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# Network curriculum design? Relational dynamics of teachers' associations in the design of *Essential Learning* in Portugal

Sílvia de Almeida[i]
Universidade Nova de Lisboa, Portugal.

Joana Viana[ii]
Universidade de Lisboa, Portugal.

Natália Barcelos[iii]
Universidade Nova de Lisboa, Portugal.

Maria do Céu Roldão[iv]
Universidade Católica Portuguesa, Portugal.

Helena Peralta[v]
Universidade de Lisboa, Portugal.

## ABSTRACT

The invitation extended by the Portuguese Ministry of Education to teachers' associations (TAs), in 2016, to participate in the process of defining the *Essential Learning* (EL) is unparalleled in the Portuguese curriculum background, as in most countries in the world. In this text, we intend to understand the social structure and the interaction dynamics created by the TAs when drawing up the EL, answering the following research questions: (i) Which actors were invited by the TAs to join their teams, and what relationships did they establish with each other? (ii) Which relational dynamics did the associations of the various subject areas establish with each other? The methodology used was the social network analysis (SNA), which allows us to visualise the structure of social relationships and their interaction patterns and represent them graphically. We developed a network analysis questionnaire and applied it to the 18 TAs that drafted the EL. The results show that the TAs formed teams were composed mainly of experts in the subject area. TAs have a social representation of professional knowledge that underestimates curriculum expertise. Furthermore, there was little collaboration between associations in the design of the EL, which can be justified by the tradition of the Portuguese education system before the 25th April Revolution, based on teacher's individual work, and by the origin or subject-based culture of the TAs.

**Keywords**: Teachers' associations; Curriculum design; Curriculum policies; Network analysis; Teachers' collaboration

## 1. INTRODUCTION

The emerging trend in the late 20th century towards ending the isolation of teachers and their individual work mindset has led to increased participation and involvement in various collaborative practices in Portugal as abroad, both among teachers of the same subject area and different subject areas. That collaboration was enhanced in schools at the beginning of the 21st century with the increasing creation of professional learning communities and networks based on a culture of participation and organisation in interdisciplinary network structures within a collegial and representative teaching framework. After the 1974 Revolution, with the transition to democracy in

Portugal, this collegial framework gained traction in the consecutive transformations of Portugal's education system (for instance, school organisation, curriculum, teacher training, etc.).

In this context, the invitation extended by the Portuguese Ministry of Education (ME) to teachers' associations (TAs), in 2016, for their institutionalised participation in the process of defining the *Essential Learning* (EL)[1] for each subject and each grade, i.e., to participate in the curriculum design process at the macro-level, is unparalleled in the Portuguese curriculum history. According to the definition on the Directorate-General for Education's (DGE) website, the Essential Learning is a framework of curriculum guidance based on the planning, implementation and assessment of teaching and learning; EL is the set of learning to be carried out in each subject per year in basic and secondary education, and aims to promote the development of the skills included in the Students' Profile by the End of Compulsory Education. Basically, the EL are the official national curriculum specifications.

Worth noting is that the Portuguese ME invited the TAs to design the curriculum, giving them some control over the process and unprecedented curriculum autonomy in the national educational policy scenario. Therefore, studying teachers' participation and collaboration in this process (2016-2018) is as innovative as the involvement of the teachers themselves in curriculum design.

This study aims to understand the social structure and the interactions created by the TAs when designing the EL, seeking to answer the following research questions: (i) Which actors were invited by the TAs to join their teams, and what relationships did they establish with each other?; (ii) Which relational dynamics did the associations of the various subject areas establish with each other?

Initially, the ME suggested that the various TAs collaborate and scheduled a series of joint meetings. Some associations indeed met regularly in small sub-groups with officials from the DGE. This study, however, does not aim to address this process of suggested interaction; it aims instead to explore the extent of the interactions between TAs that occurred on their own initiative to coordinate the production of curriculum documents for each subject – these interactions were all the more significant given the purpose of coherent harmonisation of the different subjects intended by the whole process of curriculum redesign from the interdisciplinary perspective conveyed by the *Students' Profile by the End of Compulsory Education* (Order No. 6478/2017)[2].

Methodologically, this study is based on the social network analysis approach: we collected information through a questionnaire sent in June 2019 to the 18 TAs invited by the ME. The relationship patterns between the teams were drawn in Gephi 0.9.2.

This paper is structured into five sections in addition to this introduction and the conclusions. Teacher collaboration, particularly in curriculum design processes, is dealt with in the second section of the text, followed, in the third section, by the curriculum background underlying the creation of TAs in Portugal and the teachers' participation and collaboration in curriculum policies. In the fourth section, the methodological approach is described and,

**1.** From 2018 on, EL documents became the official curriculum and can be consulted in: http://www.dge.mec.pt/aprendizagens-essenciais-ensino-basico. Confirmed in 2021 by Order No. 6605-A/2021, of 6 July.

**2.** The Students' Profile was approved in July 2017, defining the acquisition of a set of skills as a curriculum benchmark to be adopted by policymakers and educational agents and to be taken into account in the development of the Essential Learning (EL). The Students' Profile can be consulted in: https://www.dge.mec.pt/perfil-dos-alunos

in section five, the results are disclosed, providing an overview of the teams formed by the TAs and the interaction patterns developed within the teams and between teams. Finally, the conclusions are presented as constructed knowledge about teacher involvement and collaboration in curriculum design processes at the macro-level.

## 2. TEACHER COLLABORATION AND PARTICIPATION IN CURRICULUM DESIGN PROCESSES

Teachers' participation and involvement in professional development processes, including curriculum design and implementation, have been increasingly appreciated. For example, Voogt et al. (2016) conducted a study that analysed the research produced in this regard to determine the effects of teachers' participation in design teams for professional development and curriculum innovation processes, discussing the relationship between teachers' participation and the effects on their learning and curriculum practices. References to the topic in the literature have increased in recent decades, particularly highlighting the importance of promoting collaboration between teachers in the different stages and activities of these processes, especially within the school environment (e.g. Carl, 2005; Doll, 1995; Young, 1990). The emerging trend, in the late 20th century, to end the isolation of teachers and educational organisations as impenetrable territories, as well as traditional teacher professional development programmes that did not emphasise teacher interaction (Hadar & Brody, 2010), became more apparent in the early 21st century.

