

Science Education PhD in Nova Lisbon University an overview

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ABSTRACT: Doctoral supervision is quite important, as it involves the training of researchers at an early stage. Aiming at deepening knowledge about the doctoral student supervision experience in Nova Lisbon University, an exploratory study was conducted in the area of Science Education. The time to complete the doctoral degree in Educational Science at Nova Lisbon University (UNL) is not the ideal. This research work intends to bring some light to this issue and produce knowledge about it. The study focus the students' point of view regarding the doctoral supervision process. To accomplish the referred goal a survey was applied, to doctoral students that are enrolled in this doctoral program at UNL.

KEYWORDS: *PhD; Science Education; supervision practices; supervision perceptions;*

I. INTRODUCTION

In recent decades, interest in doctoral training and the quality of its supervision process has increased in several countries (Jones, 2013). At the global level, the driving force behind this educational movement has been the consciousness of the impact that the quality of doctoral experiences has on multiple levels:

- In PhD students (developed skills, acquired research skills, integration into the research environment, preparation for team work -collaborative and/or cooperative);
- Papers, publications;
- Students wellbeing and burnout;
- In the supervisors (development of quality projects, publications, personal prestige in the academy, respect of peers, training of competent collaborators);
- Time to submit of the thesis (success rate, time to complete, attrition);
- In the eventual conclusion of the academic degree, as well as in the financial costs that it entails for the universities themselves.

At European level, this area of educational knowledge has gained new importance, with the implementation in higher education of the Bologna process (1999), the Lisbon strategy approval (2000), the definition of new targets for higher education, confirmed in the Dublin descriptors (2004) and renewed in the ten principles for the third cycle, in Salzburg (2005).

One of the challenges facing universities today relates the response to these institutions give to the prospect of "lifelong learning" as advocated in the seventh point of the Salzburg report and to the emergence of "mature students" sometimes also called "lifelong learners" or "hobby PhD students", whose profile is different from the traditional doctoral student (Watts, 2008; Lee, 2008; Baptista, 2014 and 2015). This diversity of doctoral students with different expectations, needs, concerns and interests has led to a reflection on the objectives, effectiveness, preparation that doctoral programs effectively give, and also in rethinking supervision practices (Halse & Malfroy, 2010; Baptista, 2015).

During the PhD there is a process of teaching and learning between supervisor and doctoral student, and it is important to look at each one of them in order to understand how this takes place. In this sense supervision is an instructional/teaching methodology with a different pedagogical approach, once it is related to the teaching of research and to the learning process of becoming an academic (Hughes, 2011; Pearson, Evans & Macauley, 2012; Khene, 2014; Qureshi & Vazir, 2016; Bastalich, 2017). However, it is still a little-known process that is seen as something that only concerns the supervisor and the doctorate. In studies on the doctoral supervision process, it was found that the supervisor has a key role in the course and success of it, since the relationship established with the doctoral student, his style and pedagogy, the learning environments that provides and creates, as well as the communication and the relationship that establishes with the doctorate are crucial to the quality of supervision (Kam, 1997; Lee, 2008; Baltzersen, 2013). Some of the weaknesses found in these investigations were the long-time of completion doctoral, programs with poor quality, the dependence of the degree completion of the doctoral supervisor-student relationship (which may lead to impairment in the

development of personal autonomy and re-search, but also of the doctoral research project) and unpreparedness at the pedagogical, meta-cognitive and communication levels of supervisors.

Some authors highlight the fact that the kind of skills that doctoral students should have before starting the PhD and the acquisition of skills and cognitive development levels of doctoral students after completion of a PhD, can be uneven for different doctoral programs and different supervision practices (Baptista & Huet, 2012; Olehnovica, Bolgzda & Kravale-Paulina, 2015). From these investigations it is possible to perceive that three aspects influence the whole process of knowledge construction during the PhD. The first is how the supervisor handles creativity, understands metacognition, develops communication, and provides new ideas, proposals or processes to achieve objectives (know how to select and resolve problems), stimulating and enthusiastic doctoral students, (Kam, 1997). The second is the need for monitoring mechanisms to ensure that the student makes progress and develops self-efficacy (Overall et al., 2011). And the third is the relationship established between the supervisor and the doctoral candidate, who must go through the integration of the doctoral student in the research environment, the willingness to listen, to argue and to encourage debate (Olehnovica et al., 2015).

