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Students′ and teachers′ perspectives about quality of engineering education in Portugal

Cristina G. Oliveira [a] , Paulo C. Oliveira [b] & Nilza Costa [a]

[a] Universidade de Aveiro, Campos Universitário de Santiago, 3810-193, Aveiro, Portugal

[b] Instituto Superior de Engenharia do Porto, Rua Dr. António Bernardino de Almeida, 431, 4200-072, Porto, Portugal

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Students' and teachers' perspectives about quality of engineering education in Portugal

Cristina G. Oliveira[a]*, Paulo C. Oliveira[b] and Nilza Costa[a]

[a]*Universidade de Aveiro, Campos Universitário de Santiago, 3810–193 Aveiro, Portugal;* [b]*Instituto Superior de Engenharia do Porto, Rua Dr. António Bernardino de Almeida, 431, 4200–072 Porto, Portugal*

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Quality in higher education is a subject of increasing importance. This idea can be supported by looking at different sources, namely, the scientific literature, national and transnational governments' policies, such as those emerging from the Bologna Process. Also, the internationalisation of higher education and, within it, students' and staff mobility among institutions, has brought to the agenda the quality issue, particularly with regard to the teaching and learning process. Several authors argue that the meaning of quality depends on who defines it. This article focuses on a study that looks at how teachers and students in higher education institutions, in Portugal and in the domain of Engineering, see the quality issue. Data was collected through interviews to teachers (six) and students (38) in two different Portuguese institutions. The results indicate that, although teachers and students refer to the same dimensions that influence quality, they have different perspectives about their importance. From the point of view of the authors, this discrepancy requires some pedagogical actions in the context where the study was developed and, also, further research to see if the same tendency exists in different settings.

Keywords: higher education; teachers' and students' perspectives; quality of education; engineering education

Introduction

In Portugal the number of students in higher education (HE) has rapidly increased in the last 30 years: starting from around '30,000 students in the sixties, to nearly 400,000 students by the end of the 20th century' (MCTES 2006). Also, the number of HE institutions has increased; nowadays, there exists more than 150 (MCTES 2006). With this huge expansion a phenomena has emerged: the need to look at the quality of HE. This phenomenon is, however, not only national but it is a global one. In fact, in many countries the number of students in HE has increased and also has changed in profile. To respond to this, several governments have needed to create different types of institutions, different study programmes and also different forms to guarantee their quality (El-Khawas 1998, Yang 2004).

On the other hand, HE nowadays faces new challenges as a consequence of the existence of a global market, internationalisation and social and technology evolution (Pile *et al*. 1997,

*Corresponding author. Email: cgoliveira@ua.pt

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Woodhouse 1999). Furthermore, the internationalisation of education and the individual mobility assured by international agreements force the definition and implementation of criteria that ensure quality in those processes.

Harvey and Green (1993), in their pioneering paper, explore the nature and the use of the concept of quality in HE. In their work they present five categories or perspectives of quality:

- Quality as exceptional – this approach is the traditional view of quality. Quality is referred to as something special and can only be achieved by the elites.
- Quality as perfection or consistency – this approach defines quality as a consistent flawless outcome or perfection and, if consistent, it can be achieved by all.
- Quality as fitness for purpose – this approach defines quality in terms of fulfilling a customer's requirements, needs or desires. In education, fitness for purpose is usually based on the ability of an institution to fulfil its mission.
- Quality for money – this approach defines quality in terms of return on investment. If the same outcome can be achieved at a lower cost, or a better outcome can be achieved at the same cost, then the 'customer' has a quality product or service.
- Quality as transformation – this approach defines quality in terms of 'qualitative change' or transformation. The transformation refers to the enhancement and empowerment of students or the development of new knowledge.

The word 'quality' started to be used in contexts of engineering, especially in manufacturing and production engineering, but, in the last few years, quality processes have expanded to include services and public sectors. In education, in particular in HE, an approach that has gained relevance is the 'stakeholder approach' (Watty 2006). This approach implies different perspectives on what is quality that reflect the differing opinions of different stakeholders. Thus, when one tries to answer the question 'What is quality?', one knows that the answer will depend on who is responding because each stakeholder has his/her own definition (Vroeijenstijn 1995). Thus, it can be asked: What is quality in HE?