Teachers' participation in all forms of collaborative practice and reflection is seen as essential in promoting teacher learning and professional development (Day, 2004). Teacher collaboration stimulates teacher learning (Lieberman, 1996; Little, 2002) as teachers are considered professional learners, reflective learners, and autonomous practitioners working in ever-changing contexts. Teachers are, therefore, capable of evolving and improving their practice through self-assessment processes, the creation of professional learning communities, and networking (Hargreaves, 2003; Normand & Derouet, 2011). Collaboration creates a culture where learning is encouraged and supported, given that teaching and learning improve when teachers collectively question their routines, examine new paradigms, and actively engage in supporting professional growth (Little, 2002).

Collaborative work among teachers is linked to a vision of the school as a learning organisation, (re)thinking how to be in the school-organisation concerning the binomials culture of isolation vs culture of participation; disciplinary structures (the "tribes and territories" characterised by Becher, 1989) vs interdisciplinary network structures. Learning is perceived, from a constructivist and sociocultural perspective, as an individual effort, socially and culturally located (Hadar & Brody, 2010), so collegial cultures should not suffocate teachers' individuality (Day, 2004), which should be ensured and respected since they are fundamental for professional development.

Teachers' participation and involvement in processes leading to educational policies' design are crucial as they improve such processes by including their expertise. Regarding the implementation of curriculum design, several authors consider that the involvement of teachers has a considerable impact, being crucial for the success of educational reform efforts (Fullan, 2001) – since teachers implement the curriculum, it seems reasonable to benefit from their classroom experience and their perspective (Carl, 2005; Doll, 1995). Active teacher participation in curriculum development processes at both central and local levels positively influences their successful implementation (Baş & Şentürk, 2019; Young, 1990).

There are studies in the literature on teachers' participation in curriculum development at the local level (meso- and micro-school and classroom), but rarely in its design at the national level (macro-level), as far as we could confirm. Although support for teachers' active participation in these processes has been increasing (e.g. Carl, 2005; Doll, 1995; Voogt et al., 2016; Young, 1990), the research literature in this field reports that teachers are not able to participate in curriculum development processes adequately (e.g. Carl, 2005; Oloruntegbe et al., 2010), mainly due to the gap in curriculum knowledge and the skills required to implement collaborative design processes (e.g. Handelzalts, 2009; Hoogveld, 2003), but also due to difficulties in collaborating – which is not an established professional practice. Thus, the Portuguese curriculum policy followed in this process, i.e., the involvement of teachers' representatives in the authorship of the core curriculum, was an unprecedented experience. And despite its limitations, it opened the way for a more significant intervention of teachers in curriculum design.

The enduring difficulties that teachers still feel when it comes to collaborating with each other are due, among other reasons, to a tradition based on individual work and to the fact that, as a group, teachers work solely within their subject area. On the other hand, teachers usually were not active participants in the central design of national curriculum in Portugal. The involvement of teachers in curriculum at the design level may contribute to empower them with knowledge of the process of both conceiving and implementing curriculum as an integrative process that requires interaction among the participants in curriculum design process and from these with the global goals of curriculum. This implies developing a greater capacity to decide and reflect both as co-designers and at the implementation level in schools, breaking the traditional technicist opposition between conception (for the central decision-makers) and implementation (for the teachers).

This movement changes perspectives, enriching and strengthening the professional nature of teachers' knowledge, far from the traditional model of teaching knowledge as associated mostly to practice. Thus, to contextualise our work, we will now address the curriculum background of TAs in Portugal.

## 3. CURRICULUM BACKGROUND

### 3.1. THE SUBJECT AREA BACKGROUND OF TEACHERS' ASSOCIATIONS

The tradition of the Portuguese education system before the 25th April Revolution was based on an individual work approach that assumed that each teacher's scientific training made him/her responsible for teaching his/her respective subject. This was the dominant view that supported a perspective of the curriculum as the sum of a set of isolated subjects, each associated with specific knowledge focused on the respective scientific field. Teachers seldom discussed pedagogical or didactic aspects, but primarily bureaucratic information and grading at the end of the term or school year.

When the eight-year compulsory education model was enforced within the framework of Veiga Simão Reform (Law No. 5/73, of 25 July 1973), the obligation to hold teachers' meetings for pedagogical and scientific purposes was legally established for the Pre-Secondary Education Cycle (CPES[3] – 5th, 6th, 7th, and 8th grades) based on a collegiate model. According to the CPES teaching career statutes in force at the time (Articles 14th and 17th), class council and subject council meetings were prescribed every month. The roles of *class director* and *subject coordinator* were also created, establishing an intermediary leadership role in the school's organisation. In secondary education – which at the time started in the 9th grade[4] – this practice was only introduced later, following the gradual expansion of compulsory education.

This difference is essential in demonstrating that the professional teaching culture has a long tradition of individual work practices, and that collaborative work has been introduced over time, associated with provisions that have gradually replaced traditional individualism without disregarding the core idea of the teacher's professional identity as an individual who takes responsibility for teaching based on the possession of a subject-specific knowledge.

The social representation of professional teaching knowledge, with its various components, as theorised by Lee Shulman (1987) – integrating the areas of content, pedagogy and didactics, curriculum, learners, and context – and Donald Schön's (1983) analysis that ties the construction of professional knowledge to the reflection on practice, was still close to alien to the vision of the 1980s, which largely corresponded to the almost exclusive validation of content or scientific knowledge. Although TAs included, in their founding texts, didactic and sometimes pedagogical goals, their action programmes mostly privileged the scientific dimensions of the specific subject knowledge.

Pedagogical knowledge and associated didactic dimensions appeared as more significant in the training of early primary school teachers, as in the social representation of these teachers, associated with the age and developmental stage of their pupils, to the detriment of scientific knowledge. This perspective implied maintaining a duality in the representation of teaching knowledge in these two professional sub-groups: primary versus second, third cycles, and secondary. As for the subsequent levels until the end of secondary school, training and practices shifted towards the predominance and central appreciation of scientific knowledge, albeit sustained

**3.** CPES – Ciclo Preparatório do Ensino Secundário (Pre-Secondary Education Cycle).

**4.** Currently, primary education in Portugal (Framework Law of 1986) corresponds to the first (from 1st to 4th grades), second (from 5th to 6th grades), and third (from 7th to 9th grades) cycles. The first and second cycles correspond to ISCED 1, according to the International Standard Classification of Education; the third cycle to ISCED 2; secondary education (from grades 10 to 12) corresponds to ISCED 3.

by some pedagogical knowledge (Shulman, 1987). However, the representative status places scientific knowledge on a higher level, ascribing the value of pedagogical knowledge to the initial levels where the subjects are children. This duality, which is sometimes referred to as the *double-funnel metaphor*, established and strengthened a difference in the evaluative acknowledgement of these two sub-groups of teachers, generating a cultural gap of which TAs are a sign insofar as most associations, based on the specificity of a given subject, did not include primary school teachers.