In Portugal, there is no official supervisor profile of doctoral students, who may be researchers (with or without experience/knowledge/ supervisory skills) or higher education teachers with different qualifications, teaching, and supervision or research experiences. These facts, along with the growing number of PhD students and the number of PhDs not completed in the desired time or even abandoned it, make it urgent to understand who supervises, how supervision is done and how it is monitored and evaluated by supervisors, by doctoral students and by higher education institutions themselves. The doctoral supervision has been the object of some studies in recent years in Portugal, related to the competences of doctoral students, the construction of knowledge during the doctorate (Figueiredo, Huet & Pinheiro, 2012), the expectations and emotions of doctoral students in relation to supervision and supervisors (Baptista, 2014 and 2015).

At the Universidade Nova de Lisboa (UNL), the different success rates in the doctorates of the different schools that constitute it (data from 2011-2012), lead to the questioning of the supervisory practices currently applied, their success and the way they have been monitored and evaluated over time (Ribau & Gaio Alves, 2017). In recent years, this institution has published documents that seek to clarify its educational and research policy, highlighting in these: the "General Bases of the Quality Assurance System for Teaching of NOVA" (2011), The Code of Ethics (2014) and the "Good practice in PhD education at Universidade Nova de Lisboa". This institution's effort to improve training in the third cycle was also reflected in the creation and development of the NOVA Doctoral School (2010), a structure that intends to provide transversal training, interdisciplinary and develop transferable skills, as well as to support supervisors in their supervision, but also accomplish the second and eighth principles of the Salzburg report (2005): "2nd- Embedding in institutional strategies and policies. Universities as institutions need to assume responsibility for ensuring that the doctoral programs and research training they offer are de-signed to meet new challenges and include appropriate professional career development opportunities; 8th- The promotion of innovative structures. To meet the challenge of interdisciplinary training and the development of transferable skills".

In this context, and to profound knowledge about doctoral supervision, we applied a preliminary survey to PhD students in Science Education at UNL, to perceive their perceptions about the doctorate supervision process that they are living through. This initial study has as aim to conceive a good instrument to measure the doctoral students' perception about their doctoral supervision in the different schools who are part of this Portuguese university.

Our research work focuses on how doctoral students perceive supervision. It intends to deepen knowledge about two dimensions within the doctoral supervision process: the practices and the monitoring. Following a quantitative design, an exploratory survey was conducted with doctoral students in Education enrolled in different universities in Portugal. The answers from 42 doctoral students were analyzed and preliminary results and conclusions were outlined.

II. SUPERVISOR STYLE, PRACTICES AND IMPLICATIONS OF RESEARCH

2.1 *Supervisor style, practices and implications of research*

Supervision practice models differ. The British one-to-one supervisory model also referred by master and apprentice (Yeatman, 1995) isn't adequate for the actual PhD population (with different age, gender, professional background and aims). The relation between style and quality in research supervision was examined by Kam (1997) who states that quality of post-graduated research depends on the fit between supervisor and student and is related to the ability of the supervisor to meet the students' needs. He concludes "(...) the extent to which a student relies on her of his supervisor for guidance and motivation on work organization and problem solving, research preparation, and communication exerts a significant effect on the relationship between supervision quality and supervision style" (Kam, 1997).