Vroeijenstijn (1995, p. S60) defines quality as:

> '(…) a very complex concept. We cannot speak of "quality"; we must speak of "qualities". We must distinguish requirements set by the student, the academic world, professional bodies, the labor market, society, and government. Not only are there different qualities; but also there are different aspects of quality'.

Many other authors define quality and all agree that the term 'quality' is rather complex (Woodhouse 1999). Quality is: 'the most complex, multi-dimensional concept that has ever been reduced to seven letters (…) quality is impossible to define, but we recognise it when we see it' (Clemet 2003).

With the same idea, Giertz (2000, p. 296) wrote:

> 'To define what is meant by quality is easier said than done. Everyone who has tried knows that it is difficult to catch its full meaning in a few words or a short description – or even to give any satisfactory descriptions at all'.

Despite all the difficulties in defining quality, UNESCO published *The World Declaration on Higher Education*, in 1998, and in its 11th Article defines quality in HE as: 'a multidimensional concept, which should embrace all its functions, and activities: teaching and academic programmes, research and scholarship, staffing, students, buildings, facilities, equipment, services to the community and the academic environment' (UNESCO 1998, p. 7). In the same article, the process of quality evaluation is referred to in the following terms:

> 'Internal self-evaluation and external review, conducted openly by independent specialists, if possible with international expertise, are vital for enhancing quality. Independent national bodies should be established and comparative standards of quality, recognized at international level, should be defined. Due attention should be paid to specific institutional, national and regional contexts in order to take into account diversity and to avoid uniformity. Stakeholders should be an integral part of the institutional evaluation process'. (UNESCO 1998, p. 7)

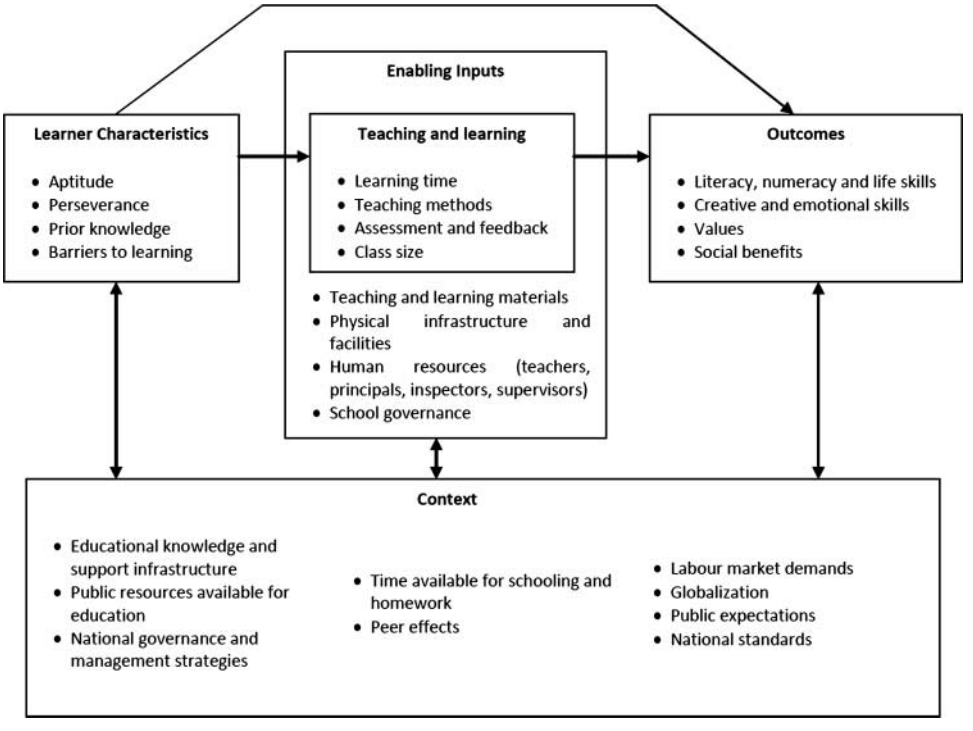

Figure 1. A framework for understanding education quality (adapted from UNESCO 2004, p. 36).