Collegiate approaches gained momentum in the system's successive transformations after 25th April 1974 and affected both organisation and curriculum within schools. It also became apparent in teachers' new associative movements, which, in addition to labour concerns associated with trade unions, materialised in TAs. Although TAs developed mainly from the second half of the 19th century, with the creation of the first teachers' association dating back to 1854 (Pintassilgo & Pedro, 2013), this trend intensified and became more visible in the 1980s, when many of the current TAs were created[5]: in February 1980, the Portuguese Language Teachers' Association (APP); in June that same year, the Portuguese Association of German Teachers (APPA); in June 1981, the History Teachers' Association (APH); in 1986, the Portuguese Association of French Teachers (APPF); in 1987, the Associations of Teachers of Mathematics (APM), English (APPI), Geography (APG), Philosophy (APF), and Biology and Geology (APPBG); in 1988, the Teachers' Association of Economic and Social Sciences, and the Association of Teachers of Latin and Greek; and, in 1989, the National Council of Professional Associations of Physical Education, and the Association of Teachers of Artistic Expression and Communication. Others appeared in the 1990s and subsequent years. According to their statutes[6] or their mission statements, the activities of the TAs focused primarily on the dissemination/promotion of the subject teachers' training. They also developed congresses, conferences and seminars, the establishment of partnerships and relationships with institutions, namely the ME, particularly regarding curriculum and assessment issues, and, more rarely, research activities or production of didactic materials.

Correlating this movement with the representational framework of teachers' knowledge mentioned above, a representational division has been found regarding the perception of value attributed throughout the time to the professional knowledge of these two groups of teachers: pedagogical knowledge has been seen as essential for generalist teachers at elementary level, compared to the supremacy of content knowledge associated with teachers of subjects at subsequent levels. Thus, it is understandable that most TAs initially limited their membership to second and third cycle and secondary education teachers, according to the terminology introduced by the Framework Law of 1986. Mathematics and Physical Education were pioneers in including first cycle teachers. The successive changes in the design of curriculum areas also influenced the associative movement's outlines and geographies.

This subject-based approach that marked the creation of TAs led to the development of a tradition of autonomy, whereby each association is mainly concerned with the promotion of its subject among its members,

**5.** We are referring here to the official constitution dates of the aforementioned associations, although some had developed associative activities before that date.

**6.** In the websites of some teachers' associations, it is possible to read the respective statutes, e.g.: APECV (https://www.apecv.pt/estatutos), APP (https://www.app.pt/sobre-a-app/estatutos), APH (https://aph.pt/quem-somos/estatutos), APPBG (http://www.appbg.pt/quem-somos/estatutos), APPELE (https://appele.pt/estatutos-2).

and with the recognition of labour and curriculum conditions by the ME, evident in the struggle for the workload of the respective subject and its relative importance in transition/retention policies. This situation did not encourage collaborative movements, except for some occasional initiatives, such as the creation of the Inter Teachers' Associations Secretariat (SIAP), in 1992, which organised some meetings and produced a few publications (Abrantes, 1994), and of the National Federation of Modern Language Teachers' Associations (FNAPLV)[7], founded in 1989. Conversely, curriculum design and assessment policies were often a source of conflicts between subjects and their TAs, configuring what Michael Apple (2019) refers to when he draws attention to the power conflicts between the curriculum subjects, using the metaphor of the "arena".

Collaborative work between TAs, especially at the curricular and interdisciplinary level, has been lacking in these organisations' backgrounds. The invitation of the ME, in 2016, to their participation in the curriculum redesign aimed at integrative curriculum coherence, a dimension that is not part of the history of the TAs, naturally encountered many difficulties that should be studied.

**7.** The National Federation of Modern Language Teachers' Associations comprises: Portuguese Teachers' Association (APP), Portuguese Association of Spanish Teachers (APPELE), Portuguese Association of German Teachers (APPA), Portuguese Association of French Teachers (APPF), Portuguese Association of English Teachers (APPI).

### 3.2. BRIEF OVERVIEW OF THE PARTICIPATION/COLLABORATION OF TEACHERS' ASSOCIATIONS IN CURRICULUM DESIGN AT THE MACRO-LEVEL

The recognition of TAs as valid partners in curriculum reforms was first formally assumed in the process of the 1989/90 Curriculum Reform (Roberto Carneiro's Reform), where their role was mainly to respond to queries and requests from the central government – regarding the preparation and implementation of the new syllabuses. TA members often integrated syllabus authors' teams.

This practice of associating TAs with curriculum proposals' design continued, and more prominently, with the Flexible Curriculum Management (1996-2001). Representative TA elements integrated, together with university experts and government officials, the Advisory Board that oversaw the document *National Curriculum for Basic Education* of 2001, and each subject's author teams formally included some elements chosen by the TAs. The different versions that supported the curriculum design established in 2001 (Decree-law No. 6/2001, of 18 January) resulted from many negotiations and some clashes with TAs, already holding greater representativeness at this stage. Many of these interactions were marked by a labour rather than scientific-pedagogical discourse, namely in the resistance to more flexible management of curriculum hours.

In the most recent curriculum redesign (2016-2018), characterised by a restructuring of the existing curriculum documents in the light of the *Students' Profile by the End of Compulsory Education* (Order No. 6478/2017, of 26 July), which originated the principles that underlie the *Essential Learnings* (Order No. 6944-A/2018, of 19 July) for each area or subject, guided by a standard curriculum reference (Roldão et al., 2017), the participation of the TAs was different because they assumed the status of co-authors of the formal

curriculum for the first time. The ME invited the associations to form teams in charge of EL production, sometimes including invited experts, and interact with a team of researchers in the curriculum area who produced guidelines and ensured feedback on the documents drafted along the process.

A more comprehensive authorship of the TAs had both an added value and some difficulties. Among the latter, particularly regarding the interactions between the TAs, as we will see below.

## 4. METHODOLOGY: NETWORK ANALYSIS AS THEORY AND METHODOLOGY

Social Network Analysis (SNA) is a multidisciplinary theory (sociology, anthropology, psychology, mathematics, statistics), which supports a methodology that enables the graphical and quantitative formalisation of concepts abstracted from social reality processes. As Wasserman and Faust (1994) point out, one of the specific features of the SNA is its focus on the relational aspect of the data collected.