Gatfield (2005), after analyzing PhD supervisory management styles, proposed a conceptual model with four supervision styles, differentiated by characteristics related to two factors (structural and support

factor), namely Laissez-faire, Pastoral, Directorial and Contractual. In this context the supervision style that is operationalized depends not only on the context and the investigative situations, but also on the attitudes and responses of both the student and the supervisor, and may be different over time and between the same supervisor and each of the various students supervised by him. In the supervision Laissez-faire style the student has limited management and motivation skills; the supervisor is not compromised or involved in the supervision relationship and in the student interaction. Pastoral style is a supportive style where the student presents a low level of management skills, but takes advantage of the resources that are available; the supervisor invests in the relationship with the student providing support, but there may be no goals to be achieved. In the Directorial style, the student presents great motivation and initiative capacity and needs to set goals, to complete work within the prescribed deadlines. The supervisor has a close and regular relationship with the student, but avoids an approach that does not involve work / tasks. Contractual style: the student feels motivated with the capacity for decision-making, taking initiative; the supervisor has decision-making capacity, good management skills and planning, and also relational / interpersonal skills.

Lee (2008) identifies five concepts of research supervision, based on the practices, attitudes and approach of the supervisor in relation to the PhD student: functional, enculturation, critical thinking, emancipation and developing a quality relationship. A supervisor with a functional approach emphasizes a more directive and managerial practice. Students follow the defined plans for the PhD research project, as well as departmental, institutional and legal rules and requirements. A supervisor with an enculturation-based approach promotes the student's socialization process, once the student is seen as a future member of a discipline, sharing its values, culture and identity. The supervisor has the role of gatekeeper and the student of apprentice. There is a mutual commitment in this environment of socialization. If the supervisor approaches supervision as critical thinking, he/she encourages the student to question and analyze his work, positioning himself/herself according to various perspectives and concepts, to define and evaluate the argument appropriately, solve problems and reflect on various aspects. The relationship established with the student is dialogic and dialectical in nature and promotes student autonomy. In the approach to doctoral supervision as emancipation the supervisor gives mentoring and support to the student, but also leads him to question/ reflect and develop progressively. If doctoral supervision is carried out on the basis of a supervised conflict-free relationship, which is established on the basis of trust, common sense, even friendship, the supervisor presents a supervisory approach corresponding to a relationship development; supervisor presents emotional intelligence and can manage conflicts during the PhD process (Lee, 2008).

One of the key predictors of research completion is the quality of the relationship between the PhD student and supervisor. In a study related to time to completion, the authors concluded that the quality of supervision (which includes personal qualities and relationship) is the key factor in the success of postgraduate degrees (Seagram, Gould and Pyke, 1998). Mainhard and collaborators, proposed a supervision model entitled "Interpersonal behavior supervision model", that is based on two dimensions, influence and proximity, and permit classify the interpersonal supervisor behavior as strict, leadership, helping/friendly, understanding, student responsibility/freedom, uncertain, dissatisfied, admonishing (Mainhard, van der Rijst, van Tartwijk and Wubbels, 2009). The interaction developed between student and supervisor is bidirectional, both elements influence the communication and the interpersonal relationship that is established. The interaction between supervisor and student is unique since there is no relational pattern between the supervisor and the students he/she supervises. In this context, the supervisor should support, with his/her experience and knowledge, the student throughout the investigative process, giving him/her time and quality feedback, so that the student develops high level investigative skills. When the relationship continues as in a PhD, expectations and relational patterns themselves are changing / developing (Mainhard et al., 2009).

Maxwell & Smyth developed a model for supervision that has three key elements: the student, the knowledge (includes the research process and the substantive content) and the research project (Maxwell & Smyth, 2011). This model for supervision is based on the assumption that supervision is a creative, synergistic relationship process that is related to student, knowledge and research project. In this context student and supervisor are a team and the leader vary according to relative expertise, student autonomy, tasks and specific situations.

2.2 Time to attainment to doctorate- causes and consequences

Time to complete or time to attain is influenced by several factors, that can go from academic integration, social integration, economic support, personal and external factors. In a study carried out by Wao and Onwuegbuzie, in a population of doctorate in Education, they found that the academic integration is particularly related to time do attainment to doctorate in Education (2011).

