# WHAT DO PRE-SERVICE TEACHERS REALLY KNOW ABOUT NEARBY ECOSYSTEMS? A CASE STUDY ABOUT THE TAGUS RIVER IN PORTUGAL

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## Abstract

The Tagus is one of the main rivers of the Iberian Peninsula, valuable due to its natural and cultural dimensions, but suffering from a variety of environmental problems. Education must play a role in this issue, since teachers are responsible for educating future generations in concern for our heritage. The objective of this study is to evaluate the elementary knowledge of pre service teachers about the Tagus River. The sample is composed of 95 of master's students, from three Higher Schools of Education: Lisbon, Santarém and Castelo Branco. The instrument for data collection was a questionnaire composed of closed and open questions. The results revealed that the majority of pre-service teachers do not give precise answers regarding the source of the river and, in several cases, even to its mouth, and they have a limited knowledge of the protected areas associated with it. In addition, they tend to ignore any aspect related to the river in the Spanish territory. They also have difficulties in identifying the values and functions of the river and its concrete environmental problems. These results evidence the need to cover the Iberian ecosystems in pre-service teacher training, to improve the knowledge of the territory and to motive teachers for its preservation.

***Keywords:*** Pre-service teachers, Tagus River, Nature heritage.

## Resumen

El río Tajo es uno de los principales ríos de la Península Ibérica, y aunque su importancia natural y cultural es indiscutible, sufre numerosos problemas medioambientales. Por ello la educación juega fundamental, ya que los maestros son los responsables de formar a las futuras generaciones que deberán conservar nuestro

patrimonio en el futuro. El objetivo de este estudio es evaluar el conocimiento básico que tienen sobre el río Tajo maestros en formación inicial. La muestra está compuesta por 95 estudiantes de máster de tres instituciones de Educación Superior portuguesas próximas al río Tajo: Lisboa, Santarem y Castelo Branco. El instrumento de recogida de datos fue un cuestionario compuesto por preguntas abiertas y cerradas. Los resultados revelan que la mayoría de los maestros participantes no proporcionan respuestas precisas en relación a su nacimiento y desembocadura, y poseen un conocimiento muy limitado de las áreas protegidas asociadas a este río. Además, tienden a ignorar cualquier aspecto asociado al río en territorio español. También tienen dificultades para identificar los valores y las funciones del río, así como problemas medioambientales concretos. Estos resultados evidencian la necesidad de abordar los ecosistemas ibéricos en formación docente para mejorar el conocimiento del territorio y promover su conservación.

***Palabras clave:*** Maestros en formación, Río Tajo, Patrimonio natural.

## Introduction

In the Spanish and Portuguese contexts, more concretely in Castilla-La Mancha and Lisbon, the Tagus river is a striking element in the landscape. However, pre service teachers often revealed restricted knowledge of the wetlands surrounding them, ignoring their values and functions, and a misunderstanding of how these ecosystems function (García, & Sánchez, 2017). And the Tagus River can be an important issue for a didactic approach, both inside and outside the classroom (García, & Sánchez, 2016).

To understand the functioning of ecosystems is a fundamental pillar of Education for Sustainability (UNESCO, 2009). That is why it is important to address this issue in teacher training, and to overcome pre-service teachers' misconceptions about the causes of environmental degradation of wetlands (Cardak & Dikmenli, 2016). And the Tagus River is a valuable ecosystem, affected by negative anthropogenic actions, both in Spain (Berzas et al., 2009) and in Portugal (Aguiar, & Ferreira, 2005). An example of this action is the change in hydrological flow due to the water transfer to the Segura River in Spain.

The value of the Tagus river is also associated with a historical and cultural dimension, which is related to human activities in its watershed (Ortega, & Del Valle,

2004). This enhances a didactic value that cannot be ignored by higher education institutions located close to its surroundings.