The concept of *social network* refers to a structure of links between actors, organisations or social institutions in a given social system. Network analysis takes social reality as a structure of relationships involving interdependent entities (groups, individuals, organisations, etc.). However, the network is not simply a consequence of the relationships between actors; it may simultaneously result from the absence of relationships, the lack of direct ties between two actors, what Burt (1992) called the "structural hole" in the network.

The basic principle of network analysis is that the structure of social relationships determines those relationships' content. It seeks to detect patterns of interaction and explain why they occur and what their consequences are. Thus, network analysis (Wasserman & Faust, 1994) assumes a structural analysis approach based on two primary purposes: (i) identifying specific social interaction patterns; (ii) understanding the influence of these patterns on the behaviour of actors. This is an inductive matrix process that starts from objective social relations and moves towards relationship patterns that form a given system's social structure. The main relationship patterns noticeable in a social network, taking as reference the position of the actors in the network, are the following (Cross & Parker, 2004):

- *hubs*, actors that have a high number of relationships in the network, i.e., experts;
- *boundary spanners*, actors that connect sub-groups (cliques or small groups) in a network, acting as an interface. They facilitate critical connections due to functional, geographical or hierarchical aspects, thus avoiding the isolation of these sub-groups;
- *information brokers,* actors that are closer, albeit indirectly, to every member of the network. They are usually in the shortest path between two people for most people in the network and have a significant influence on the flow of information, so they are the right people to start disseminating information while promoting increased connectivity in the network;

- *peripheral people*, actors that have few connections within the network.

These relationship patterns can be measured mathematically using the graph theory, statistical and probabilistic theory, or algebraic models (Wasserman & Faust, 1994).

In the type of graph used to represent social networks, the nodes are equivalent to the actors, and the lines correspond to the links or ties (Wasserman & Faust, 1994). In graph theory, the network is a set of nodes connected by links or ties that constitute a set of actors.

SNA, as a theory and methodology, is a fundamental tool to describe the social structure and the interactions within and between TAs during the process of collaboration in curriculum design at the macro-level – designing the EL for primary and secondary education.

When analysing social networks in closed groups, as in this study, where groups are the teams constituted by the various TAs, the literature suggests starting by defining the strategic group to be analysed to subsequently collect from each element in the team the type and degree of their relationship with each other or with other teams (Borgatti & Molina, 2005; Cross & Parker, 2004). To obtain information on the members of the associations' teams, each association was asked to fill out an Excel spreadsheet with the identification (names or numbers) of the coordinators, team members and consultants, and their area of expertise, qualifications, professional affiliation, and information on whether they belonged to the association (management or associates).

These data allowed us, on the one hand, to understand the social structure of the associations' teams and/or the stakeholders they invited to the elaboration of the EL, and, on the other hand, they enabled us to construct the social network analysis questionnaire that allowed us to understand the participants' interaction relationships within each association and between the associations in the various subject areas.

The questionnaire was composed of six dimensions that assessed different levels of interaction: (1) Interaction between the members of each association's team; 2) interaction between the teams of each association; 3) Interaction between each association's coordinator and their teams; (4) Interaction between each association's coordinator, consultants and teams; (5) Interaction between each association's coordinator and their consultants; (6) Interactions between associations from different subject areas.

The questionnaire was sent by email to the 18 TA for completion. All associations contacted completed the request.

To visualise the relationship patterns between team members and between different TA teams, we used 64-bit Gephi 0.9.2. In addition to drawing the relationship network, this type of software also possesses many of the metrics used for quantitative network analysis, which is a significant advantage. Questionnaire data were processed in Excel (.xlsx) in a square matrix that allows the identification of the interactions or relational patterns, later modified in two different databases for the data to be entered into Gephi: (i) one for the identification of the nodes (with the roles of the elements in the team – coordinator, team member, consultant and mediator); (ii) another for

the identification of the ties (links, and link direction and frequency). These two databases were then imported into Gephi.

To guarantee total confidentiality and anonymity, each association is represented by a letter and each team member by that letter and a number. Each association, its team members, and the relationships they built within each group and with other TA groups were represented in graphs divided into four relatively homogeneous thematic areas in order to better synthesise the information collected: Languages, Social Sciences, Sciences and Technologies and Expressions (in no specific order, with the letters: A-D).

To represent the actors' attributes concerning their roles in the graphs, we used geometric figures, for which the "polygon plugin" was installed, provided by the online Gephi support platform. We used a colour scheme to represent the attributes related to the actors' areas of training or professional experience.

The initial network drawn by Gephi is formed randomly, positioning the nodes without any apparent logic. However, to facilitate the analysis, one can use some Gephi features. Accordingly, we chose the "Force Atlas" distribution of the "Layout" menu that "makes graphs more compact". We also selected the "Attraction distribution" option from "Force Atlas" to show the "authorities in a more central position than the hubs"[8].

**8.** Information contained in Gephi 0.9.2.

To calculate distance (diameter, radius, and tie average path length), the centrality of the three graphs was standardised to [0,1] for better visualisation, preventing many lines from becoming too thick (due to the numerous interactions), which would render the graphs unreadable. To calculate the centrality and the density of the networks, tie direction was not considered since the relationships were mostly bidirectional. Table 1 describes the most relevant metrics to understand the analysed network.

**Table 1**

*Gephi Metrics Used for Network Analysis*

| Metric | Description |
|---|---|
| Average network degree | Average number of connections (ties) of the network nodes. |
| Network diameter | Smallest distance between the two most distant nodes in the network: it represents the linear size of the network. |
| Average path length | Average graph distance between all pairs of nodes. |
| Graph density | Number of existing connections divided by the number of possible connections. It shows how close the network is to being complete or comprising all possible connections. |
| Clustering coefficient | It indicates how connected the nodes are with their neighbourhood. |
| Connected components | Number of connected components in the network. |

Source: Elaborated by the authors. Adapted from Gephi 0.9.2.

## 5. RESULTS

To answer the two key questions of this research, identifying the authors invited by the TAs and the relationships they established between them, as well as characterising the relational dynamics that the associations of the various areas established between them, the results are presented in graphs, considering the four thematic areas of the TAs (Language, Sciences and Technologies, Social Sciences, and Expressions) referenced by letters from A to D, for confidentiality reasons.

The findings are presented in three graphs only, because two of these areas are combined in the same graph, due to the interaction that occurred between those two associations. We now describe and analyse the three graphical representations that clarify the composition and relational dynamics between the teams within each association and between the teams of the various associations.