Later, in 2004, UNESCO, by Vlãsceanu and colleagues, redefined the concept of quality in HE by strengthening their multi-dimension characteristic according to the point of view of the different stakeholders:

> '(Quality is) a multi-dimensional, multi-level, and dynamic concept that relates to the contextual settings of an educational model, to the institutional mission and objectives, as well as to specific standards within a given system, institution, programme, or discipline. Quality may thus take different meanings depending on: (i) the understandings of various interests of different constituencies or stakeholders in Higher Education (quality requirements set by student / university discipline / labour / market / society // government); (ii) its references: inputs, processes, outputs, missions, objectives, etc.; (iii) the attributes or characteristics of the academic world which are worth evaluating; and (iv) the historical period in the development of Higher Education'(Vlãsceanu *et al*. 2004, p. 70).

In order to guide monitoring and the improvement of quality of education, UNESCO (2004) proposes a framework (see Figure 1). This framework illustrates how to organise and understand the various dimensions involved in the quality of education and how they interact with each other. Figure 1 shows that this framework involves the following dimensions:

- Learner characteristics – the way people learn is influenced by their capacities and experiences. In order to improve quality of education, one must pay attention to the characteristics of learners.
- Context – society and surroundings have a direct influence on the motivations of all the stakeholders involved in the process of education. In order to promote quality, this influence must be taken into account.
- Enabling inputs – which stresses that the success of teaching and learning depends on the available resources (human and physical) to support the process and how they are managed.
- Outcomes – the outcomes of education should be assessed in the context of its agreed objectives.

In summary and despite the different definitions one can find in the literature, quality in general and quality in HE in particular:

- is a complex concept, not easily defined;
- its definition depends on the point of view of who defines it and so one may better talk about 'qualities';
- has several dimensions. Taking on board UNESCO (2004), quality in HE needs to be thought of in terms of the context, students, enabling inputs related to the teaching and learning process and outcomes;
- needs to be evaluated and monitored in order to be achieved.

Within the background summarised above, this paper reports a study in which six university physics teachers and 38 students of the first year of engineering courses were interviewed in order to understand the way they define the quality of education. This study is part of a PhD project, by the first author of this paper, which aims to promote the quality of the teaching and learning process in introductory physics courses of Engineering Degrees.

The context of the study

In order to enrich what the literature says concerning the quality of education in HE, the authors undertook an empirical study involving two kinds of participants: HE teachers and students involved in introductory physics courses of Engineering Degrees (first cycle). The technique used to collect data was, in both cases, inquiry by interview. The specific aims of the interviews were: (1) to understand teachers' and students' perspectives about the concept of quality of education and the learning and teaching process; (2) to characterise possible differences in teachers' and students' perspectives. In this work, only the results about quality of education are presented.

The study with teachers was conducted, during the academic year 2006–2007, involving six university teachers (represented herein by T1–T6) from two different universities in Portugal. Three of them are from Oporto University, a classic university in the north of Portugal, and the others three from Aveiro University, a new university in the centre of the country. All of them were physics teachers and taught introductory physics to engineer students.

The study with the students was conducted in the academics years 2006–2007, 2007–2008 and 2008–2009, involving 38 students (represented herein by S1–S38) from two different institutions of HE; 18 from Oporto and 20 from Aveiro. The students were all from the first year of Engineering and were attending an introductory physics course.

The transcriptions of teachers' and students' interviews were validated by them. The data were analysed by content analyses with QSR NVivo 7 software.

Results and discussion

From the content analysis, both in teachers' and students' interviews, three main dimensions have been identified as influencing quality: teachers; students; institution.

For the teachers' interviews, those three dimensions are defined as follows:

- Students' dimension – all excerpts of the interviews in which teachers reported that the quality of education is related to students were included. This dimension was divided into three categories: motivation; self-study; development of skills.

  The category 'motivation' included the excerpts where teachers said that students need to have

motivation to learn. The category 'self-study' included the excerpts where teachers said that students need to have ability to study by themselves. Finally, the category 'development of skills' included all the excerpts where teachers said that to have quality in education it is necessary that students develop skills such as the ability to solve problems, critical thinking, reasoning and lifelong learning.

