been designed to encourage students to work independently and cooperatively, to construct their own knowledge, to take responsibility for their learning and to develop a critical spirit based on rational analysis and respectful values. With this, the aim is to value the development of didactic proposals that combine traditional aspects with innovative technological instruments to provide future teachers with tools and skills that allow them to face the teaching-learning process from a position of innovation and educational quality.