## Method

The present study sought to assess the students' knowledge about the Tagus River. It involved 95 master's students, average age 24.4 years old, attending three institutions for teacher training in Primary Education: 51 from the Lisbon School of Education, 11 from the Santarém School of Education and 33 from the Castelo Branco School of Education. Each institution offers very different numbers of vacancies, the main reason for the unequal number of students in the subsamples. The institutions are in cities located near the Tagus, Lisbon and Santarém, or relatively near, Castelo Branco, a city also fairly close to the Spanish border.

A questionnaire was given to all the students and its questions are listed in Table 1.

Table 1

*The questions included in the questionnaire about the Tagus River with its classification (closed or open).*

| Question | Nature |
|---|---|
| 1. Where is the source of the Tagus River? | Open |
| 2. Where is the mouth of the Tagus? | Open |
| 3. The Tagus river mouth type is a ria, a delta or an estuary? | Closed |
| 4. Into which body of water does the Tagus River flow? | Open |
| 5. Indicate five localities through which the Tagus flow. | Open |
| 6. Indicate protected nature areas along or near The Tagus River. | Open |
| 7. Indicate functions and values associated with the Tagus River, which can be covered on school curricula. | Open |
| 8. Indicate environmental problems of the Tagus River. | Open |

The questionnaire was validated by a group of experts and piloted on a group of students who did not make up the final sample. In the analysis of the answers, the absolute and relative frequency of the correct answers was calculated. In questions 7 and 8 the content analysis of the answers was carried out in order to group similar ideas.

## Results

Most students know that the Tagus River rises in Spain: 50 (98%) of the Lisbon students, 11 (100%) from the Santarém and 25 (75.8%) from Castelo Branco. But it should be noted that only 4 (12.1%) students from this last institution answered the exact place where this occurs, Serra de Albarracin. With respect to the location of the mouth of the Tagus, 45 (88.2%) of the Lisbon students, all of Santarém and 25 (75%) of Castelo Branco answered correctly. And the number of wrong answers in the Castelo Branco group had its highest incidence, 4 (12.1%) besides the number of students who did not answer the question: 4 (7.8%) from Lisbon and 4 (12.1%) from Castelo Branco. The students from this city, maybe due to its proximity to Spain, tend to know better where the river rises than where it flows into the sea.

Concerning the type of river mouth, the Lisbon students were the ones with more incorrect answers, since 11 (21.6%) opted for ria or delta. In relation to the name of the body of water where the river drains, the students from Santarém obtained the highest frequency of correct answers, 9 (81.8%), while those from Castelo Branco were the most imprecise: 10 (30.3%) only said into the sea or ocean. We should also stress the high number of students who did not answer this question, which may be related to a misunderstanding of the term “body of water”.

In relation to the localities through which the river flows, each group mainly pointed out locations closer to their own area, and several wrong places were mentioned by the students from the three groups. In terms of the number of localities, the Lisbon students, on average, indicated fewer. It should be noted also that only two students from Castelo Branco indicated Spanish localities, respectively, Toledo and Valencia de Alcántara.

The Lisbon students were the ones that perceptually listed fewer protected areas associated with the Tagus River, 46 (89.2%), and the other 5 (9.8%) only mentioned the Tagus Estuary Nature Reserve. Considering the other students, 21 (63.6%) from Castelo Branco and 6 (54.5%) from Santarém also failed to indicate any protected area. Even so, the protected areas mentioned were more diverse. For example one student from Santarém mentioned the International Tagus Nature Park and another the Boquilobo Bog Nature Reserve; among the Castelo Branco students, one mentioned the

International Tagus Nature Park and three the Naturtejo Geopark. Protected areas located in Spain were not mentioned by any student.

The students from the three institutions had difficulties in pointing out the functions and values of the river, the majority opting not to respond. Nevertheless, 14 (27%) of the Lisbon students highlighted habitat, 8 (15.7%), transport and 3 (6%) the energy production function. Those from Castelo Branco reported similar functions, respectively, with a frequency of 8 (24.3%), 2 (6%) and 2 (6%); and the Santarem students refereed only to the first two functions, with the frequency of 3 (27.2%) and 1 (9%).

