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Perceptions of secondary school teachers on the use of collaborative tools

Maria do Mar Proença Duarte de Sampaio Nunes

Mestrado em Informática e Gestão

Orientador:
Professor Abílio Oliveira, Professor Auxiliar,
ISCTE-IUL

Outubro, 2020



TECNOLOGIAS
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Ciências e Tecnologias da Informação

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Abstract

Technology has changed many aspects of life in society, playing a key role in the lives of individuals, and having profound impacts on how we relate to our peers and the way we educate younger people. Collaborative tools have broken the barriers of time and space, allowing individuals to collaborate without these constraints. There are numerous advantages in the use of these tools in secondary education both in the immediate and future lives of students. Thus, emerges the question: What is teachers' perception of collaborative tools and what role do they play in the teaching-learning process, in the transmission of knowledge and in education? In this paper, the state of the art is addressed in relation to collaborative tools in schools, the advantages and possible deterrents to the use of this type of tools from the perspective of teachers are explored. In order to collect the opinions and perceptions of teachers, a questionnaire was elaborated based on the analysis of the literature, previous studies and experience of researchers. Results highlighted that teachers recognize the benefits of these tools but, at the same time, there are factors that function as limitations to their use. In fact, collaborative tools and ICT are still not well explored by teachers in the context of their work.

Keywords: Collaborative tools; Teachers; Technology; ICT; Education; Learning.

Resumo

A tecnologia veio mudar muitos aspetos da vida em sociedade, desempenhando um papel fundamental na vida dos indivíduos, tendo impactos profundos na forma como nos relacionamos com os nossos pares e na forma como educamos os mais jovens. As ferramentas colaborativas vieram quebrar as barreiras do tempo e espaço, permitindo aos indivíduos comunicar e colaborar sem fronteiras. Existem inúmeras vantagens na utilização destas ferramentas no ensino secundário, no imediato e na vida futura dos alunos. Assim surgiu pergunta: Qual a perceção dos professores acerca das ferramentas colaborativas e qual o papel que estas têm no processo de ensino-aprendizagem, na transmissão de conhecimentos e na educação? Começa-se por abordar o estado da arte relativamente às ferramentas colaborativas nas escolas, explorando as vantagens e possíveis entraves da sua utilização, na perspetiva dos professores. Para conhecer as suas opiniões, foi elaborado um questionário com base na revisão teórica, estudos anteriores e experiência dos investigadores. Constata-se pelos resultados obtidos que os professores reconhecem os benefícios destas ferramentas. Porém, alguns fatores funcionam como dissuasores da utilização das mesmas, e estas até à recente situação criada com o Covid-19, eram pouco usadas pelos docentes no contexto profissional.

Palavras-chave: Ferramentas colaborativas; Comunicação; TIC; Ensino-aprendizagem; Professores do ensino secundário.

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Abbreviations Glossary and Acronyms

ICT – Information and communications technology

Covid-19 - disease caused by a strain of coronavirus - 'CO' corona, 'VI' virus, and 'D' for disease and 19 because it was discovered in the year 2019.

PCA - Principal Component Analysis

M - Mean

Chapter 1 – Introduction

Technology has changed many aspects of our life in society, and plays a fundamental role in education, transforming in a great extent the teaching methods, with the addition of new collaborative tools which enable long distance learning – and which has become particularly important in recent time due to the covid-19 advent.

“Emerging technologies provide opportunities for instructor–student as well as student–student real-time and/or time-delayed collaboration. Software companies are creating user-friendly applications that are an asset to business and educational settings alike” (Beldarrain, 2006, 140).

The distance between students and knowledge is decreasing, in particular the technological tools that create spaces to allow interaction and collaboration between students and teachers facilitating the existence of learning communities t (Beldarrain, 2006). In particular, we highlight the emergence of collaborative tools and social software whose versatility allow for new ways to communicate, share knowledge and cooperate McLoughlin & Lee (2008). These tools motivate and help to meet the learning needs of students, adding new dimensions to learning.

1.1. Motivation and relevance of the theme

The motivation for this work from the personal interesses and from the impact that understanding teachers’ point of view can have in facilitating the adoption of collaborative tools.

Considering the importance that technology has in the lives of individuals, especially in the current pandemic situation we live in, it is increasingly important to understand how it fits into learning and education, in particular, it was the use of these tools that allowed classes to continue in a safe maner allowing students and teachers to continue the teaching-lerning process with the propper social distancing needed in this phase of the pandemic. It is through these technologies that we form the citizens of the future. It is then crucial that children and adolescents grow up in a technology-rich environment as it will be part of their daily lives, also by having contact with these technologies from an early age we are allowing students to gain skills that they will use later in the performance of their work as active citizens (Beldarrain, 2006).

This work aims contribute to the theory and society by understanding what is the current use of technological tools by teaches in the context of their work and what factors hinder the adoption of these tools in order to manage and mitigate these factors.

There are numerous advantages that can come from using new technologies, in particular the use of collaborative tools that facilitate communication and allow collaboration of individuals with different levels of knowledge, facilitating the existence of shared learning, eliminating barriers of time and space. These tools also become useful for the future life of students as more and more companies are organized by virtual teams with the support of collaborative tools to streamline and assist group work, so a school environment rich in collaborative tools will not only benefits students in the immediate future but also bring future advantages, preparing young people for the challenges of active life.

1.2 Presentation of the research

This project aims to verify the perceptions of teachers, in secondary schools, about the use of information and communication technologies (ICT) in the context of their profession, in particular with regard to the use of collaborative software as a means of facilitating the learning of students. In this sense, the following research question arises: What is the teachers' perception of collaborative tools and what role do they play in the teaching-learning process, in the transmission of knowledge and in education?