- Teachers' dimension – this dimension included all replies in which teachers reported that quality in education is related to them. This dimension was divided into five categories: explain well; relationship with students; ability to motivate; pedagogical approach; relevant content. The first category, 'explain well', included the replies where teachers said that they need to be well organised and explain the contents clearly. The category 'relationships with students' included the replies where teachers said that it is necessary to have a friendly environment in the classroom, so that students feel comfortable to participate and ask questions. The category 'ability to motivate' included all the opinions where teachers said that it is necessary to motivate the students so they have interest in the contents covered and be engaged in their learning process. The category 'pedagogical approach' included all the replies where teachers stated that it is necessary to use different approaches and strategies to promote the participation of students in their learning process. Finally, the 'relevant content' category included the replies where teachers said that it is important that the subjects covered in the courses are related to real world; in particular, with contexts close to the future students' professions.
- Institutional dimension – this dimension includes all replies that are related to the institution. This dimension was divided into two categories: conditions; well-defined objectives and assessment criteria. The category 'conditions' included all replies where teachers said that quality of education was related to the conditions of the institutions, such as good classrooms, laboratories and libraries. The 'well-defined objectives and assessment criteria' category included the replies where teachers stated that, to have quality in education, it is necessary to define the objectives and the assessment criteria that will be used in the course. This category was included in the institutional dimension because objectives and the assessment criteria are usually defined by the programme director at a more institutional level.

Figure 2 summarises the dimensions, categories and the results found for each. The number of teachers whose answers were included in each dimension and category are shown in parentheses.

From Figure 2 it can be seen that all teachers interviewed said that quality of education depends both on 'teachers' and 'students'. The 'development of skills' by the students and the 'relationship'

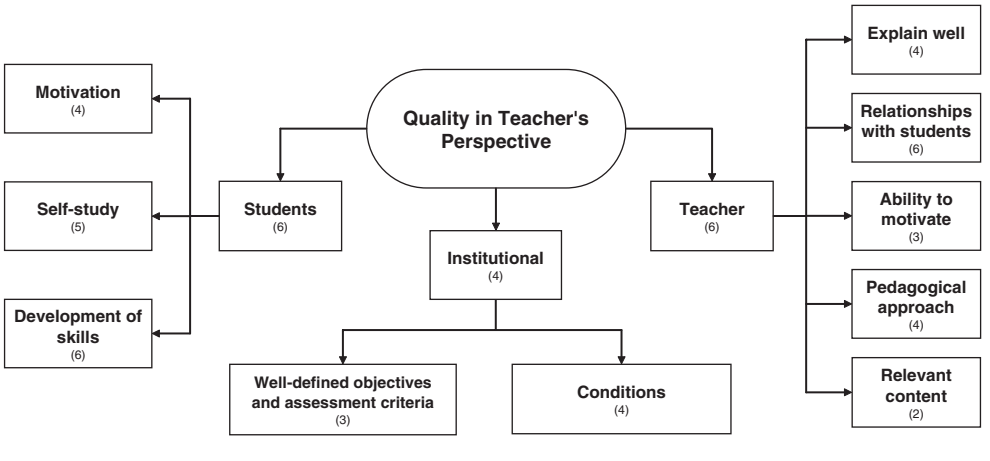

Figure 2. Dimensions, categories and results considered in the teachers' interviews.

they establish with the students are the categories where most responses were included. The 'institutional' dimension is referred to by the majority of the teachers (four), being the 'conditions' category where most replies were included. These three dimensions are in accordance with the aspects referenced by UNESCO (2004). In order to illustrate what teachers' said, some of the excerpts from the interviews are quoted:

(a) Concerning the 'students'

> '...The learning process can be successful if students are willing to learn ... if they have that motivation ... '(T1)
>
> '…students' should study outside the classroom, alone or in groups, and later try to clarify their doubts in classrooms with the support of the teacher …' (T4)

(b) Concerning the 'teachers'

> 'In order to enhance understanding one should seek a wide variety of examples that connect the subjects taught with the real world.' (T1)
>
> '… we have to start from situations that students know using examples from the real-world and discuss with them the qualitative aspects before presenting the mathematical foundations. This approach is, in general, more appealing for students.' (T2)
>
> 'When we teach future engineers we have to give them tools and knowledge so that they can solve problems in their professional future...' (T6)
>
> '… I can't lecture for a long time, I have to dialogue with students and put them dialoguing with each other. There must be interaction between teacher and students otherwise it's monotonous because now students are not able to listen for as long a time…' (T1)
>
> '…usually I try to prepare the lesson to have the topics that I want to cover in a sequence very well organized and clear for students be able to learn…' (T4)

(c) Concerning the 'institution'