### 5.1. CHARACTERISATION OF THE TEAMS FORMED BY THE TEACHERS' ASSOCIATIONS

For the construction/definition of the EL (Table 1), the 18 TAs assembled teams with 129 members (team members) and 86 consultants, totalling 215 participants (nodes) with 1549 relationships between them (ties). Overall, the associations invited consultants (experts), with only six TAs choosing not to use this resource (Figures 1, 2, and 3). In two thematic areas (C and D), a mediator was required to ensure the dialogue/interaction process.

**Table 2**

*Number of TA Team Members by Thematic Area and Ties*

| Associations by thematic area | N (team members) | N (consultants) | Total participants | Mediator | N ties |
|---|---|---|---|---|---|
| A and B (8 TAs) | 67 | 38 | 105 | - | 802 |
| C (3 TAs) | 28 | 25 | 53 | 1 | 515 |
| D (7 TAs) | 34 | 23 | 57 | 1 | 232 |
| Total (18 TAs) | 129 | 86 | 215 | 2 | 1549 |

Source: Elaborated by the authors based on data provided by the TAs.

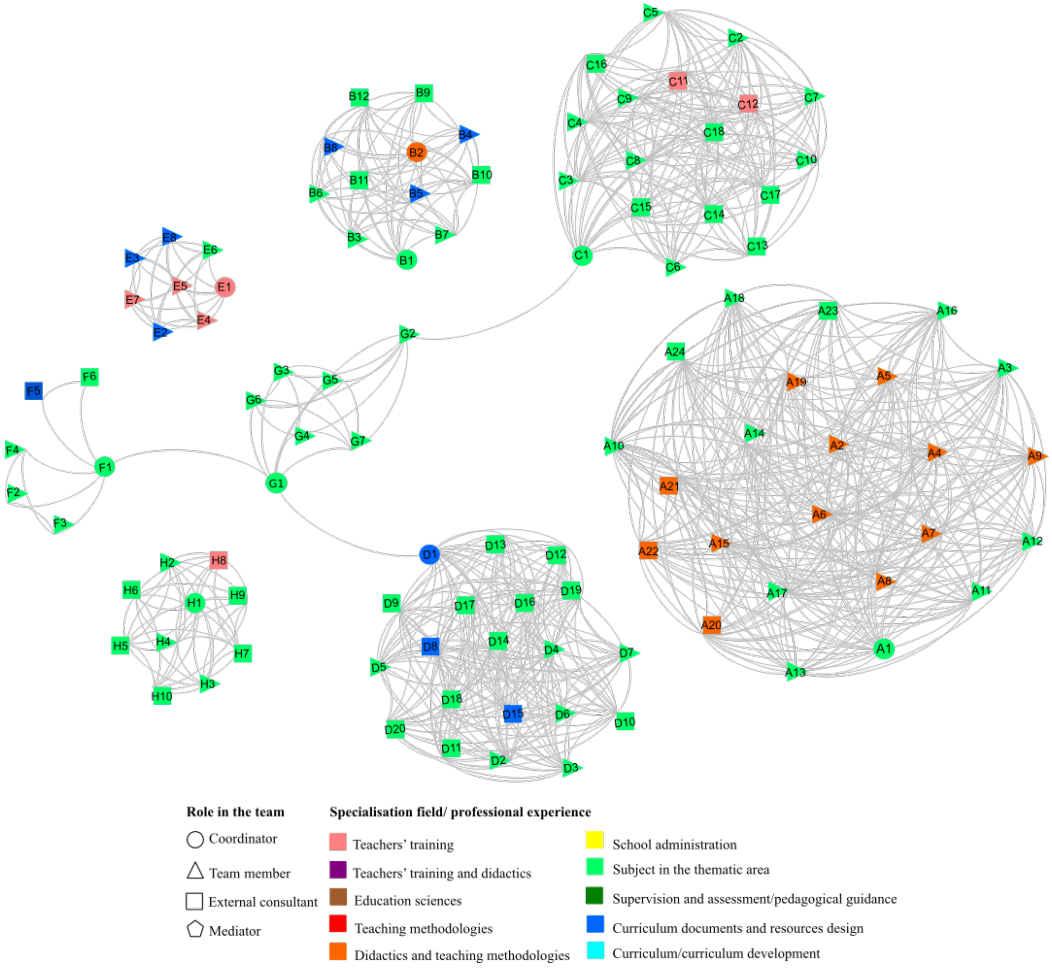
Next, the constitution of each subject area's social structure and relational dynamics is presented and analysed by visualising each graph (Figures 1, 2, and 3).

### 5.1.1. COMPOSITION AND RELATIONAL DYNAMICS OF THE TEAMS FORMED BY THE TEACHERS' ASSOCIATIONS IN THEMATIC AREAS A AND B

The relational dynamics of the TAs of thematic areas A and B (Figure 1) show eight teams (A-H) formed by the associations (groups), totalling 105 participants (nodes) and 802 relationships (ties).

**Figure 1**

*Representation of the Relational Dynamics of TAs in Thematic Areas A and B*




Source: Elaborated by the authors using Gephi 0.9.2.

Associations C and D requested the collaboration of more external consultants, and in D and H the team included more consultants than TA members.

The eight teams formed by the eight associations in thematic areas A and B are comprised of participants whose training is mainly in the thematic area, except TA E team, whose participants' area of specialisation/professional experience varies between the thematic area, teacher training or experience in curriculum documents/resources design[9]. Only this and TA B teams are comprised of participants whose training ranges across three areas. The remaining TAs are composed of participants from two areas of training. The team coordinator's training area is usually in the subject area, except

**9.** The latter (curriculum documents/resources design) is not an area of specialisation, but it means that people have experience in the authorship of curriculum documents/resources, i.e., TAs invited authors of textbooks, syllabuses and/or other Portuguese curriculum documents.

for the coordinators of TA D (D1, curriculum documents/resources author), E (E1, teacher training) and B (B2, didactics and teaching methodology) (Figure 1). Among the eight teams formed by the TAs, half (B, D, E, F) have at least one participant whose experience is in curriculum documents/ resources design, and there are three participants with this speciality in three of the teams (B, D, E).

In terms of connections, Figure 1 shows that associations A, B, E, and H did not interact with outside participants since the graph does not show any external connections leading to those teams. In contrast, TAs C, D, F, and G have links among themselves with TA G's team intermediation through their coordinators (C1, D1, F1, G1) and of the team member G2.