In sequence, the following objectives were proposed:

1. Find out which collaborative tools are most used by teachers in the contet of their profession;
2. Determine how often teachers use collaborative tools in the context of their work;
3. Find out what teachers think about collaborative and cooperative learning;
4. Determine which types of information are most important to teachers;
5. Verify what teachers think about the main advantages of using these tools (in terms of productivity, communication with students, utility);
6. Determine which factors hinder the adoption of collaborative tools;
7. Test whether gender influences the use of technological tools.

1.3 Methodological approach

Considering the proposed objectives, these were the steps taken in order to achieve them:

- a) Survey and analysis of the literature on school and teaching tools in Portugal, information and communication technologies and their role in teaching and learning, collaborative tools and the use of ICT and collaborative tools in teaching-learning;
- b) Preparation of a questionnaire, with closed question questions (Likert scales), developed based on literature analysis, results of previous studies, previous questionnaires and researchers' experience;
- c) Data collection through the online questionnaire, applied to secondary school teachers;
- d) Quantitative analysis of data obtained and interpretation of the results in order to answer the proposed research questions;
- e) Discussion of the results obtained, limitations of the study as well as suggestions for future studies.

1.4 Structure and organization of this dissertation

This document is divided into five parts. The first chapter aims to present and introduce the research thematic, explain the motivation for its development and make a brief synthesis of work structure, including the presentation of research question, research objectives and methodological approach;

The second chapter presents the theoretical framework and analyses of the state of the art in order to frame the theme, define important concepts, and also as a basis for the construction of the questionnaire;

The third chapter presents the methodology used in the data collection process, as well as the justification for the choice for obtaining data as well as the processing of data;

The fourth presents an analysis and interpretation of the results obtained, considering their statistical analysis using the SPSS data analysis software and discussion of results;

The fifth, and final chapter, presents the conclusions drawn from our research, as well as some limitations and suggestions for future studies.

Chapter 2 - Theoretical Framework

Information and communication technologies are at the basis of contemporary societies, they evolve rapidly to keep up with the evolution of society, often under pressure. The pressure for change arises due to society's perception of the benefits that these tools may have (Lim, Zhao, Tondeur, Chai & Tsai, 2013).

There is a paradigm shift, from technical to technological. The integration of technology in schools is seen as generating qualitative transformations in school work and in the development of the student as a citizen with profound impact on their daily lives. This works as a pillar for updating and modernizing the technological, scientific, cultural and social aspects not only as an accessory, instrument or tool, but as effective change (Patrocínio, 2002).

2.1 School and Teaching in Portugal

2.1.1 About the school

The school, as an institution, is one of the main pillars of society when it comes to the transmission of knowledge and the preparation of young people to the challenges of their current and future life. Schools are organizations whose purpose is to promote learning and prepare their students for life and the knowledge society through experience. Students actively participate in this organization. Knowledge is constructed collaboratively through joint learning. There is a focus on increasing knowledge, and learning is a consequence of doing school work and projects (Scardamalia & Bereiter, 1999).

As in all areas of society, technology has changed the way teaching and school are structured and organized, particularly in the way teachers teach and students learn. There is a strong link between technology, interaction and education (Beldarrain, 2006), with the development of new tools the teaching and learning models have adapted in order to respond to the needs of students and teachers. According to McInnerney (2002), with increasing competitiveness in the market and with companies increasingly needing professionals who can collaborate and cooperate efficiently in response to this need, many educational institutions are adapting curricula to meet these market needs, in particular in higher education courses.

There are numerous benefits that come from using technological tools, the initial investment for schools is substantial and with technology evolving at an extremely fast pace many resources are needed to keep the hardware and software up to date and functional, which means that many of them are unable to access and keep up with

technological developments. There is a lot of pressure from the media, the general public and political parties to ensure that technological tools are used in schools, through technology programmes and initiatives that, despite being very expensive, have shown extremely positive results (Lim et al., 2013).

2.1.2 About the teachers

The teachers' role is essential for society, guiding and leading students as well as transmitting knowledge and stimulating education, not only through conventional forms, but also through their attitude and example.

Technology has been changing the way teachers interact with students and how classrooms are organized. According to Beldarrain (2006), many educators are aware and take advantage of the advantages of using these tools, the role of the teacher is to support learning, challenge students to reflect and develop critical thinking. The new learning models show that there's mutual learning between students and their peers, as well as between students and instructors.

Teachers are aware of the potential of ICT to respond to social and educational challenges and also about institutional and personal limitations. The use of ICT plays a secondary role in teachers' teaching practices and is used as a complement to other materials. Some of the impediments pointed out are the lack of time to adapt the program, lack of time to know the software and acquire new skills and lack of time to give the complete class program, the classes are constituted by a large number of students and the very nature of teachers' work is very individualistic, so there is little cooperation between professionals (Peralta, 2007).

Methodologies that give teachers the technological tools to improve teaching have significant potential to improve learning, and there are numerous evidences that cooperative learning as a pedagogical practice has a profound effect on student learning and socialization (Slavin, 2014).

According to Miranda (2007), simply adding technology to classrooms alone does not produce positive outcomes in student learning. Some of the reasons that the author indicates for this to happen are: the lack of proficiency of teachers due to the absence of resources and training; ICT integration requires effort to reflect and modify practical teaching concepts, which some teachers may not have the tools or knowledge to do. In order to register positive effects in students' learning, it is necessary to develop challenging and creative activities, that explore the possibilities offered by technologies.

