



## Investigating Science Education in the context of International Cooperation for Development: the case of the Portuguese public higher education institutions

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### Abstract

*Presently we are experiencing the globalization of development and education. In the past years more and more higher education institutions (HEIs) from developed countries have been collaborating with institutions from developing states, by ministering specific training programs for diverse professionals, such as (future) teachers.*

*Within this backdrop the presented research aims to describe the global scenario considering the international cooperation of Portugal by identifying and describing the main characteristics of the protocols involving science and which were established between Portuguese public HEIs and institutions of five African countries as well as East-Timor. Data is being gathered by content analysis of the information available at the official web sites of the Portuguese institutions and also by personal contact with key-informants, whenever it is necessary.*

*Descriptive statistical analysis of the data that has been gathered so far indicates that Portugal has apparently been investing equitably in different knowledge areas. Nearly half of the identified cooperation protocols involve working in science, being mainly in scientific education (and not research). Within this context 26,47% of the protocols correspond to science teacher training programmes, mainly from secondary or pre-secondary level. Finally obtained outputs indicate that Portuguese HEI have been collaborating more intensively with Cape Verde, Mozambique and Angola, and that these collaborations rarely involve only one scientific area per protocol.*

*Even though the research is still in progress, it is believed that it constitutes a crucial milestone towards improving the quality of education at global level, since outputs may serve as a primer for further reflection on the major strengths and challenges of transnational science education. It is aimed that the research findings of the follow up work will contribute to more informed actions considering further investments in global (science) education, like it is aspired by the target 4.C of the recently approved Sustainable Development Goals (SDGs).*

## 1. Research on teaching and learning in the context of International Cooperation for Development (ICD)

### 1.1. Brief state of the art

Growing cooperation at international level is both a consequence and promoter of globalization [1, 2]. Among the various forms of cooperation are included many cross-border protocols aimed at helping developing countries to build more sustainable societies [3,4]. More and more HEIs in developed countries are required to deliver programs aimed at assisting in the (re)construction, maintenance and assessment of educational systems [5].

Although the central motivation of these programs is the development of the professionals from the country receiving the training, some studies report that they entail reciprocal advantages for the trainers/teachers [2,3,6]. Teaching in another country can be a very rich learning experience: it promotes the teachers' flexibility, as well as his/hers meta-cognitive skills, having a positive impact on teaching practices [5,7,8]. Finally these protocols also contribute to enhance the diplomatic relations between the participating countries and to geminate their cultures.

Although the training initiatives in ICD are growing, the information and knowledge that results from it continues to be scattered and isolated, since there is still lacking a global strategy of researching and disseminating this domain of education [9]. The sparse existing research mainly concerns the HEIs of Australia [3], United Kingdom, New Zealand and United States of America [7,8,9]. On what concerns to Portugal there is also a lack of systematized knowledge [2,10].



## 1.2. The potential of the Portuguese speaking community towards ICD

Portugal has a long tradition of cooperating with the PALOP countries and also with East – Timor. This can be related to historical reasons. In fact, the Portuguese presence in these countries can be traced back to the beginning of the age of discovery (15th and 16th centuries), when this European Kingdom successfully build a large maritime empire across Africa and Asia, contributing actively to the first global mapping of the world [1].

These five centuries of hegemony and political and commercial influence over large foreign regions, with wide cultural and racial mixing almost everywhere, led to a vast Portuguese speaking community. Presently there are around 244 million Portuguese speakers around the world<sup>1</sup>, sharing also socio-cultural practices, commonly known as *Lusophonia* [12], with reflections at institutional level [10] and therefore great potential for boosting ICD in (teacher) education.

## 3. The present research

### 3.1. Main rationale

The need of further investment in the quality of global education is stated in the target 4.c of the recently approved Sustainable Development Goals (SDGs), namely the need in increasing the supply of qualified teachers, through international cooperation for teacher training programmes [13].

Acknowledging the importance of Science Education towards development [14,15] it urges to look closer at the global scenario of science education programmes involving protocols between Portuguese HEIs and African, as well as East Timorese, institutions. Considering this aim specific research milestones were defined:

- i) to constitute a national data base using SPSS version 21® including the protocols of all public Portuguese HEIs (universities and polytechnic schools) with five PALOP countries (Angola, Cape Verde, Guinea-Bissau, Mozambique and São Tomé and Príncipe) as well as East–Timor in the context of ICD;
- ii) to analyse the protocols that involve collaboration in science (in its theoretical or applied dimension) considering its finality, namely research or education;
- iii) to analyse the protocols in science education attending to the scientific area as well as academic level of the education/training program. Among this analysis particular attention is given to the programmes that involve the education/training of pre or in service science teachers.