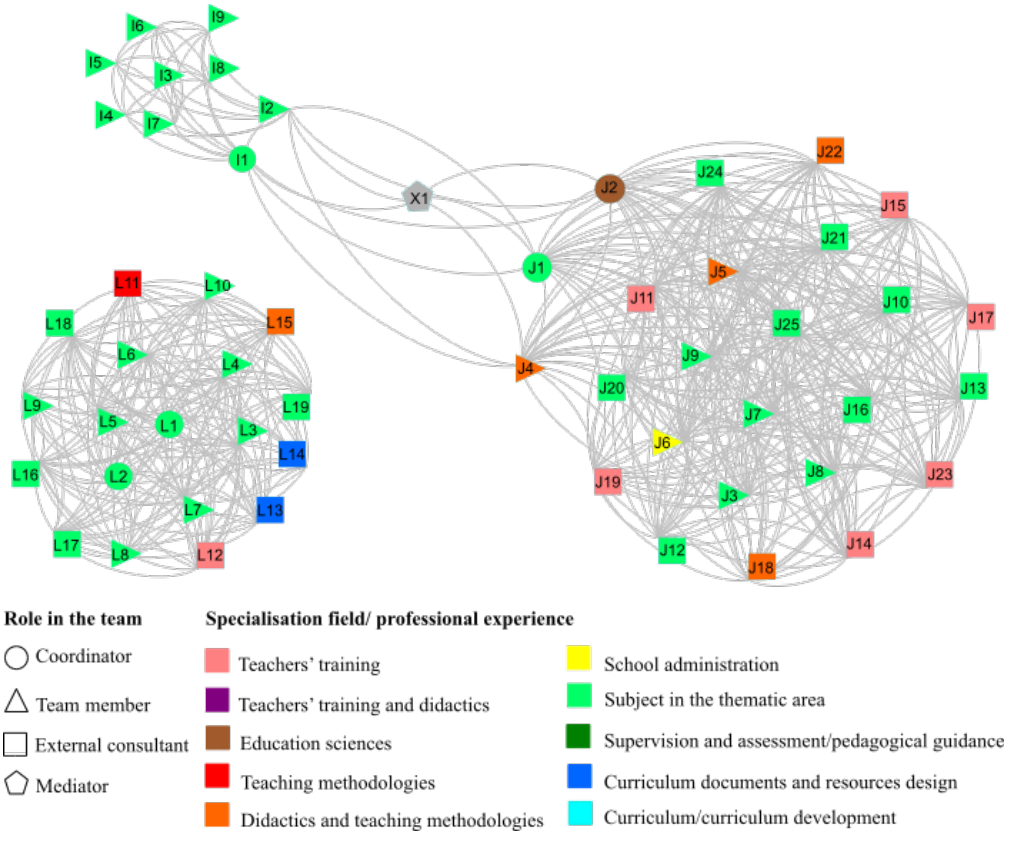
Thematic area A+B graph advances a key idea that we will find in the other graphs: coordinators are the hubs in their teams given their hierarchical position. Coordinators are also boundary spanners, playing the role of interface between these sub-groups. As seen in the four thematic areas (Figures 1, 2, and 3), coordinators are mainly those liaising with other groups/associations.

### 5.1.2. COMPOSITION AND RELATIONAL DYNAMICS OF THE TEAMS FORMED BY THE TEACHERS' ASSOCIATIONS IN THEMATIC AREA C

The relational dynamics of the TAs of thematic area C (Figure 2) – the smallest of the three areas – show three teams (I, J, L) formed by the associations (groups), totalling 53 participants (nodes) and 515 relationships (ties).

**Figure 2**

*Representation of the Relational Dynamics of the TAs in Thematic Area C*




Source: Elaborated by the authors using Gephi 0.9.2.

TA I was the only one that did not request external consultants' collaboration and included only participants with training in the subject area. The other two teams are composed of participants whose training is mainly in the subject area, although they also include participants with training that ranges from five different areas. The coordinators' training is in the subject area, except for one of the coordinators (J2) who has a background in educational sciences.

In the three teams comprising the associations in thematic area C, only L has participants (L13, L14) specialised in curriculum documents/ resources design.

Associations I and J are linked through mediation (X1), and there are also direct links between teams, namely between coordinators (J1, J2) and the J4 team member with coordinator (I1) and another team member (I2). Association L does not have external links to other associations in the same area.

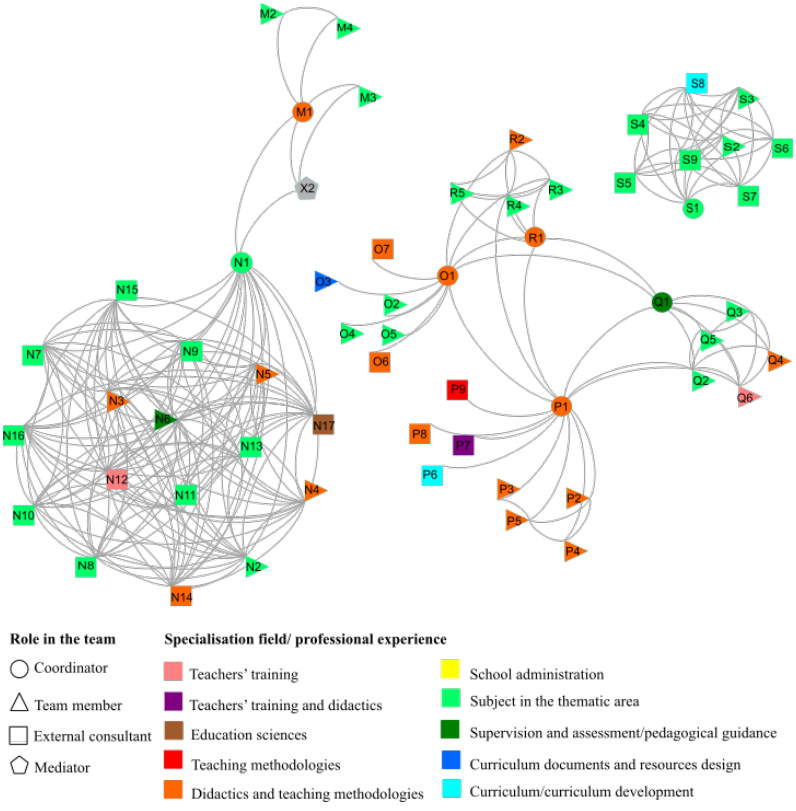
It should be noted that, in thematic areas C and D, TAs used external mediators who, similarly to the coordinators, acted as boundary spanners, facilitating critical links between two sub-groups due to existing conflicts.

### 5.1.3. COMPOSITION AND RELATIONAL DYNAMICS OF THE TEAMS FORMED BY THE TEACHERS' ASSOCIATIONS IN THEMATIC AREA D

The relational dynamics of the TAs in thematic area D (Figure 3) show seven teams (M-S) formed by the associations (groups), totalling 57 participants (nodes) and 232 relationships (ties).