> 'The learning community should promote infrastructural, organizational and methodological conditions that provide a learning environment centered on the student.' (T2)
>
> 'In order to have a quality education it is also necessary to clarify and define the objectives of the course, assessment and teaching methods.' (T4)

Similar to what was done with the teachers' interview transcriptions, the students' opinions were analysed within the same three dimensions. The definitions of each dimension are similar to those of the teachers' interviews:

- The students' dimension was divided into three categories: do the task proposed; motivation; self-study. The category 'do the task proposed' included all the excerpts where students said that to have quality in education they need to do what they are asked to do by the teachers. The other two categories are similar to those discussed in teacher's interviews.
- The teachers' dimension was divided into five categories: be available; explain well; relationship with students; ability to motivate; relevant content. The first category, 'be available', included the replies where students said that teachers must be available to them. The other four categories are similar to those discussed in teachers' interviews.
- Institutional dimension was divided into two categories: conditions; success. The category 'conditions' is similar to that discussed in teachers' interviews. The category 'success' included all the replies where students stated that for quality education to occur the success rate must be high.

Figure 3 summarises the dimensions and categories defined above. The numbers shown in parentheses represent the percentage of students whose answers were included in each dimension and category.

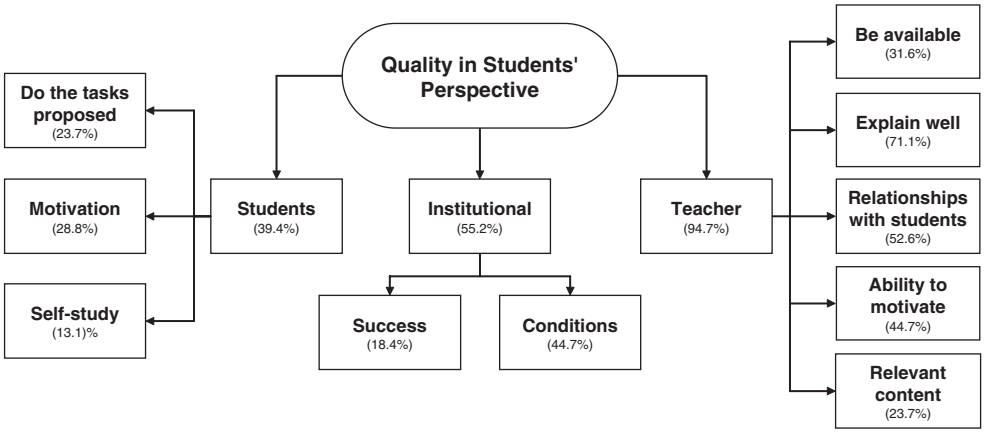

Figure 3. Dimensions, categories and results considered in the students' interviews.

From the results presented in Figure 3 it can be seen that students feel that teachers have the most important role in promoting quality in education (94.7%). According to them, the main characteristics that a teacher should have to promote quality are 'explain well' (71.1%) and 'relationships with students' (52.6%), In order to illustrate these opinions, some passages from the interviews are quoted:

'… a quality teacher should have a good relationship with students…' (S3)

'…quality of education requires a good teacher who knows how to explain very well and understands students' problems.' (S4)

'…we had a good relationship with the teacher, both inside and outside the classroom … we were not afraid to ask questions, she always had time to listen to us.' (S15)

'I think the quality of education depends largely on the teacher, I think it's an element that has a key role in the ability to motivate students and instil in them the desire to learn and study.' (S23)

'Quality also has to do with the contents which are given for a particular course. If you teach me a subject that will not be used in my course, why have I studied it? The contents taught must be related to our professional future.' (S27)

The second dimension that students referred to was the institutional (55.2%) and the category 'conditions' (44.7%) . The students interviewed thought that it was necessary to have good conditions, such as laboratories, libraries, classrooms and informatics tools. Quoting from interviews: 'Quality education . . . First, I think it is important to have good infrastructure because, for example, a classroom laboratory without material could not have quality . . .' (S30).

Finally, from the results of the students' dimension, it can be said that the students interviewed do not see themselves as having an important role in promoting quality of education (39.4%); namely, when compared with the results described above. However, some of them recognise that their 'motivation' to learn (28.8%) and 'do the tasks proposed' (23.7%) are important to promote quality. Quoting from the interviews:

'A quality student is a student that likes the course and does the requested tasks.' (S6).

