APPLICATIONS (APPS) FOR TEACHING GEOGRAPHY. A MOBILE LEARNING EXPERIENCE IN INITIAL TRAINING FOR PRIMARY SCHOOL TEACHERS

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1. APPS AND MOBILE LEARNING IN GEOGRAPHY TEACHING

Mobile learning, in other words learning using mobile devices, is an educational trend which seeks to explore and systematize the use of devices and networks in teaching. The vast array of teaching possibilities which the latter can provide enable their use in teaching processes to be gauged. Camacho (2011, p 41) underscores the notion that mobile learning encourages learning that is based on the pupil's particular environment and milieu, and that its use enables newly acquired skills and knowledge to be applied immediately, placing the emphasis on self-learning and differentiated learning in addition to enhancing confidence in pupils' own learning capacity and, therefore, self-esteem.

Use of technologies in the classroom should form a natural part of the learning process since this allows the knowledge acquired in school to be transferred to real life contexts and vice-versa, thereby strengthening the link between school and real life. Yet the use of technology should not be seen as an end in itself. Moraga (2011) states that when teaching geography the use of technology in the classroom is a means which, given its vast potential, should enable the actual use of the technology itself to be improved, whilst also encouraging an understanding of geographical space in all its complexity, beyond a static vision and that it should contribute to "developing a truly significant spatial awareness" (pp. 143), coupled with the use of methodological strategies which foster collaborative, creative and participative learning.

Rafael de Miguel (2016) offers an insightful study into the linkages between the learning style of digital native pupils and geospatial technology, said linkages encouraging the use of active methodological strategies which should seek to promote

digital education in geography. He states that spatial thought is not synonymous with geographical thought, but rather that they are complementary notions. The former refers to the cognitive processes linked to spatial intelligence whilst the latter is related to the field of geography. The systemic link between the two boosts the role played by geographical thought as a driver in the acquisition of spatial thought. Geography teaching should address geographical or socio-spatial intelligence which merges the two ways of thinking.

2. APPS AND TEACHING GEOGRAPHY

Apps are programmes downloaded and installed in mobile devices which enable us to both access as well as interact with information. The apps installed help us to customise our mobile devices, reflecting our personal tastes, interests and needs, which may range from reading the press to finding out what the weather is like in any part of the world as well as accessing games or social networks. This defines our Personal Learning Environment (PLE) (Cabero, Martín y Infante, 2011) and is manifested through all the features with which we normally interact.

The use of apps which provide access to geographical information is becoming increasingly widespread. Such easy access is endowing society with the ability to georeference places and to enjoy experiences based on geolocalisation. We are now immersed in neogeography, a new kind of geography involving mass participation in the handling of geographical information, and which now allows us to use everyday devices with pupils for educational purposes. (Ramón, 2017).

Many apps now offer geographical content. A quick search with the term "teach geography" in Play Store for Android yields over 200 apps. The large number of available applications coupled with the vast amount of downloads (some exceeding one million) reflect their high social demand and consumption. Some are geared towards educational purposes, whereas many others are designed for fun and entertainment. Whatever the app designer's intention, what is interesting for teachers is how these may be put to use.

It should be remembered that employing apps in the classroom helps to put what is learnt in formal contexts to practical use in everyday life and vice-versa. Games, tasks and activities designed for recreational purposes, leisure and entertainment also help to further and enhance knowledge. Learning can take place in any context and in any place, whether in formal or informal structures, and apps can be used in formal education situations and then employed at any time and in any place.

We have made a selection of apps and grouped them into three sections depending on how useful they prove for teaching geography:

2.1. Help with learning spatial localisation and working with other geographical concepts. Apps such as Google Earth and Google Maps, which enable localisation and location anywhere are the most widely recognised in the field of education in their web version, although they offer other possibilities in their mobile version, since their geolocalisation features allow for in situ spatial exploration when planning a route or in fieldwork.

Other digital mapping applications: prominent is the National Geographical Institute application: MapasIGN, which uses OruxMap (the OruxMaps application allows for greater use of mapping, although it is no longer free). The MapsIGN app grants access to the Spanish mapping network at all levels. It allows routes to be created and enables us to stay on course by using its location feature, thus helping us to mark out an itinerary and create maps. It is designed to aid hikers following trails and comes preloaded with certain routes such as the Camino de Santiago.