The author concludes that it is necessary to reflect on how we can make learning effective and modify the institutions and how curriculum is taught in order to take advantage of new computer tools, since just adding them to the school context is not enough. There are other variables to consider such as the contribution that these educational practices can make to the literacy of students and teachers themselves, in addition they generate motivation and create networks. In sum technological tools should be integrated and not only added to the curriculum.

2.1.3 About the students

The educational needs of students have evolved compared to the past, currently students are extremely familiar with technological tools. These tools, in particular collaborative ones, widen the horizons of the classroom.

Collaborative tools allow students to learn in a collaborative social environment, an environment that is familiar to them. Students tend to prefer to work in groups rather than in isolation (Beldarrain, 2006). The use of social networks by students starts early in life. This develops into a certain dependence on these types of tools, because they respond to the needs of individuals to maintain contact. Most students already uses these types of tools to relate to their social network, outside the school environment (McLoughlin & Lee, 2008).

With the evolution at an increasingly rapid pace today, in a short period of time, information is quickly deprecated, the use of collaborative tools allow students access to relevant and up-to-date content (Beldarrain, 2006). Students no longer have a passive role as consumers of information, they have an active role in the construction and sharing of their contributions, thus fostering the emergence of virtual communities that break geographical, physical and institutional barriers, responding to their needs, namely the search for autonomy, connectivity and socialization-based learning.

It is increasingly important to teach students how to work together, one of the main advantages of using collaborative online tools is that it allows students to participate and collaborate outside of classes. Collaborative learning teaches students the importance of teamwork and facilitates their integration into the job market (McInnerney, 2002; Beldarrain, 2006).

2.1.4 The development of young people

This point aims to explain the development process of young adolescents and the importance of learning for this process. Learning is intrinsically linked to the

development of young people, as this is they acquire knowledge and experience so it is imperative to understand how this process works.

Young people attending secondary school are in the age group of 12 years, which represents the 7th year up to 18 years that corresponds to the 12th year. According to Piaget (1972) young people in these ages groups are in the formal operative phase where they are already able to think logically, formulate hypotheses and find solutions based not only on the observation of reality, but based on abstract thinking.

The use of information technologies in schools has expanded the cognitive development of children and adolescents, and has changed the way one learns since there is a link between the development of higher psychological functions (Vygotsky, 1994) and the systems of treatment and representation of information. These changes in the way of learning and cognitively organizing information, are slow processes and will not be visible immediately, the modification of mental processes is slow and will take generations (Miranda, 2007).

The study of learning is not a recent topic in literature, this interest came from the need to transmit knowledge and values to individuals, particularly the younger ones, so that they remain motivated and develop characteristics that will be essential to them in the future. Learning is a constructive, intentional and collaborative process so activities developed by teachers related to the new systems of treatment and representation of information and communication should take this into account. Learning is a constructive process, and students are active participants in building their knowledge based on the structures and representations already acquired. The more students strive and commit to tasks, the more efficient learning will be (Miranda, 2007).

Cooperative and collaborative terms are often used as synonyms, but in reality, they are distinct concepts, according to author Panitz (1999), who studied this distinction between them. Collaboration is a philosophy of interaction and a personal lifestyle in which the individual is responsible for his actions including learning and for respecting the contributions of his peers. Cooperation is a framework of interaction with a specific design in order to achieve a specific goal through working together.

Collaborative learning is a method that uses social interaction as a basis for the construction of knowledge, refers to group work of two or more people in order to achieve a common goal, respecting individual collaborations for the whole group (Paz, 2000).

According to Gillies (2016) who wrote a meta-analysis on cooperative learning, this topic began to have emphasis in 1980 with the publication of a meta-analysis by Johnson and colleagues in 1981 the authors emphasise that with the use of the methodology of cooperation between students these present more favourable results, increased productivity, in sum his type of learning seems to have more positive effects since it promotes greater learning and socialization among students (Johnson et al., 1984). It should be noted that these results were consistent in all school subjects, for all age groups and for all tasks involving learning theoretical concepts, problem solving, categorization and reasoning tasks. Cooperative learning compared to competitive and individualistic learning has a very positive correlation not only with variables such as success, but also increases socialization, motivation and personal development (Slavin, 1989), as a pedagogical practice that promotes learning and socialization among students (Gillies, 2016).

Context can facilitate or hinder learning, not only from what is directly taught, but also with what is observed around us, this is how individuals' appropriate knowledge and slang associated with a certain knowledge and community, this type of learning facilitated by the context it is more accessible with internet access (Greeno, 1998). However, it is necessary to consider that not all learning can be collaborative and not all students appreciate and take advantage of this type environment (Hopper, 2003).

Collaborative learning brings several benefits to students' development, such as increased capacity for dialogue, problem solving, question formulation, construction of thinking based on the ideas of others, reflection on results (Alexander, 2008), developing the capacity for collaboration, cognitive structures, and formal thinking (Miranda, 2007).

2.2 Use of ICT and collaborative tools in teaching-learning

2.2.1 Before covid-19

Miranda (2007) made an analysis of studies on the implementation of ICT in secondary education, with the use of Virtual Learning Environment that aims to combine synchronous and asynchronous contents and activities. Researchers found that the most interested students were the ones who used the most and took advantage of the technological environment that was facilitated, it also verified the existence of a positive correlation between students who had access to these tools and their classifications. These tools also prove to contribute to a greater literacy of both students and teachers, and there

is more interest from students and teachers in the disciplines that use these resources in an innovative and creative way. The adoption of new technological strategies and methods gives teachers more positive feelings about technologies in general.