'. . .I think that quality of education depends of the interactions between teachers and students but also from the students' interest in learning. . .' (S37)

The results presented above are in agreement with those found by Harvey and Knight (1996), where they claim that students and teachers see quality in terms of a set of operational criteria. For students and teachers the dimensions of quality are directly related to the teaching and learning

process and this process depends on teachers, students and the institutions where they are (policies and physical conditions).

It can also be said that the teachers and students interviewed are in agreement with the main factors that influence quality of education. Thus, the main characteristics that a teacher should have to promote quality are 'have a good relationship with students' and 'explain well'. In the student dimension, to be 'motivated' to learn is one of the characteristics most referred to by teachers and students. However, 'self-study' is valued by the teachers to a much greater extent than by the students, which may be problematic considering the importance that it should be given today to students' autonomous work (Cooper *et al*. 2006).

Another significant difference that emerges in this study is the discrepancy between what is valued by the teachers and the students in what quality is concerned with. For the students, quality depends essentially on the teachers, while for the teachers it depends on both of them. Several interpretations can be put forward, one being that the students interviewed do not assume their responsibility in their learning process. This interpretation may also explain the difference found, and referred to above, as to what concerns 'self-study'.

Conclusions

The main conclusion that can be drawn from this work is that both students and teachers refer to the same characteristics that must exist in the quality of education. For the teachers, 'students' and 'teachers' dimensions have equal importance followed by the 'institutional' one. So, teachers see quality in education as a multi-dimensional concept as has been defined by UNESCO (1998, 2004). In this multi-dimensional concept, teachers and students have an important role in promoting and creating conditions so that quality education can occur.

However, teachers and students disagree on the importance of the roles that both play for quality of education to occur. Students think that the teacher has a major responsibility in it. For them the quality of education depends mainly on how well teachers explain and on their capability of interacting with students. The role played by the students, in their opinion, seems to be of little importance, they only need to be motivated to learn. 'Self-study', for example, is highly valued by the teachers but not by the students. Therefore, this study suggests that there are two different approaches to promote quality in education or, in the words of Vroeijenstijn (1995), 'two qualities': to have 'good' teachers and students and to have mainly 'good' teachers. One interpretation of this difference lies in the lack of responsibility assumed by the students involved in this study. Although this result may be linked with the context where this empirical study was developed, and therefore further research is needed, it implies pedagogical actions in such conditions. If one wants to embrace teaching and learning methods where students have an active role, as is stated by several authors as essential to promote the quality in education (Mazur 1997, Saul 1998, Redish 2003, Oliveira *et al*. 2006, 2007, 2008, Oliveira 2009), it is essential to change students' mentality and to encourage them to be more responsible in their learning process. This can be accomplished by encouraging students to attend tutorial sessions, workshops about their role as HE students and promoting active learning in classrooms.

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About the authors

Cristina G. Oliveira is a PhD student in the Department of Didactics and Educational Technology, University of Aveiro, in the area of Science and Engineering Education. She has a scholarship from Fundação para a Ciência e Tecnologia (FCT). She gained a MSc in Materials Science and Engineering in 2001 from the University of Aveiro and Diploma Degree (five years) in Physics Engineering in 1997 from the University of Aveiro. She is a member of the Laboratory of Quality Evaluation in Education at the University of Aveiro.

Paulo Oliveira is an assistant professor and lecturer in Electrical & Computer Engineering at the Polytechnic Institute of Porto – Higher School of Engineering (IPP-ISEP). He gained a PhD in Didactics of Higher Education from the University of Aveiro in 2009, a MSc in Mechanic Engineer (Option Fluids and Heat Transfer) in 2001 from the Faculty of Engineering, University of Porto and a Diploma Degree (four years) in Physics and Applied Mathematics in 1994 from the Faculty of Science, University of Oporto. He is a collaborator at the Laboratory of Quality Evaluation in Education at the University of Aveiro.

Nilza Costa has been a full professor at the University of Aveiro since 2004 and her main activities and responsibilities are teaching undergraduates and postgraduate students in education, Director of the Doctoral Program in Education at the University of Aveiro, Supervision of Master and Doctoral students, Coordinator of the Laboratory of Quality Evaluation in Education at the University of Aveiro, coordination of research projects and Coordinator of Erasmus Students Mobility.