Work on spatial location can be done in the classroom using a number of webpages. The education portal of the Regional Government of Castilla y León offers a wide range of location maps and games (http://www.educa.jcyl.es/zonaalumnos/es/areas-troncales/conoc-medio/geografia-espana). The teaching resources offered by the National Geographical Institute (http://www.ign.es/ign/layout/cartografiaEnsenanza.do) are also useful. There are also the interactive maps of Enrique Alonso (http://serbal.pntic.mec.es/ealg0027/mapasflash.htm), or the Didactalia maps (http://mapasinteractivos.didactalia.net/comunidad/mapasflashinteractivos/)

A large number of applications have been created in mobile format in order to help learn spatial localisation. These include *Aprende Geografía*. The name is somewhat inappropriate as it equates learning geography with learning where places are located. It uses a mapping base and then asks questions in order to locate countries, capitals, flags and a physical map to pinpoint geographical accidents. It comes in the form of a game and offers various levels of difficulty. In its game format, places have to be found within a given time, and points are awarded for correct answers. It also offers the chance to practise (before playing) and provides help in finding the places requested.

Mention should be made here of apps which use QR codes (quick response codes) to favour geolocalisation. Geoloc is to be found in the web providing QR codes (http://www.codigos-qr.com/generador-de-codigos-qr/). It allows routes and gymkhanas to be created since it enables places of interest to be pinpointed using geographical coordinates. The use of apps equipped with QR code readers also grants access to information and data. Teaching practice (Coma, 2013, Rodríguez y Muñoz, 2015) has shown that the use of code readers proves extremely useful for accessing information on places for learning about heritage and the natural environment.

Other apps use *Brújula* for orientation anywhere, although these vary in accuracy. With our students, we use *Brújula* Pro.

In this section, we also mention apps which can be used to obtain weather information and to work with concepts concerning the weather and climate. These include the one offered by AEMET (the National Meteorology Agency), or others such as "El tiempo". One notable app is that devised by Pedro Colmenero, called "Climogramas de España", and which is very useful when creating a graphic representation of the climate.

2.2. Apps that can be useful for working with geographical concepts based on augmented reality

The most well-known apps for working with augmented reality are Aurasma and Aumentaty, which draw on a large bank of images that can be used anywhere, and which allow new images to be created that can be incorporated into the area we are seeing.

One augmented reality application which stands out for its use in teaching is LanscapAR. It is extremely easy to use and helps contour lines to be understood. First, a drawing is made on a blank page of a simple relief figure such as a mountain using concentric contour lines (see figure 1). The drawing is then captured by the mobile device and we see the representation of the mountain on the screen in augmented reality (see figure 2).

2.3. Apps which can be useful for interpreting landscapes

In order to visualise landscapes, there are resources which merge Street View images and Google Maps, and which appear in the form of games. One web version is https://geoguessr.com/, and a very similar mobile version is the GeoWhere app. When starting up the application, players see the picture of a location at ground level. This might be a rural or an urban scene, with a 360º view. The player can move around it and analyse the various elements that emerge: vegetation, relief, water, man-made constructions, buildings, types of road. Using a guided view allows the player to work on interpreting different scenes and, by deduction, conclude what it is. The image must be placed on some location on the planet with a click. The correct location then immediately appears on the screen. Depending on how close we get to the correct place, in kilometres, the app awards the player points. Each round allows five different places to be viewed.

3. APPS IN INITIAL TEACHER TRAINING

We present a teaching experience in which the previously analysed apps were used to help teach geographical concepts in initial primary school teacher training. We set out

from the notion that using active techniques in initial teacher training will enhance the teaching-learning process and will improve teachers' ability and have an impact on the professional development of our graduates.

The training experience was carried out in three stages. First, we conducted a preliminary survey aimed at gauging students' previous conceptions concerning apps. We then implemented a training programme involving a range of practical activities in which we used some of the apps mentioned earlier. Finally, students were asked about the process employed and were then invited to give their opinion about how, as future teachers, they viewed the use of these apps.

3.1. Future teachers' previous conceptions about apps.

Before undertaking any training process, it is essential to understand what previous notions students have. Gaining an insight into what they think and know is key to ensuring meaningful learning and will help them to become aware of to what extent they can change and embrace innovations in their future teaching practice. Although many of them display a "willingness to change, pre-conceived ideas about traditional methods still persist" (Sebastiá, 2014, p 66). As a result, encouraging them to comprehend what they know and to devise active practices can help improve the teacher training process.

In order to gain an insight into our students' ideas, we designed a survey (see chart 2) with open questions which sought to extract information about which apps they were familiar with, and whether some of these might prove useful for teaching geography.

A total of 185 students were surveyed. The results are shown below.

As regards the first question (1. As a future teacher, what do you feel about the use of tablets and smartphones in teaching?), most (79%) expressed a positive view. Opinions tended to follow one of two lines of argument; firstly, students referred to the recreational side of using such devices and how the latter can motivate. Comments included "they would be an enriching resource; lessons would be pleasant and fun". Secondly, students' answers focused on the need to use such devices in teaching. For instance, it was pointed out that "their use is inevitable", and that "they will end up becoming commonplace in the classroom". Nevertheless, 16% were opposed to using them. Some answers did not state why the students felt this, merely claiming that "use of these devices should be prevented", whilst others claimed that it would be better not to use them "so as to avoid exposing pupils to electromagnetic waves", or because "they might prove to be a distraction to teaching", and that using them would mean that "the pupil might start using them to do something else". Other students (5%) did not answer the question.