Once the statistical analysis of the data base is concluded it is intended to use the obtained information to sustain the design of a research strategy with a more qualitative approach. A list of activities from at least four HEIs (two universities and two polytechnic schools) will be selected in order to constitute a multi case follow up research. The aim is to investigate the major strength and challenges associated to the design and implementation of science teacher education programmes in the context of ICD.

### 3.2. The construction of the data base

#### 3.2.1. Main procedures taken so far

The operationalization of the defined research milestones implied several decisions. The description of these procedures is crucial in order to allow other scholars to ‘replicate’ the adopted methodology and therefore open the opportunity to do comparative studies [11,12].

First, the list of public Portuguese HEIs was accessed at the portal of the Portuguese Ministry of Science and Education<sup>2</sup> in order to identify the present research universe. This list entails a total of 172 organic units (such as faculties, institutes and departments). Considering the need in obtaining a global picture of each higher education subsystem (university and polytechnic), as soon as possible, it was decided to start gathering information only for the universities. After completing this sub-universe, the researchers will replicate the strategy for the Portuguese polytechnic subsystem.

The official list entails a total of 15 Portuguese public universities with a total of 77 functional subunits. For each university, data is being gathered by accessing the official website of the institutions, using key words such as: “Cooperation for development”; “International Cooperation” or “International

<sup>1</sup> <http://observinglinguaportuguesa.org/>

<sup>2</sup> <http://www.dges.mctes.pt/DGES/pt/Estudantes/Rede/Ensino+Superior/Estabelecimentos/Rede+Publica/>



Projects". In order to avoid random lacking of information, due to possible incompatibilities with the technologic applications used at each site, the most updated version of one internet browser is being used. Whenever it is necessary, the researchers contact, by e-mail or by phone, key-informants to obtain complementary data.

So far, a total of 85 protocols of public and private institutions from the cooperating countries were identified. In total six Portuguese public universities are responsible for these protocols. Protocols that ended before 2000 were excluded. From the 85 consulted protocols that were analysed so far, 47 (55,3%) were coded as being related to sciences (Biology, Chemistry; Geography; Geology, Mathematics and Physics, in its theoretical or applied dimension). This means that, nearly half of the considered protocols, namely 44,7% do not include science education or research, being related to domains such as promotion of the Portuguese language, support to services (for example in justice, finance or health), art or other cultural activity. It is important to notice that protocols including only mobility of international students to the Portuguese HEI were excluded. On contrary, considering the research rationale, protocols involving mobility of Portuguese researchers/teachers (in sciences) were considered.

The coding process has been more time consuming than initially thought, due to several constraints, such as the high diversity of universities in organizing the available information at their web site, delaying the localization of the data in need; as well as difficulty in contacting key-informants for each protocol of cooperation. Even identified key-respondents frequently do not have the information in an organized way.

### **3.2.2. Science education in the context of ICD: a preliminary scenario**

Presented findings are only preliminary, since they report work in progress, not including the protocols from all 15 Portuguese public universities. As previously mentioned, from the 85 consulted protocols 47 (55,3%) were coded as being related to science(s). Concerning the cooperating countries in the considered scientific areas, it seems, so far, that Portuguese public universities are particularly active in Cape Verde (with 15 protocols), Mozambique (13 protocols) and Angola (12 protocols).

Within these protocols related to cooperation in science(s), the majority have education as finality (n=34). More than half of those (n=21) correspond to programmes associated to a bachelor/first cycle degree. So far no collaboration at doctoral level was identified. Regarding the remaining 13 projects, seven cases are related to the development of specific research projects<sup>3</sup>, while other six remain uncategorized, due to delayed information supply.

Focusing on the science education protocols involving specifically pre or in service science teachers, analysis reveals that from 34 protocols, nine involve training programmes of science teachers in academic context (bachelor/graduation level n=5; master level n=1), while three correspond to modular/shorter in service training, not associated to the achievement of an academic degree.

Considering the scientific domain, six of the analysed science teacher training protocols involved the mobility of Portuguese teaching staff from more than one domain (for example Biology, Mathematic, Chemistry and Physic) to the cooperants institutions, where they ministered specific contents at course level. So far, only one specific case was identified where the Portuguese(s) trainer(s) was/were responsible for teaching mathematical contents at a specific curricular unit not directly associated to the global domains of Biology, Chemistry; Geography; Geology, Mathematics or Physics. In this case the protocol involved teaching Mathematics for future teachers of a master course in mechatronic engineering.

Finally, the countries with more protocols of science teacher training programs are Cape Verde (n=3) and East – Timor (n=3), followed by Mozambique (n=2) and Angola (n=1).