Cooperative education tends to adopt constructivist ideas where the student creates his own network of personal knowledge supported by social networks, which provide a connection to other individuals, contact with other ideas, and communities that lead to creativity and generation of knowledge, with the support of technological tools (McLoughlin & Lee, 2008).

Collaborative tools allow students to suggest topics based on the subject content and dynamic content giving student more control and enabling a more efficient knowledge construction, the new learning models integrate mutual learning between students and their peers, as well as between students and instructors (Beldarrain, 2006).

Collaboration prepares students to be part of a community, through synchronous communication tools students can rehearse presentations, provide instant feedback, clarify misunderstandings, and share knowledge. Educational institutions must adapt to integrate student interaction through the use of collaborative tools. These tools also tend to change the role of students and instructors, due to increased control and interaction by students. With the use of these technological tools students tend to better understand subjects and it promotes collaboration between colleagues through the emergence of mentors, teamwork as well as other strategies that come from group work. These tools allow students to be constantly connected with their peers and allow feedback to be received from both the teacher and their peers (Beldarrain, 2006).

Tools such as wikis, blogs, feeds, social networks allow students to learn in a collaborative social environment, an environment that is familiar to them since the generality of students uses this type of tools to relate to their social network, outside the school environment. The same authors McLoughlin & Lee (2008) indicate that the use of these tools will be the future of learning and it is particularly important now that students and teachers have to maintain social distancing, there is a need to understand which tools are used by teachers and what are the main factors that can hinder the adoption of these tools.

With the evolution at an increasingly rapid pace today, in a short period of time information is gets quickly deprecated, these type of collaborative tools allow both

students and teachers to have quick access to relevant and up-to-date content and activities (Beldarrain, 2006).

2.2.2 After covid-19

Due to the need to prevent and control the COVID-19 epidemic, schools had to be closed and in person learning was not an option since social distancing had to be enforced. Schools had to adapt very quickly and become online based, parents had to step up and help their children since time with their teachers and their colleagues was limited. This has accelerated the integration of technology in education and has reformed the teaching methods of education to adapt to this new situation but it also revealed some issues and raised some questions like how to better integrate technology in education, make students more autonomous, and make learning more effective (Zhou, Fangmei, Shanshan & Zhou, 2020).

The lessons learned from this need to have the schools closed and online learning that were gained by teachers, students and school administration can be used in a postpandemic scenario in case of missing lessons, students with special needs or in case another similar event like this occurs. The school community has experienced distance learning in a new way and have adapted to the new format of the lessons, additional hours were needed for more effective group teaching and feedback, and students worked more independently. This experience has made the teaching methodologies to have to be studied further in order to improve, including the available technological tools and platforms, school classes, assignments and evaluations (Basilaia & Kvavadze, 2020).

Chapter 3 - Methodology

3.1 Population - sample

In order to study the population of secondary school teachers, since it was not possible to enquire all the teachers in Portugal, data was collected from a subset of it as it was not possible to acquire a random sample, this is a convenience sample (Reis, 2003), where it is established that all viable candidates for participation in the study are those who are currently secondary school teachers in Portugal. Teachers were invited to participate in the study mostly via word of mouth and personal contact. The number of participants required was 100 in order to maintain the number of responses/items ratio 20:1 (Aleamoni, L. 1976).

Of the 104 participants 31.7% are male and 68.3% are female. The sample has individuals whose ages range between 23 and 58 years. The average age is 43 years and there is a deviation from the average of 8 years which means that the average age is between 35 and 58 years (cf. Annex 2 - Table 2- Descriptive statistics tables for age distribution).