The answers to questions 2 (Which webpages would you use to support teaching in geography?) and 3 (Do you know of any applications for tablet and smartphone that

could help when teaching geography?) proved surprising. Results showed that very few students knew of any webs or apps that could be used in the classroom to teach geography. A total of 183 students left question 2 about webs for teaching geography blank. Only two people mentioned Google Earth. As regards the third question concerning specific applications, 11 students answered, 10 of whom mentioned Google Maps as apps. The eleventh student said they used GPS as an active member of the Geocaching community. This is a community which creates gymkhanas using GPS and which is based on a web for hiding and seeking "treasures" (http://www.geocachingspain.es/). It is geared towards leisure and free time. However, it has enormous educational potential and can be used to teach geography (Cardona, 2013).

The results highlight how unfamiliar the vast majority of students are with apps which might be used in education and even more so when it comes to teaching geography. This came as quite a surprise given that these students tend to be considered digital natives, and are assumed to be well acquainted with all the possibilities afforded by the use of mobile devices, something which is not borne out by the reality. This finding concurs with similar results we obtained in research conducted a few years ago (Calle, 2009) and ties in with the findings of other authors (Camacho, 2011). However, given the time period that has elapsed, almost ten years, we expected that the situation would have changed. The results highlight that being a digital native does lead to an extremely intuitive and efficacious use of IT tools on their part, yet it does not mean, in this particular instance, that they are familiar with apps that are useful for application in the classroom, and implies that they need guidance in order to become accustomed to using such resources.

Our conclusion is thus that the bulk of our students are not aware of how apps can be used for educational purposes. Amongst the students who confessed to not being acquainted with any apps, one pointed out that "I had not thought mobiles could be used to learn", while another stated that "they could not be used in the classroom". These answers reflect the belief that the use of mobile learning in the classroom might cause problems of discipline and lead to an improper use of mobile devices. Yet, as the studies carried out by Camacho (2011) have shown, use of mobile devices does actually foster learning, enhance motivation, and does mean that pupils continue to employ tools which can be put to other uses.

With regard to question 4, (Would you like to learn (more) about apps for use in your social science lessons?) virtually all the students (180 out of 185) said they would. Those who expanded on their affirmative answer stated that they would like to learn to use apps with a view to including them when designing their classroom activities. They also referred to their need to improve their professional skills, and to familiarise themselves with a greater range of resources so as to teach better, pointing out that they "want to be a better teacher" or "to get to know all the available resources".

In relation to the latter question (concerning which apps they would like to familiarise themselves with or to know better) only 50% answered, with most of the students expressing their desire to learn how to use computer games. What they wish to learn might be closely connected to the recreational domain although it does also reflect a desire to change with regard to a conventional approach to teaching and the desire to embrace innovative resources in their daily teaching practice.

3.2. Training experience with apps

In light of the results, we designed a procedure which entailed devising various practical activities involving the use and teaching application of Google Earth and Google Maps. Another practical exercise involved games using the Brújula digital app to enhance spatial awareness. Finally, we analysed webpages and apps for teaching geography.

4. CONCLUSIONS

The views expressed by these future teachers reflect their belief that the training experience they have undergone has benefitted them enormously. All the students felt that the training process had proved extremely valuable. They highlighted the fact that the practical work had given them "a fresh outlook on the use of mobile devices in the classroom", whilst others pointed to the applications as being "interesting, useful and fun". One key point stressed was the recreational aspect of the use of technology in the classroom.

They also stated that practical work of this nature had led them to reappraise their approach to geography, and that they now saw it as a "useful science", since what was learnt was then not just confined to the classroom but could be used in the outside world, in daily life.

Students felt that learning about and handling resources which go beyond the "conventional paper map and textbook formats" was extremely valuable. We consider that this will enable them to teach geography beyond what is merely spatial localisation. This experience has provided them with fresh insights into the possibilities which mobile learning can have for teaching, and has encouraged them to include apps in their future career as teachers.

This experience has also confirmed that students undergoing initial teacher training are extremely receptive to the use of new technologies and are open to working systematically with them, particularly when they come to view them as an aid to teaching curricular content, in this case geography.

Mobile learning and apps for teaching geography offer enormous potential, although many areas are yet to be explored. Such techniques can benefit the learning process and can help students to reappraise the contents of geography as a subject since they are seen to be of use outside the classroom. All of this helps the subject to be viewed in a more personal and real light.