2.3 *Effective PhD supervision practices – some recommendations*

Some authors suggest supervision practices for effective supervision, in order to promote better postgraduate supervision (James and Baldwin, 1999). These authors divide the supervision practices in three issues: Foundations, Momentum and Final stages. The first moment, Foundations, includes ensuring that the fit between supervisor and student is the right for project; that the supervisor gets to know the student profile (personally and technically) and needs; that reasonable and agreed expectations are established; that he/she works with the student in the research project development. After the partnership establishment, the supervisor should encourage the students to write, provide high quality feedback and get students to be involved in the department life, be inspiring and motivated and help students to cross crises. At the last moment, the supervisor should demonstrate an active interest in students' future career and monitor the final research, production and presentation (James and Baldwin, 1999).

Other higher education institutions propose the best practice for doctoral education, as Max Plank Society (2012), highlighting that "a PhD project is closely related to the quality of supervision" and underling that students should choose not only the topics but also the supervisor. In the latest selection they should have a chance of contact with potential supervisors. There are recommendations related to supervision referee and also a well –balance student-to-supervisor ratio, the existence of a thesis advisory committee, regular meetings between students and supervisor, framework conditions for a PhD project, confidante and training of the supervisors. The students support pillar should be based on personal development, academic development, career development and have a representation in the institute (Max Plank Society, 2012).

At Reading University they have "a system whereby staff who have not supervised previously act as co-supervisors (alongside a more experienced supervisor) until they have supervised a student successfully to completion", and have also a guide to complement this hands-on experience. This PhD supervision guide refer the procedure of student selection, training and development, responsibilities, supervisory meetings and styles, give advice on how to supervise international and part-time students, reflects on different phase of the PhD course, but also propose strategies to overcome the difficulties throughout effective supervision practices: timely feedback, communicate academic standards and support PhD writing, monitoring progress, help student examination preparation (Berry, 2013).

In Georg-August University school of science, there is a document named "Rules of good practice for doctoral supervision" that focus on the supervisors, doctoral students and thesis advisory committees referring their role in the PhD process (Georg-August University school of science 2012).

The German University Association of Advanced Graduate Training (UniWiND) recently (2015) published a document entitled "Doctoral Supervision. Recommendations and good practice for universities and doctoral supervisors" that aims to give clues to improve the doctoral supervision and provides recommendations for the support and advancement of good doctoral supervision.

III. METHODOLOGY

An exploratory survey, was distributed to doctoral students in science education at the NOVA Lisbon University (UNL) by e-mail (during two weeks) and twenty two of them answered it. At the questioner students must agree, partially agree, partially disagreed and disagreed, with positive or negative statements, related to doctoral education, particularly the supervision process and supervision research process. The survey focuses on nine domains: Doctoral aim, Doctorate journey, Doctoral conclusion, Contact type; Feedback type; Work environment; Supervision monitorization (mechanism and instruments); Supervision practices; Autonomy development, students' perceptions about supervisor; supervisor engagement in the supervision process, supervisor pro-file. Regarding the scale's internal reliability, Cronbach's alpha obtained was 0.900.

IV. RESULTS

4.1 *Students profile*

This preliminary study reveals that 50 % of the students that answer the survey present age between 40 and 50 years old, but 27 % of the students referred that have age higher than 50 years old. Some of the students are from FCSH (23%) and others are from FCT (68%), two schools of the Nova Lisbon University. 50% of the students are doing the PhD in full-time, and 41% indicate that are frequenting the four years or more.

4.2 *Supervisor profile*

Students assigned the following characteristics on their PhD supervisor: Excellent explainer and patient (54 %), always supportive (54%), good listener and responsible (68%), tranquil (73%), inspire (77%), honest in their opinion (86%). Supervisors are perceived as being experts in the re-search field (73%) and as leader that guides students in the research project (64%).

4.3 Doctorate aim

To understand what students considered the PhD aims, the survey, focused on the autonomy development, competence, creativity development and innovations. 68% of the PhD students indicate that one of the doctorate goals is the autonomy development and 73 % considered that develop research competence (skills and capabilities) is also a finality. 59% are pretending to work in a higher education institution, and 41% partially agreed.