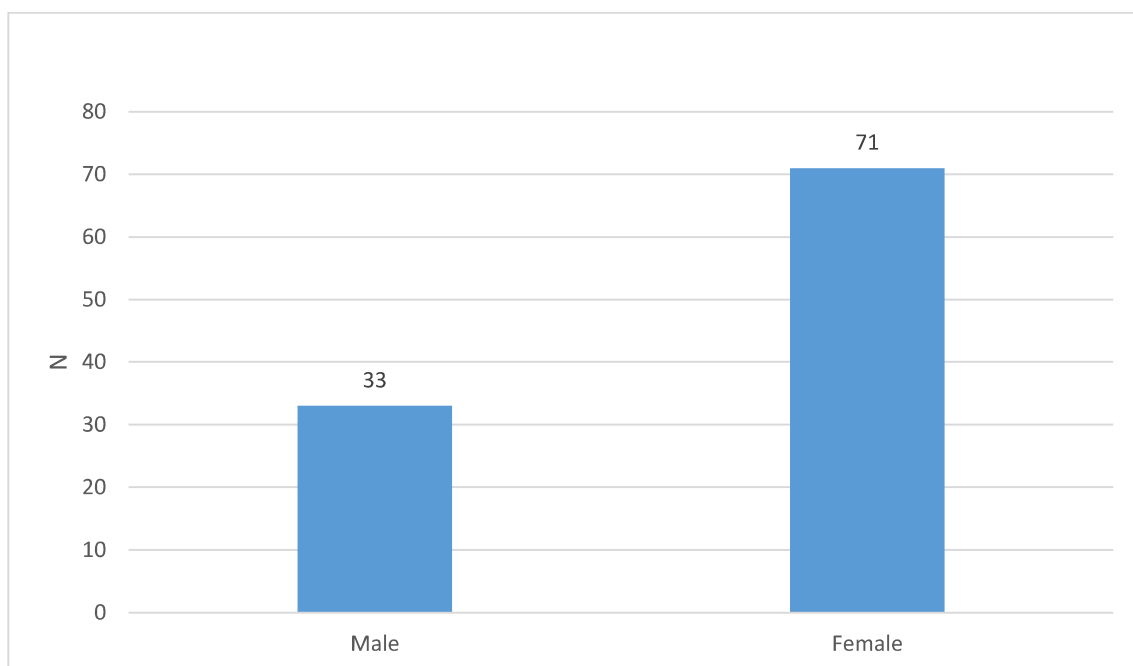


Chart 1 - Descriptive statistics tables for age distribution

Data was obtained between May 13 and September 30, 2019, 108 questionnaires' answers were collected, three of the participants did not agree to participate and one of the participants did not fit the study population (did not teach secondary education). The data were exported to SPSS Statistics 25, where the statistical treatment of the information

was performed. Descriptive statistics for all questions, PCA and a T-test to test de equality of means.

3.2 Procedure - study by Questionnaire

For this study, data was collected through an online questionnaire survey (cf. Appendix 1). This method of data collection was chosen since it is an objective way of perceiving opinions, beliefs, feelings, interests, expectations and situations experienced, having as main advantages the scope of a greater number of people and in a wider geographical area, obtain faster and more accurate answers and provides greater freedom in responses since it provides a greater perception of anonymity (Gerhardt & Silveira, 2009). Based on experience the aim was to have at least 100 participants in order to perform the intended statistics tests.

The items and scales of the questionnaire, derived from the analysis of the state of the art, previous studies, other questionnaires and the experience of the researchers (Peralta, 2007; McLoughlin & Lee, 2008; Miranda, 2007; Beldarrain, 2006). It was developed in order to answer to the research question and the objectives proposed (cf. 1.2 Presentation of the research). Thus, the proposed questions mainly aim to understand the perceptions of secondary school teachers about the use of collaborative tools in schools. The questionnaire was divided as follows:

- Q 1 to Q 4 - Aim to determine the demographic data of the participants;
- Q 5 - Find which collaborative tools are most used by teachers in the context of their work;
- Q 6 - Determine how often teachers use collaborative tools in the context of their work;
- Q 7 - Find out what teachers think about collaborative learning and cooperative;
- Q 9 - Determine which types of information are most important to teachers;
- Q 6, Q 8 and Q 10- Test the teachers' opinion about the main advantages of using these tools (in terms of productivity, communication with students, utility);
- Q11 - Determine which factors hinder the adoption of collaborative tools;
- Q 5 and Q 2 - Test whether gender influences the use of technological tools.

The items that integrate these questions, are closed answer questions, evaluated through Likert scales, from 1 (generally meaning “I disagree”) to 5 (“Totally agree”) (cf. Annex 1). The questionnaire was created using the Google Forms tool and distributed in digital format through email and social networks. The questionnaire was designed in digital format since this was possible an easier distribution, obtaining results from a more

comprehensive geographical area and allowing participants to be filled in at times and places that were more convenient for them.

Chapter 4 - Results

4.1 Descriptive analysis

4.1.1 Disciplines taught by teachers

Regarding the disciplines taught, there were 18 subjects, 9 (8.7%) Biology and Geology, 6 (5.8%) Drawing, 1 (1%) Law and Economics, 7 (6.7%) Economics, 2 (1.9%) Special Education, 6 (5.8%) Physical Education, 6 (5.8%) Philosophy, 7 (6.7%) Physics and Chemistry, 3 (2.9%) French, 6 (5.8%) Geography, 5 (4.8%) Descriptive Geometry, 9 (8.7%) History, 1 (1%) Art History, 7 (6.7%) English, 9 (8.7%) Mathematics, 13 (12.5%) Portuguese, 3 (2.9%) Psychology, 2 (1.9%) Chemistry, 2 (1.9%) Sociology. The most frequent discipline is Portuguese with 13 participants, representing 12.5% of the sample (cf. Annex 2 - Table 4- Descriptive statistics table for disciplines taught by teachers).

4.1.2 Tools that teachers use the most in the context of their work

For the tools that teachers use the most in the context of their work on a scale where 1 corresponds to "Never" and 5 corresponds to "Very Often" (cf. Annex 2 - Table 5 - Descriptive statistics table tools that teachers use the most in the context of their work and Table 5- Descriptive statistics social networking tools that teachers use the most in the context of their work).

The most used tools are personal contact (Mean $M=4.36$), Email contact ($M=3.62$) which tends to "Often". The phone contact ($M=3.33$), File sharing without the possibility of editing ($M=2.45$).

The tools rarely used by teachers are Video Sharing ($M=2.31$), File sharing applications with no possibility of editing ($M=2.17$), Shared Presentations ($M=2.08$), SmartPhone Instant Messaging ($M=1.76$), Computer-like Instant Messaging ($M=1.68$), Audio ($M=1.48$) that tends to "Rarely". The tools least used by teachers are Video Conferencing ($M=1.43$), E-Learning ($M=1.38$), Blogs ($M=1.33$) that tend to "Never". Regarding the use of social networks by teachers the most used is Youtube ($M=1.78$), WhatsApp ($M=1.46$), Facebook ($M=1.45$).

The least used are Messenger ($M=1.41$), Instagram ($M=1.29$), Twitter ($M=1.26$).