## **4. Final comments**

The data base under discussion is still being elaborated. However, it is already evident that Portuguese HEIs are indeed projecting their activities at international level. The mean value of protocols per university is over ten, and nearly half of them are in science education. Moreover, science teaching programs seem to be a frequent strategy for collaboration between Portugal and the

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<sup>3</sup> Considering collaboration in sciences through research, some protocols were excluded since they did not present the characteristics of cooperation towards development [16], in the sense that the non-Portuguese cooperants were not active researchers or researchers in training of the project, but 'only' beneficiaries.





PALOP countries, as well as East-Timor. Therefore it is believed that the outputs of the planned follow up work will give valuable insights considering the (quality) of transnational science education.

## References

- [1] Albergaria Almeida, P.; Martinho, M. & Lopes, B. (2013). Teacher Professional Development in the context of International Cooperation: opportunities and challenges. In Y. Bashevis & Y. Weidenseld (Eds.) *Professional Development: Perspectives, Strategies and Practices* (147-167). New York: Nova Publishers.
- [2] Baker, J. (2000). *Evaluating the impact of development projects on poverty – a handbook for practitioners*. Washington: The World Bank.
- [3] Dunn, L. & Wallace, M. (2006). Australian academics and transnational teaching: an exploratory study of their preparedness. *Higher Education and Research Development*, 25:4, 357-369.
- [4] van der Wende, M. (2007). Internationalization of Higher Education in the OECD countries: challenges and opportunities for the coming decade. *Journal of Studies in International Education*, 11, 247-289.
- [5] Waterval, D.J.G.; Frambach, J.M., Driessen, E.W. & Albert, J.J.A. (2014). Copy but not paste: a literature review on crossborder curriculum. *Journal of Studies in Higher Education*, 1 – 21.
- [6] Albergaria-Almeida, P., Lopes, B., Martinho, M., & Capelo, A. International Cooperation in Education: in-service teacher training in East Timor. *The International Journal of Learner Diversity and Identities*. 19(3), 11-25.
- [7] Hamza, A. (2010). International experiences: an opportunity for professional development in Higher Education. *Journal of Studies in Higher Education*, 14:1, 50-69
- [8] Smith, K. (2014). Exploring flying faculty teaching experiences: motivations, challenges and opportunities: *Studies in Higher Education*, 39:1, 117-134.
- [9] Vincent-Lacrine, B. (2007). Developing Capacity through cross border tertiary education. In R. Kagia & B. Ishinger (Eds.). *Cross Border Tertiary Education: a way towards capacity development* (4-37). Paris: OECD/World Bank.
- [10] Sangreman Proença, C. & Santos, T. (2012). Os paradigmas de conhecimento sobre a cooperação internacional para o desenvolvimento e a evolução do papel da sociedade civil em Portugal. [Knowledge paradigms about international cooperation for development and the evolution of the role of civil society in Portugal]. Paper presented at the 1<sup>st</sup> conference “Cooperation and Knowledge”, 6<sup>th</sup> July 2012, INA & ISCTE-IUL, Lisbon, Portugal.
- [11] Silva Lopes, B.; Callapez, P.M. & Gomes, C. (2012). The importance of the historical and scientific legacy from the colonial age in education in natural sciences in portuguese-speaking african countries (PALOP). Paper presented at the 2<sup>nd</sup> COOPEdu Conference Africa and the World, 5<sup>th</sup>-6<sup>th</sup> July, ISCTE – IUL, Lisbon, Portugal.
- [12] Mariel, C.L.F. (2010). The construction of a lusophone community from the ancient centre: micro communities and practices of lusophonia. [A construção da comunidade lusófona a partir do antigo centro: micro-comunidades e práticas da Lusofonia]. Tese de doutoramento não publicada. Universidade Nova de Lisboa. Portugal
- [13] United Nations Department of Economic and Social Affairs (2015). *Sustainable development Goals – SDGs*, available at: <https://sustainabledevelopment.un.org/topics> (consulted at 26th October 2015).
- [14] Martins, I.P.; Pedrosa, M.A.; Ferreira, A.J. & Simões, M.O. (2014). Chemistry and Education for sustainability: foundations and curricular proposals for East Timor; *Educació Química EduQ*, 17: 20-29.
- [15] Hodson, D. (2003). Time for action: science education for an alternative future. *International Journal of Science Education*, 36:6, 645 – 670.
- [16] Cangas, A.H.; Parshotam, A. & Helly, D. (2015). The role of Europe in the implementation of the global development agenda pos 2015 – EPDCM Background note. Paper presented at the Conference “Is Global Development Achievable?”, 13<sup>th</sup> October 2015, Orient Museum, Lisbon, Portugal.