4.4 Doctorate journey

To perceive why students chose their PhD supervisor we asked if they had already worked with them, 41% of the respondents assign that had worked previously with the supervisor but 54% never worked. 27% of the students that answer the survey assign that this is a solitary process and 54% partially agreed with the sentence: "PhD is a lonely process". 9% refer that once consider giving up the PhD and 32 % partially agreed with the sentence: "Sometimes I think of giving up the doctorate". The most difficult thing in doctorate for these PhD students is the time management (54% agreed and 46% partially agreed with the sentence "The most difficult thing in the doctorate is the correct time management". Only 36% of the PhD students feel that belongs to an academic community, but 18% have the opposite feeling. 82% of the students consider themselves as the author and 73% has an executor of their research project.

4.5 Doctorate conclusion

Students considered that known how to solve/ resolve problems and the acquisition of new competences and knowledge are essential to conclude the degree for 77% of the PhD students, but 68% consider that being creative and innovator is essential to.

4.6 Contact type and feedback

Seventy three percent (73%) of the PhD students indicate that usually the supervisor contact them and meet them individually (45%). 73% of the respondents refer that Supervisor give them frequent feedback, but 18% refer that it is unclear/vague.

4.7 Supervision monitorization and practices

To perceive what, where the instruments used by the supervisor during the monitorization of the doctoral research, we ask students if they used portfolios (5%), diary of the activities made by students or a log or a lab book (5%), a regular written work (resumes, monographs, reports) (14%) and if they made during the meeting with their supervisor a written information with the themes treated always (50%). Some activities proposed by the supervisor are the observation of seminars or workshops, organize by research and pos-doc research (41%), or participation in seminars or workshops with peer (55%), or even to participate in seminars or workshops related to the themes of their PhD research (64%). 14% indicate that supervisor gives them limited time to the tasks proposed by him and 64% stats that supervisor guide them in the research project.

4.8 Autonomy development

The planning and management of the research activities are made by both supervisor and students (50%) and only 23% of the doctorate make is one research planes and manage them. 55% of the doctorate refer that their supervisor consider them competent to make their one research decisions and encourage them to present their results in conference and congress, and 59% to write papers. 64% of the doctorate indicate that the supervisor ask their opinion about the re-search development. Only 45 % refer that do tasks that aren't proposed by the supervisor.

4.9 Supervisor engagement in the supervision process

Seventy three percent (73%) of the student classifies the relationship student-supervisor has a good relationship. 73% refer that it is not necessary remember supervisor the project, although 14 % refer that need to remember supervisor what is their research project and that rarely supervisor are involved with the project. In the same context 23% of the doctorate feel that need more support from supervisors. 45% of the students state that must schedule their meeting with supervisor previously and 18% refer that rarely supervisor has time to meet them.

V. CONCLUSIONS

The results of the exploratory study indicate that the age profile of doctoral students surveyed is analogous to the one reported in previous research about doctoral students in Education in Lisbon University (Alves & Azevedo, 2010; Alves, Neves, Azevedo & Gonçalves, 2012). Some students refer to the lack of timely feedback and availability to schedule meetings, but the majority considers that the supervisor's availability is good. It was not possible to perceive if supervisor or students use instruments or strategies to monitor the research development, but is possible to conclude that the individual and presently meetings are important to do a review of the work done. The attrition is influenced by several factors that can go from academic integration,

social integration, economic support, personal and external factors. Wao and Onwuegbuzie found that the academic integration is particularly related to time to do attainment to a doctorate in education (2011). With our data it is possible to see that less than half of the students have the sense of belonging to an academic community, and this can be the causes of the attrition in this population. These results give some clues related to the strategies that can be used to help students concluding the PhD, one is the monitoring research process by the students, which seems that is not done by them. Others may include participation in the research group and department activities as research group meetings, seminars, workshops, lessons, which is not clear if it appends. Further developments of this explanatory survey aimed at a broader sample of doctoral students will enable to better understand these results.

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