**Figure 3**

*Representation of the Relational Dynamics of TAs in Thematic Area D*




Source: Elaborated by the authors using Gephi 0.9.2.

Teams M, Q, and R did not integrate external consultants, forming the smallest groups of the network in thematic area D. Association N requested the collaboration of more external consultants; like S, the team was formed by more consultants than team members.

Contrary to A+B and C networks, the seven teams in thematic area D are composed of participants with varied training areas, and most of their members are not specialised in the subject area (this is only true of team S). Even the team formed by TA P does not include participants whose training is in the subject area. Teams N, O, P, and Q include participants whose training ranges from at least three different areas. Among the coordinators, the area of training of N1 and S1 is in the subject area; M1, O1, P1, and R1 are trained in didactics and teaching methodology; and coordinator Q1 is trained in supervision and assessment/pedagogical guidance.

Among the teams formed by the TAs in area D, two integrate a participant with curriculum expertise: P6 and S8 (both consultants) have training in curriculum/curriculum development. Moreover, participant O3 has experience in curriculum documents/resources design.

Associations M and N are linked through mediation (X2), and there are also direct links between teams, namely the link between coordinators (M1, N1). Associations O, P, Q, and R are linked through their coordinators (O1, P1, Q1, R1) and some team members (R2, R3, R4, Q2, Q6). Association S does not have external links with the other associations in the same area.

We may consider TA S as a peripheral group within this network, given that it is the only group that does not interact with any other group.

### 5.2. INTERACTION PATTERNS OF THE TEAMS FORMED BY TEACHERS' ASSOCIATIONS FOR THE DEVELOPMENT OF ESSENTIAL LEARNINGS

Based on the network analysis, we observe that collaboration in TA teams drafting the EL occurs mainly inside the team. We can see that some groups worked deeply internally and little with team members of other TAs. The density metric shows that the associations in thematic area C worked more intensively, with more interactions (density = 0.36) than the others (Table 3). The value of the average degree of the network also shows that the connections are higher in C, i.e., the average number of connections (ties) between the network nodes is 19.074. The lower value of the other areas (A+B and D) is explained by the different intensities in the connections of the respective associations, some with much more than others (Figures 1, 2, and 3). In the network formed by thematic areas A+B, associations A, C and D have the most interactions within their teams (Figure 1), and in area D, teams N and S interacted the most internally. As for the associations whose teams showed the most negligible interaction, we can identify in the figures associations F in network A+B, I in network C, and associations M, O, and P in network D.

**Table 3**

*Gephi Metrics Used to Analyse A+B, C and D Networks*

| Metric | Thematic areas A + B | Thematic area C | Thematic area D |
|---|---|---|---|
| Average network degree | 15.276 | 19.074 | 8 |
| Network diameter | 5 | 3 | 3 |
| Average path length | 2.599 | 1.528 | 1.954 |
| Graph density | 0.147 | 0.36 | 0.14 |
| Cluster coefficient | 0.981 | 0.966 | 0.878 |
| Connected components | 5 | 2 | 3 |

Source: Elaborated by the authors. Adapted from Gephi 0.9.2.

The analysis of the networks (A+B, C and D) reveals that these are fragmented with isolated connected components, i.e., we identified 10 groups (number of connected components in the three networks), some with great connectivity between the nodes, but no connection between them.

These are *small-world* networks, described by Watts and Strogatz (1998). The occurrence of the *small-world* phenomenon in a graph is characterised by a large coefficient clustering and a small characteristic path length between the nodes. The clustering coefficient, described by Watts and Strogatz (1998) as the probability that two nodes related to a third are also related to each other, is one of the attributes that defines a *small-world* network, which, as we can see, is very high for all TAs by subject area. Team elements can reach or be reached by others, using few connections to do so, according to the value of the "average path length" metric.

It is relevant to point out that the 10 groups are weakly connected by only one element, usually the team coordinator. The collaboration between two associations in both thematic areas C and D also required the presence of a mediator (X1, X2), who was not part of their teams, which suggests some type of conflict between them (Figure 2 – I, J; Figure 3 – M, N).

In essence, the data show that the teams formed by the TAs to prepare the EL did little collaborative work with other associations from related areas (considering the same thematic area). Collaboration between different areas was practically non-existent, with this practice being identified only between two associations (C, G) of subject areas A and B (Figure 1), in a low-intensity interaction between coordinator C1 and team member G2.

These results seem to clarify that teachers (who constitute the TAs) still have few collaborative habits, namely between different subject areas and, in particular, regarding curriculum design.

## 6. CONCLUSION

This study aimed to understand the social structure and the interaction dynamics created by the TAs in the elaboration of the EL. To achieve this, we started from two research questions: (i) Which actors were invited by the TAs to join their teams, and what relationships did they establish with each other?; (ii) Which relational dynamics did the associations of the various subject areas establish with each other?

With regard to the first question, we found that most associations formed teams composed of members whose training was mainly in the subject area, followed by didactics and teaching methodologies, valuing above all the content or scientific knowledge of the subject teachers. Invited consultants were also mainly linked to those two backgrounds: subject area and didactics. As the EL was a policy request for curriculum design, subject knowledge was perceived as essential by TAs, mostly for reinforcing the role of their subjects within the design. However, given the demands of the task to be carried out – the design of the formal curriculum –, its authors were supposed to be holders of curricular knowledge in terms of theory and not just in the practice of its disciplinary implementation. The importance of this need is reinforced by the literature in this field. For instance, Carl (2005) and Oloruntegbe et al. (2010) report that teachers are not able to participate in curriculum development processes adequately mainly due to the gap in curriculum knowledge and the skills required to implement collaborative design processes (e.g., Handelzalts, 2009; Hoogveld, 2003). However, this was not valued by the team coordinators of the various associations. We should underline that only two of the invited consultants were specialised in curriculum design.

These results suggest that the social representation of professional knowledge by the TAs undervalues curriculum knowledge, even in the context of curriculum design processes. This almost exclusive overvaluation of content or scientific knowledge represents an imbalance in what Lee Shulman (1987) considers to be the components of the necessary knowledge for the social representation of professional teaching, namely: content, pedagogy and didactics, curriculum, learners, and context.

The results also point to little collaboration between associations in the EL design. The associations collaborated very little in related areas, which can be justified by the Portuguese education system's tradition before the 25th April Revolution, which was mainly based on individual work. Although TAs included, in their founding texts, didactic and sometimes pedagogical goals, their action programmes mostly privileged the scientific and didactic dimensions of each subject knowledge.

