

1 - INTRODUCTION

In-service training should lead teachers to develop and update the knowledge-base acquired during initial teacher education and to fulfil their professional needs.

This raises questions about the consistency between: i) teachers' needs and the in-service training courses provided by Higher Education Institutions (HEI) and School Network Training Centres (SNTC); ii) in-service courses and the science education research agenda.

2 - OBJECTIVES OF THE STUDY

How does the set of in-service courses provided to science teachers cover:

- the diverse teacher education knowledge components?
- nowadays science education research agenda?

How do courses offered by HEI and by SNTC compare with regard to fitting the diverse teacher's knowledge components and the science education research agenda?

3 - THEORETICAL BACKGROUND

The development of teachers' relevant teaching competences starts in pre-service teacher education.

The Portuguese law (since 2007) states that initial teacher education must include six training components: subject knowledge; pedagogical content knowledge (PCK); general educational knowledge; educational research knowledge; cultural, social and ethics knowledge; teaching practice.

These initial teacher education components:

- Are consistent with science teacher education specialists points of view;
- Encompass a diversity of types of knowledge that any science teacher should hold;
- Introduce prospective teachers to issues that any science teacher needs to be able to deal with.

However:

- Initial science teacher education programmes are not enough to lead to a good level of professional development;
- Subject knowledge (that is, science knowledge) is dynamic and its learning is a never ended process;
- PCK (that is, science education knowledge) is continuously being updated.

Portuguese teachers are obliged to take in-service training courses focusing on:

- Subject knowledge and in subject PCK (a minimum number of credits is required)
- Other education relevant issues

In-service training courses may be post-graduation programmes or in-service short courses.

In Portugal, in-service short courses are organised mainly by

- Higher Education Institutions
- School Network Training Centres

In-service training should lead teachers to:

- Develop and update the knowledge-base acquired during initial teacher education
- Fulfil teachers' professional needs
- Give a contribution to teachers' identities

In-service courses for teachers are often organised from:

- Teacher educators' own interests
- Teachers' perceived needs

Assuming that science teachers may be unaware of some specific own needs and may not feel the need of unfamiliar issues, three questions may be raised:

- How consistent are science teachers' needs and the in-service training courses provided to them?
- How consistent is the set of in-service teacher training courses and the science education research agenda?
- Are HEI science teacher in-service training courses more updated than the SNTC ones?

4 - METHODOLOGY

Geographic area: North of Portugal

Courses provided by HEI and SNTC: 3106

Courses selected to be analysed: 1383

- Courses that are relevant to a science teacher, focusing on:
 - science content knowledge themes;
 - science education themes;
 - general educational issues (e.g., assessment, special educational needs), relevant to a science teaching;
 - cultural, social and ethics themes;
 - educational research issues;
 - teaching practice issues.

Table 1
In-service courses offered and analysed, by type of training institution

Training Entity	TC in website (n=3106)		TC analysed (n=1383)	
	f	%	f	%
HEI	430	13,8	184	13,3
SNTC	2676	86,2	1199	86,7

5 - RESULTS

Table 2
Focus of the training courses per type of training institution (N=1383) - %

Focus of the Training Courses		HEI (n=184)	SNTC (n=1199)
Specific Issues	Science themes	14,1	1,6
	Science Education themes	23,9	22,2
General Issues	General Educational issues	55,4	66,1
	Cultural, Social and Ethics themes	3,8	6,2
	Educational research issues	1,1	0,1
	Teaching Practice issues	1,7	3,8

Table 3
Science scope of the content knowledge training courses (N=45) - %

Science scope	HEI (n=26)	SNTC (n=19)	Examples of training courses themes
Science	30,8	21,1	Contemporary science themes; Earth and life science topics
Biology	11,5	26,3	Ethnobotanics; Mycology & environment
Chemistry	3,9	5,2	Biodiesel production; Chemistry, Health and environment
Geology	19,2	26,3	Viana do Castelo geologic Patrimony; Geology and sustainability
Physics	34,6	21,1	Topics and history of astronomy; Sound and light waves

Table 4
Focus of the science education training courses (N=310) - %

Science Education issues	HEI (n=44)	SNTC (n=266)	Examples of training courses themes
ICT in Sc. Education	13,6	23,3	ICT in science teaching
Practical work	27,3	17,7	Lab. activities in science teaching; The Penha mountain as a Geology teaching resource
Health Education	20,5	39,8	Sex education in school context; Health education in school for tobacco prevention.
Environmental Educ.	6,8	8,6	Biodiversity, nature conservation and environmental education
PBL of science	9,1	0,4	The learning of science and geography through PBL
STS	2,3	0,8	Applying STEM in the classroom
History of science	4,5	0,0	History of science in science teaching
Science curricula	6,8	3,0	Teaching and learning about Environment and Geography and the horizontal and vertical curriculum articulation
Sc.teach.approaches	9,1	4,5	Sound and light: possibilities in the classroom; Physical Sciences: a modern and global approach
Other	0,0	1,9	Science and mathematics teaching strategies able to promote success and inclusion in the classroom

Table 5
Focus of the general Education training courses (N=895) - %

General Educational Issues	HEI (n=102)	SNTC (n=793)	Examples of training courses themes
Curriculum development	4,9	0,5	Curriculum horizontal and vertical articulation
ICT	20,6	40,5	Exploration of educational software: Movie Maker
Sp. Educ. Needs	5,9	12,1	Improving educ. practices for students with SN
Learning difficulties	7,8	8,4	Learning difficulties and educational success
Teacher characteristics	0,0	1,8	The importance of voice and corporal posture in the teaching profession
School management	25,5	12,2	School management
Assessment	14,7	11,9	Students' learning assessment; Supervision and assessment of teacher performance; Schools self-assessment and educational project
Students' misbehaviour	0,0	8,7	Misbehaviour in the school
First aid	0,0	1,4	The basics of first aid in the school context
Educational mediation	20,6	2,5	Conflicts mediation in the school community

6 - CONCLUSIONS AND IMPLICATIONS

SNTC offer 6 times more courses than HEI.

In-service training short courses offered by both types of training institutions focus on the diverse teacher education components **but**:

- they tend to concentrate on General Educational issues
- they are not covered by the two types of training institutions

HEI offer more Content knowledge (science) courses while SNTC offer more General Education courses

HEI offer larger % of courses on Physics and Science **while** SNTC offer larger % of courses on Biology and Geology

HEI surpass SNTC on Practical Work and on PBL **while** SNTC surpass HEI on Health Education and ICT in Sc. Educ.

Some Science Education issues are very popular for SNTC: Health Education (106 / 266 courses); ICT in Science Education (62 / 266 courses)

The number of Content knowledge and Sc. Education courses is lower than the number of General Education courses.

The amount of courses available in the diverse components may lead teachers to take courses on issues that may not be the most relevant for fulfilling teachers' felt needs – they may just take what is offered to them.

7 - BIBLIOGRAPHY

- Castro, R. (2015). Teacher education in Portugal: a history of transitions. In L. Leite, M. Flores, L. Dourado, M. Vilaça & S. Morgado (Orgs.), Proceedings of the ATEE annual conference 2014 - transitions in teacher education and professional identities (pp. 3-14). Brussels: ATEE
- Crawford, R. (2014). A pedagogic trinity: exploring the art, craft and science of teaching. *Journal of Pedagogic Development*, 4(2), 77-84.
- Gil-Pérez, D. (1991). ¿Qué han de saber y saber hacer los profesores de ciencias? *Enseñanza de las Ciencias*, 9(1), 69-77.
- Shulman, L. (1986). Those who understand: knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.