In regard to values, the Lisbon students stated a more diversified range, emphasizing the cultural and ecological values with the same frequency, 11 (21.6%), followed by the economic value, 5 (9, 8%), and the environmental and landscape values, both indicated by 3 (5.9%) students each one. The Castelo Branco students also highlighted similar values, for with the ecological value the most cited by 7 (21.2%), followed by the environmental value by 3 (9%) and the cultural value by 2 (6%). The Santarém students had difficulties in answering this question, only marking the cultural, the ecological and the economic value, each one quoted by a different student.

Finally, with regard to environmental problems, the students generally pointed to pollution without specifying its causes.

## Discussion/Conclusions

The present study aimed to identify the students' knowledge about the Tagus River. The questions were elementary, so that errors and omissions are a worrying trend. They also tend to ignore any aspect of the river related to Spain, this situation being slightly less frequent with the Castelo Branco students.

It was considered that the students' failings are, at least partly, due to the absence of contextualized knowledge about the territory in the curricular units of the different curricular plans of higher school courses. This situation should be changed in the near future, since, as stated by Sánchez and García (2013), what is not known or understood can hardly be valued, and what is not valued can hardly be defended where preservation is endangered.

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# OUTDOOR EDUCATION AND INTERDISCIPLINARITY: A CONNECTION BETWEEN SCIENCE AND MOTHER TONGUE

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**Abstract**

The study plans of the courses for Primary School Teachers in the Lisbon Higher School of Education include a curricular unit designed "Projects of Curricular Integration between Science and Mother Tongue". Their main goal is to develop interdisciplinarity reflection, discussion and didactic proposals between these two subjects. In the final session of the unit, in the last two school years, a questionnaire about interdisciplinarity was administered to the 37 students that chose it, in order to identify, among other aspects, the advantages and potentialities of this type of knowledge articulation. Fourteen educational resources designed by the students to explore Nacional Tapada of Mafra were also analyzed. The results showed that the majority of the students tend to emphasize the importance of interdisciplinarity in promoting meaningful learning and in the perception that knowledge is interconnected. Concerning the educational resources, the students explore mainly scientific vocabulary and the use of description and expository text, regularly used in outdoor tasks.

***Keywords:*** Interdisciplinarity, Mother tongue, Science, Higher education.

**Resumen**

El plan de estudios de la titulación de Maestro en Educación Primaria de la Escuela Superior de Educación de Lisboa incluye una unidad curricular llamada “Proyectos de integración curricular entre ciencia y lengua materna”. Su principal objetivo es

desarrollar una reflexión interdisciplinar, discusión y propuestas didácticas entre estas dos materias. En la sesión final de esta unidad, durante los dos últimos cursos académicos, se administró un cuestionario sobre interdisciplinariedad a 37 estudiantes que eligieron cursar esta unidad curricular, con el objetivo de identificar, entre otros aspectos, las ventajas y las potencialidades de este tipo de articulación del conocimiento. Los estudiantes que cursaron la unidad curricular diseñaron un total de catorce actividades para explorar la Tapada Nacional de Mafra. Los resultados revelaron que la mayoría de los estudiantes tienden a enfatizar la importancia de la interdisciplinariedad para promover el aprendizaje significativo y la percepción sobre la interconexión del conocimiento. En los recursos educativos, los estudiantes exploraron fundamentalmente vocabulario científico y el uso de la descripción y del texto expositivo, frecuentemente empleados en tareas al aire libre.

***Palabras clave:*** Interdisciplinariedad, Lengua materna, Ciencia, Educación superior.

## Introduction

Since the end of the eighteenth century, the exponential increase of knowledge has led to a process of its fragmentation, increasing the number of scientific disciplines and their level of abstraction (Gusdorf, 1990). School has been following this trend of fragmentation and several new disciplines have been introduced on the curricula through time.