In relation to the second research question, and although the literature in this field emphasises teachers' participation, collaboration, and reflection as essential in promoting teacher learning and professional development (Day, 2004; Lieberman, 1996; Little, 2002), our study concluded that there was almost no collaboration between associations from different areas since the subject-based rationale of culture of the TAs leads to conflicts over the curriculum. The supremacy of certain subjects in the curriculum to the detriment of others triggers conflict among teachers, which is not conducive to collabora-

tion, calling upon a double influence – the segmenting subject-based tradition and the tradition of teaching based on individual responsibility, characteristic of a profession that was historically built in a culture of individualism.

Teachers' involvement in curriculum design at the macro-level could be, if such an initiative is maintained in curriculum policies, one of the drivers of collaborative work.

Thus, it appears as essential that teachers of different subjects will participate more collaboratively in every stage of curriculum development, i.e., not only in its implementation but also in the definition of the curriculum at macro-level, especially when the present curriculum policies aim to develop interdisciplinarity in schools. Also, at meso- and micro-levels, teachers' collaborative involvement will be more substantial the more schools reproduce this type of initiative and promote the collaborative development of the curriculum and the reflection on curricular practices. This may contribute to overcome the traditional teacher's individualism and isolation and encourage innovation and the improvement of pedagogical practices. This isolation can be more easily breached if interdisciplinarity originates in the active and shared participation of teachers from different areas in global curriculum construction.

The pedagogical principles of the EL curricular model rely on assuming the importance and necessity of collaborative work in schools. Therefore, it seems relevant to point out the discrepancy between the founding principles of the EL and the lack of collaborative practices demonstrated by their authors in the process of designing the EL. So far, we have no data that allow us to understand this apparent contradiction. Further research is needed either to inquire the TAs on this subject or to analyse the EL of different subject areas in order to understand how they develop or not suggestions leading to interdisciplinary perspectives related to their specific content and goals.

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**i** Centro Interdisciplinar de Ciências Sociais, Universidade Nova de Lisboa, Portugal. https://orcid.org/0000-0002-4728-064X

**ii** Unidade de Investigação e Desenvolvimento em Educação e Formação, Instituto de Educação, Universidade de Lisboa, Portugal. Centro Interdisciplinar de Ciências Sociais – Pólo de Leiria, Instituto Politécnico de Leiria, Portugal. http://orcid.org/0000-0001-5939-4401

**iii** Centro Interdisciplinar de Ciências Sociais, Universidade Nova de Lisboa, Portugal. https://orcid.org/0000-0001-6001-2802

**iv** Centro de Investigação para o Desenvolvimento Humano, Universidade Católica Portuguesa, Portugal. https://orcid.org/0000-0002-0151-7760

**v** Instituto de Educação, Universidade de Lisboa, Portugal. https://orcid.org/0000-0001-5513-2025

Toda a correspondência relativa a este artigo deve ser enviada para:

Sílvia de Almeida
Centro Interdisciplinar de Ciências Sociais, Universidade Nova de Lisboa
Avenida de Berna, 26-C
1069-061 Lisboa
silvia.almeida@fcsh.unl.pt

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## *Design* do currículo em rede? Dinâmica relacional das associações de professores na elaboração das *Aprendizagens Essenciais* em Portugal


### RESUMO

O convite do Ministério da Educação português às associações de professores (AP), em 2016, para a sua participação no processo de definição das *Aprendizagens Essenciais* (AE) é inédito no contexto histórico-curricular português, como na maioria dos países do mundo. Neste texto pretende-se perceber a estrutura social e a dinâmica de interação criada pelas AP na elaboração das AE, respondendo às seguintes questões de investigação: i) Que atores foram convidados pelas AP para as suas equipas e que relações de interação estabeleceram entre si?; ii) Que dinâmica relacional estabeleceram as associações das várias áreas disciplinares entre si? Como metodologia privilegiámos a análise de redes sociais (*Social Network Analysis* – SNA) que permite detetar a estrutura das relações sociais, e seus padrões de interação e representá-los graficamente. Elaborámos um questionário de análise de redes que foi aplicado às 18 AP que participaram na elaboração das AE. Os resultados demonstram que as AP constituíram equipas formadas, sobretudo, por elementos especialistas na disciplina da área. A representação social do conhecimento profissional por parte das AE desvaloriza o conhecimento do currículo. Verificou-se ainda a pouca colaboração entre associações na elaboração das AE, o que se pode justificar pela tradição do sistema educativo português anterior ao 25 de Abril, que se sustentava numa lógica de trabalho individual dos docentes, e pela génese ou cultura disciplinar das AP.


**Palavras-chave:** Associações de professores; Design do currículo; Políticas curriculares; Análise de redes; Colaboração docente.

## Conception de programmes d'études en réseau? Dynamique relationnelle des associations d'enseignants dans l'élaboration des Apprentissage Essentiel au Portugal


### ABSTRAIT

L'invitation du Ministère Portugais de l'Éducation aux associations d'enseignants (AEs), en 2016, pour leur participation au processus de définition de les *Apprentissage Essentiel* (AE) est sans précédent dans le contexte historique et curriculaire portugais, comme dans la plupart des pays du monde. Dans ce texte, nous entendons comprendre la structure sociale et les dynamiques d'interaction créées par les AEs dans la préparation de les AE, en répondant aux questions de recherche suivantes: i) Quels acteurs ont été invités par les AEs dans leurs équipes et quelles relations d'interaction ont-elles établies entre eux?; ii) Quelle dynamique relationnelle les associations des différents domaines disciplinaires ont-elles établie entre elles? En tant que méthodologie, nous avons privilégié l'analyse des réseaux sociaux (ARS), qui permet de détecter la structure des relations sociales, et leurs schémas d'interaction et de les représenter graphiquement. Nous avons développé un questionnaire d'analyse de réseau qui a été appliqué aux 18 AEs qui ont participé à la préparation des AE. Les résultats montrent que les AEs constituaient des équipes formées avant tout par des spécialistes de la discipline dans le domaine disciplinaire des AEs. La représentation sociale des connaissances professionnelles par l'AEs dévalorise la connaissance du curriculum. Il y avait aussi peu de collaboration entre les associations dans la préparation des AE, ce qui peut être justifié par la tradition du système éducatif portugais avant la Révolution du 25 Avril, qui était soutenue par une logique de travail individuel des enseignants, et par la genèse ou la culture disciplinaire des AEs.


**Mots clés:** Associations d'enseignants; Conception du curriculum; Politiques curriculaires; Analyse des réseaux sociaux; Collaboration entre enseignants.