4.1.3 Teachers' opinions regarding the importance and utility of collaborative tools

Regarding the opinion of teachers (Considering the tools that most use the most to what extent do you consider that ...) about collaborative tools on a scale where 1 corresponds to "Disagree" and 5 corresponds to "Totally agree" (cf. Annex 2 - Table 7 -

Descriptive statistics teachers' opinions regarding the importance and utility of collaborative tools).

Teachers consider it important for students to learn in a technological environment (M= 4.33), Are useful for you (M= 4.19), Increase your technological literacy with an (M= 4.17), Enhance and facilitate the learning of students (M=4.15), Increase their productivity (M= 4.04), Help communicate with their students (M= 3.96) , Facilitate communication with the outside world (M= 3.95), Facilitate internal communication (M= 3.88) that tends to "Partially Agree". The deviation from the mean in all questions is less than or equal to 0.8 which indicates that on average the participants answered "Partially agree".

4.1.4 Main advantages of collaborative learning

Regarding the main advantages of collaborative learning (What do you consider as the main advantages of collaborative learning among your students?) on a scale where 1 corresponds to "I disagree" and 5 corresponds to "Totally Agree" (cf. Annex 2 - Table 7- Descriptive statistics main advantages of collaborative learning).

The main advantages of collaborative learning, according to the participants are Promoting learning (M= 4.26), Learning in a technologically rich environment is advantageous for students since they have access to more (M= 4.16), Students benefit from a technologically rich environment (M= 4.15), Learning in a technologically rich environment is advantageous for students since they have more access to didactic tools (M= 4.10), Increased collaboration capacity (M= 4.07), Helps consolidate the knowledge acquired in classes since it provides information (M= 4.05), Promotes personal development (M= 4.02), Promotes socialization (M= 4.02) , Increases motivation (M= 4.01), Helps consolidate the knowledge acquired in the classes by providing didactic tools (M= 3.85), Students actively participate (M= 3.78), Makes learning more effective, with a higher probability of retaining knowledge in the long term (M= 3.75), Increases problem resolution capacity (M= 3.71) , Promotes the learning of theoretical concepts (M= 3.70), Promotes logical reasoning (M= 3.46).

The aspects that tend towards an indifference on the part of the participants are Increased feeling of learning community (M= 3.09), Development of formal thinking (M= 3.28), Development of cognitive structures (patterns of physical and mental action underlying specific acts of intelligence) (M= 3.36).

4.1.5 Teachers' opinion on collaborative tools

Regarding the teachers' opinion about collaborative tools (To what extent do you consider collaborative tools...) on a scale where 1 corresponds to "I disagree" and 5 corresponds to "I totally agree" (cf. Annex 2 - Table 9 - Descriptive statistics teachers' opinion on collaborative tools).

Regarding the contribution of collaborative tools participants consider that those who contribute the most are: Contribute to students do work together (M= 4.48), Social networks simplify the sharing of resources (M= 4.29), Contribute to the teaching-learning process (M= 4.23), Contribute to students study (M= 4.22), Social networks facilitate working together for a common goal (M= 4.20), Contribute to boost the classroom (M= 4.20), Contribute to prepare classes (M= 4.17), As social networks allow to keep in touch (M= 4.13), Social networks facilitate the exchange of ideas (M= 4.06), contribute to students do work individually (M= 3.89). The greatest variation in relation to the recorded average is 0.7 which indicates that the answers do not vary much in relation to the mean.

4.1.6 Classification of each type of information

Regarding the teachers' opinion regarding the importance of the types of communication involved in the collaboration (How do you classify each of the following types of information (involved in collaboration)?) on a scale where 1 corresponds to "Not Important" and 5 corresponds to "Very Important" (cf. Annex 2 - Table 10 - Descriptive statistics classification of each type of information).

The communication that type participants consider to be the most important is verbal communication (M=4.61).

The types of communication that participants consider to be important are Textual Information (M=4.16), Spatial or Graphic Information (maps or drawings) (M=3.90), Emotional Information (M= 3.71), Photographic Information (M=3.63), Video Information (M=3.58).

4.1.7 Classifying the advantages of aspects related to collaborative tools

With regard to the teachers' opinion on the advantages of aspects related to collaborative tools (As for the use of collaborative tools by students, classify the following aspects...) on a scale from 1 (Nothing Advantageous) to 5 (Very Advantageous) (cf. Annex 2 - Table 11 - Descriptive statistics classifying the advantages of aspects related to collaborative tools), the aspects that participants considered very advantageous were:

Facilitating access to information (M= 4.49), Allowing students access to class material (M= 4.42), Having access to more up-to-date content (M= 4.39), Working in a group (M= 4.36), Contributing to greater technological literacy (M= 4.36), Familiarity with collaborative tools is an important knowledge for the future of students (M= 4.35), Teamwork (M= 4.35), Allows students to collaborate (M= 4.32), Contribute to which students have acquired important skills for their future, such as group work (M= 4.27), Give tools to explore (M= 4.24), Have access to more content related to the subject (M= 4.23), Motivate for learning (M= 4.18), Help in social development (M= 4.17), Prepare presentations (M= 4.14), Facilitate entry into the labor market (M= 4.12), Arouse curiosity (M= 4.11), Captivate students to the subject taught (M= 4.06), Motivate students to study (M= 4.00), Familiarity with collaborative tools is an important knowledge for the future of students (M= 4.35), Teamwork (M= 4.35), Allows students to collaborate (M= 4.32), Contribute to which students have acquired important skills for their future, such as group work (M= 4.27), Give tools to explore (M= 4.24), Have access to more content related to the subject (M= 4.23), Motivate for learning (M= 4.18), Help in social development (M= 4.17), Prepare presentations (M= 4.14), Facilitate entry into the labor market (M= 4.12), Arouse curiosity (M= 4.11), Captivate students to the subject taught (M= 4.06), Motivate students to study (M= 4.00), Allows students to actively participate (ask questions, suggest topics...) (M= 3.55).