Several questions arise as the specialization of knowledge advances. Pombo, Guimarães, & Levy, (1993) points out that it becomes increasingly difficult to find answers to the new and complex issues faced by the world. And in school, the lack of articulation among subjects prevents a more holistic construction of knowledge, making it difficult to transfer ideas and concepts addressed in different subjects. Thus, the emergence of interdisciplinarity has been placed in schools as a necessity that allows to complement school subjects, to recover the concrete sense of things (Fazenda, 2008) and to make the curriculum more relevant for students (Jacobs, 1989).

In Portugal, in the context of the 1st cycle of primary school, the curriculum is organized around a set of areas: Mother Tongue, Mathematics, Study of the Environment, Artistic Expressions and Physical Education. Although this cycle is

ensured by a single teacher, curricular fragmentation is frequent due to the existence of separate moments for each area in the week schedule.

As a result of this situation, the Lisbon Higher School of Education has sought to promote interdisciplinary approaches inside its courses. A good example was the creation of the Master's Course in "Integrated Didactics in Mother Tongue, Maths, Science and Social Sciences, an innovative course in the Portuguese Context (see, Gonçalves, Almeida, Rodrigues, & Dias, 2015, for knowing its structure). But other initiatives can be cited, as the creation of the curricular unit called "Projects of Curricular Integration between Science and Mother Tongue" in the study plans of the courses that prepare teachers for Primary School.

Scientific knowledge has revealed a big potential to aggregate other areas of knowledge (Almeida, 2007). Stevens (2011) emphasizes the role of language in interdisciplinary approaches through literature, linguistics or thematic exploration. Thus, this unit articulates two areas of knowledge with an enormous interdisciplinary potential and intends to be a space for research, reflection and systematic debate on the identification of methodologies, working tools and contents which allow the development of integrated work proposals to be developed with pupils of the first six years of schooling. In this unit, among the topics of the syllabus, is discussed how language and science can be covered in the context of experimental work and outdoor activities.

## Method

The aim of this study was to identify the advantages derived from the existence of the curricular unit mentioned above. For this purpose, a questionnaire was built, with open questions to identify and analyze (i) the disciplines students consider more favorable to interdisciplinarity; (ii) the potentialities for the promotion of interdisciplinarity; (iii) the potentialities for the interdisciplinarity between Science and Mother Tongue.

The instrument was administered to 37 students (35 females), with an average age of 23.6 years, attending the unit in the two school years of 2016/2017 and 2017/2018.

The data were analyzed in a qualitative way and the answers were subject to content analysis and later categorization. After this process, the absolute and relative frequency of the responses included in each category was calculated.

Fourteen productions of the students (educational resources for primary students) were also analyzed, regarding the didactic exploration of the National Tapada of Mafra. This analysis intended to check the potential of outdoor activities in the field of the articulation between Mother Tongue and Science.

## Results

When questioned about the subjects which can facilitate interdisciplinarity, 23 (62,1%) of the students considered that all can have this role. Of the 14 (37.9%) students who highlighted concrete subjects, four mentioned two possibilities of articulation. Thus, six (14.6%) identified the articulation between Mother Tongue and Science; four (9.8%) highlighted Mother Tongue as an enhancer of interdisciplinarity; and three (7.3%) the articulation between Mother Tongue and History and Geography. The remaining subjects or articulations of subjects were: Mother Tongue and Drama; Science and Mathematics; History and Geography; Science; Mother Tongue and Mathematics, all mentioned by only one student (Table 1).

Table 1

*Articulations between subjects which facilitate an interdisciplinary approach mentioned by the students.*

| | **n** | **%** |
|---|---|---|
| All subjects can promote interdisciplinarity | 23 | 62.1 |
| Mother Tongue and Science | 6 | 14.6 |
| Mother Tongue | 4 | 9.8 |
| Mother Tongue, History and Geography | 3 | 7.3 |
| Mother Tongue and Drama | 1 | 2.4 |
| Since and Maths | 1 | 2.4 |
| History and Geography | 1 | 2.4 |
| Science | 1 | 2.4 |
| Mother Tongue and Maths | 1 | 2.4 |

[a] Four students report two pairs of subjects, so the number of responses exceeds the number of the sample.