The aspects that participants consider to be advantageous when it comes to collaborative tools are, Getting faster feedback on questions from colleagues (M= 3.16), Receiving more feedback (M= 3.14), Getting faster feedback on questions from teachers (M= 3.06).

4.1.8 Factors that hinder the adoption of collaborative tools

Regarding the difficulties that participants encounter in adopting collaborative tools (To what extent do the following factors hinder the adoption of collaborative methods) on a scale from 1 (Has No Influence) to 5 (Much Influence) (cf. Annex 2 - Table 12- Descriptive statistics factors that hinder the adoption of collaborative tools).

The main reasons that teachers point to for not adopting collaborative tools, the ones that teachers consider to have the highest influence are Lack of time to adapt the curriculum (M= 3.70), Lack of resources (M= 3.70), High number of students (M= 3.68), Internet network (non-existent or with unsatisfactory functioning) (M= 3.67), Requires an effort to adapt the curriculum (M= 3.66), Lack of didactic tools (M= 3.58).

Other factors that hinder the adoption of collaborative tools and that teachers consider that influence their usage of collaborative tools are the Lack of time to know the software (M= 3.43), Lack of interest on the part of students (M= 3.13), Lack of time to acquire necessary skills (M= 3.11), Lack of proficiency of teachers (M= 2.97), Little cooperation between teachers (M= 2.88), Lack of training (M= 2.82).

4.2 Factor analysis

Principal component analysis (PCA) was performed in order to transform a set of correlated variables into a smaller number of independent variables, main components, in order to simplify the description of the data. This will allow us to find the main dimensions regarding teachers' perspective in the use of collaborative tools (cf. Annex 3).

4.2.1 Find out what teachers think about collaborative and cooperative learning

Items	F1 Promotion of learning and socialisation	F2 Promotion of logical thinking	F3 Promotion of interaction
Learning in a technologically rich environment is advantageous for students as they have more access to teaching tools	0,806	0,180	0,091
Learning in a technologically rich environment is advantageous for students as they have access to more information	0,784	0,072	0,242
Students benefit from a technologically rich environment	0,780	0,110	-0,043
Promotes socialization	0,760	0,223	0,014
Helps consolidate the knowledge acquired in the classes as it provides information	0,759	0,375	0,102
Promotes learning	0,617	-0,101	0,259
Helps consolidate the knowledge acquired in the classes by providing didactic tools	0,590	0,516	0,113

Increases motivation	0,560	0,400	0,111
Promotes personal development	0,517	0,436	-0,073
Promotes logical reasoning	0,173	0,806	0,211
Development of formal thinking	0,022	0,763	0,365
Increases problem-solving capability	0,344	0,745	-0,093
Development of cognitive structures (patterns of physical and mental action underlying specific acts of intelligence)	0,041	0,639	0,533
Makes learning more effective, with a greater likelihood of long-term retention of knowledge Makes learning more effective, with a greater likelihood of long-term retention of knowledge	0,396	0,592	0,225
Students actively participate	0,179	-0,015	0,865
Increases the feeling of learning community	0,093	0,354	0,750
Promotes the learning of theoretical concepts	0,118	0,416	0,610
Explained variance (%)	26,153	20,689	13,303
Accumulated variance (%)	26,153	46,841	60,145
Cronbach's Alpha	0,897	0,854	0,748

Note: Matrix after Varimax rotation, with Kaiser normalization, KMO=0.835, Bartlett test with significance 0.000.

The first factor (F1 - Promotion of learning and socialisation) ICT promotes learning in a technologically rich environment, consolidates learning and promotes socialization encompasses the following items: Promotes learning, Learning in a technologically rich environment is advantageous for students since they have access to more information, Increases motivation, Students benefit from a technologically rich environment, Promotes socialization, Helps consolidate the knowledge acquired in classes by providing educational tools , It helps to consolidate the knowledge acquired in the classes since it provides information, Learning in a technologically rich environment

is advantageous for students since they have more access to didactic tools, and Promotes personal development.

The second factor (F2 - Promotion of logical thinking): Development of cognitive structures (patterns of physical and mental action underlying specific acts of intelligence), Development of formal thinking, Makes learning more effective, with a higher probability of long-term knowledge retention, Increases problem-solving capacity, Promotes logical reasoning.

The third factor (F3 - Promotion of interaction): Students actively participate, Increases the feeling of learning community, Promotes the learning of theoretical concepts.

The (F1 - Promotion of learning and socialisation) factor promotes learning in a technologically rich environment, consolidates learning and promotes socialization presents a minimum of 1.67 that tends to the "Partially Disagree" and a maximum value of 5.00 that tends to "Totally Agree", the average is 4.07 which tends to "Partially Agree" with a deviation from the average of 0.61. The factor (F2 - Promotion of logical thinking) Development of cognitive structures and logical reasoning presents a minimum of 1.80 that tends towards the "Partially Disagree" and a maximum maximum value of 5.00 that tends to the "Totally Agree", the average is 3.51 which tends to "Partially Agree" with a deviation from the average of 0.77. The factor (F3 - Promotion of interaction) Active learning community presents a minimum of 1.00 that tends to "Totally Disagree" and a maximum maximum value of 5.00 that tends towards the "Totally Agree" , the average is 3.52 which tends to "Partially Agree" with a deviation from the average of 0.86.