The potential of interdisciplinarity (Table 2) is essentially centered on fostering an integrative and meaningful approach to knowledge (16 - 33.3%). Other students also mentioned that "it helps to outline concepts and knowledge" (9 - 18.3%). Other aspects highlighted the contribution of Mother Tongue to interdisciplinarity, such as its contribution to the "understanding of scientific texts" (7 - 14.6%) and to the "elaboration of textual genres of science" (7 - 14.6%), as is the case of reports, and expository, argumentative and instructional texts. They also stated it will be "easier to learn scientific language" (4 - 8.3%) and "others" (5 - 10.4%), which include potentialities as "motivation for learning", "better time management" and “helping outdoor activities".

Table 2

*Potentialities of interdisciplinary highlighted by the students.*

| | ***N*** | ***%*** |
|---|---|---|
| *Integrative and meaningful approach to knowledge* | *16* | *33,3* |
| *Helping to outline concepts and knowledge* | *9* | *18,8* |
| *Understanding of scientific texts* | *7* | *14,6* |
| *Elaboration of textual genres of science* | *7* | *14,6* |
| *Facilities to learn scientific language* | *4* | *8,3* |
| *Others* | *5* | *10,4* |

[a] 11 students pointed out more than one potentiality.

It was also intended to check the advantages of an interdisciplinarity approach between Mother tongue and Science, since this articulation was the focus of the curricular unit (Table 3). Thus, 21 (26.9%) students considered that the interdisciplinary involving these two subjects can develop "different perspectives of daily situations”. Other students considered that it can be an "easier way for learning concepts and problem solving" (15 - 19.2%). Another advantage mentioned was the promotion of a better "knowledge integration" (12 - 15.4%). The development of a "significant and global learning" (9 - 11.5%),” the promotion of knowledge acquisition" (8 - 10.3%) or "the promotion of motivation and interest" (5 - 6.4%) were other advantages added. In addition, other advantages included the promotion of cooperative work, the

development of critical thinking, the teaching of content in less time, and to allow a lifelong learning (8 – 10.3%).

Table 3

*Advantages of interdisciplinarity between mother tongue and science.*

| | n | % |
|---|---|---|
| Different perspectives of daily situations | 21 | 26,9 |
| Learning of the concepts and problema solving | 15 | 19,2 |
| Knowledge integration | 12 | 15,4 |
| Learning in a more holistic and significant way | 9 | 11,5 |
| Aquisition of knowlege | 8 | 10,3 |
| Motivation and interest | 5 | 6,4 |
| Others | 8 | 10,3 |

[a]All the students listed more than one advantage.

After the analysis of the educational resources, it was possible to check that, at the level of language learning, the performance descriptors most mobilized by the students were the exploration of the specific vocabulary, which gains a scientific character in the context of science, as well as the exploration of textual genres that best fit the work with this area of knowledge, namely the news, the description and the expository text, regularly used in outdoor tasks. Research and information recording were also descriptors used for preparatory tasks, which help primary students in knowledge building.

## Discussion/Conclusions

The present study is a contribution to assess the curricular unit "Projects of Curricular Integration between Since and Mother Tongue". The students who attended it could enumerate a set of advantages associated to an interdisciplinary practice, in general, and to the articulation between Science and Mother Tongue, in particular. Nevertheless, the majority of the students expressed the idea that interdisciplinarity can be fostered among any areas of knowledge, which shows that students were not particularly conditioned or influenced by the articulation developed in the unit. The outdoor contexts seem to be effective for the articulation between Mother Tongue and Science, since students were able to use contents of both areas of knowledge in the design of educational resources.

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