4.2.2 Test the teachers' opinion about the main advantages of using these tools (in terms of productivity, communication with students, utility)

This objective is comprised of three groups of questions, Q6, Q8 and Q 10; in order to allow us to find the main dimensions regarding teachers' opinions about the use of collaborative tools three PCAs were performed.

4.2.2.1 Q 6 - Taking into account the collaborative tools you use the most to what extent do you think that... (cf. Annex 4)

Items	F1 Improvement of productivity and interaction	F2 Improvement of communication and learning
Increase your productivity	0,794	0,112

Help communicate with your students	0,792	0,111
They are useful for you	0,722	0,292
Enhance and facilitate your students' learning	0,715	0,114
They help with your work	0,614	0,483
Facilitate internal communication (at school)	0,005	0,840
Facilitate communication with the outside world (entities outside schools)	0,113	0,818
It is important for students to learn in a technological environment	0,342	0,537
Increase your technological literacy	0,300	0,451
Explained variance (%)	42,025	14,761
Accumulated variance (%)	42,025	56,786
Cronbach's Alpha	0,825	0,680

Note: Matrix after Varimax rotation, with Kaiser normalization, KMO=0.800, Bartlett test with significance 0.000.

The first factor (F1 - Improvement of productivity and interaction)- refers to the productivity and usefulness of collaborative tools in the work of teachers, help to communicate, facilitate and enhance the learning of students. The second factor (F2 - Improvement of communication and learning) - refers to the importance of learning and working in a technological environment and communication both internal and external. Factor 1 Improvement of productivity and interaction has an average of 4 that tends to "partially agree", with a minimum of 2 that tends to "partially disagree" and a maximum of 5 that tends to "totally agree" and with a standard deviation of 0.5.

The factor 2 (F2 - Improvement of communication and learning) presents an average of 4 that tends to "partially agree", with a minimum of 2.25 that tends to "partially disagree" and a maximum of 5 that tends to "totally agree" and with a standard deviation of 0.5.

4.2.2.2 Q8 - To what extent do you consider that collaborative tools... (cf. Annex 5)

Itens	F1 Sharing and cooperation	F2 Facilitates work and learning
Social networks simplify resource sharing	0,851	.285
Social networks make it easier to work together for a common goal	0,815	0,248
Social networks make it easy to exchange ideas	0,799	0,233

Social networks allow you to stay in touch	0,761	0,160
They contribute to students doing work individually	0,215	0,744
Contribute to boost the classroom	0,218	0,732
They help students study	0,142	0,719
They help students do work together	0,393	0,571
Contribute to prepare lessons	0,115	0,508
Contribute to the teaching-learning process	0,323	0,379
Explained variance (%)	29,919	25.565
Accumulated variance (%)	29,919	55.484
Cronbach's Alpha	0,736	0,736

Note: Matrix after Varimax rotation, with Kaiser normalization, KMO=0.847, Bartlett test with significance 0.000.

The first factor (F1 - Sharing and cooperation) - it refers to social networks allow to maintain contact, simplify the sharing of resources, facilitate working together for a common goal. The second factor (F2 - Facilitates work and learning) - refers to the contribution that the tools have for students to do the work together, to do the work individually, for the students to study, to prepare the classes, to streamline the classroom, to the teaching-learning process.

The factor (F1 - Sharing and cooperation) has an average of 4.2 that tends to "partially agree", with a minimum of 2 that tends to "partially disagree" and a maximum of 5 that tends to "totally agree" and with a standard deviation of 0.6.

Factor 2 (F2 - Facilitates work and learning) has an average of 4.2 that tends to "partially agree", with a minimum of 3 that tends to "indifferent" and a maximum of 5 that tends to "totally agree" and with a standard deviation of 0.4.

4.2.2.3 Q 10 - As for students' use of collaborative tools, classify the following aspects... (cf. Annex 6)

Itens	F1 Stimulates collaboration and access to content	F2 Stimulates motivation to learn	F3 Allows interaction within colleagues and with the teacher
Allow students access to lesson material	0,773	0,212	0,024

Have access to more content related to the subject matter	0,720	0,203	0,245
Allows students to collaborate with each other	0,717	0,357	0,037
Facilitating access to information	0,692	0,285	0,142
Prepare presentations	0,663	0,202	0,369
Get access to more up-to-date content	0,652	0,448	0,150
Working as a team	0,624	0,433	0,024
Helping students acquire important skills for their future, such as group work	0,602	0,468	0,064
Working in groups	0,584	0,434	-0,027
Familiarity with collaborative tools is an important knowledge for the future of students	0,536	0,500	0,144
Captivate students for the subject taught	0,241	0,837	0,171
Motivate students to study	0,274	0,832	0,027
Motivating for learning	0,301	0,764	0,095
Arouse curiosity	0,318	0,743	0,089
Give students tools to explore	0,527	0,561	0,088
Contributing to greater tenological literacy	0,463	0,538	0,037
Help in social development	0,500	0,507	-0,003
Facilitating entry into the labour market	0,302	0,363	0,038
Get faster feedback on questions from colleagues	-0,022	0,076	0,946
Get faster feedback on questions from teachers	0,035	0,088	0,935
Get more feedback	0,140	0,150	0,895
Allows students to actively participate (ask questions, suggest topics...)	0,243	-0,023	0,707
Explained variance (%)	25,419	22,443	15,440
Accumulated variance (%)	25,419	47,862	63,302
Cronbach's Alpha	0,912	0,890	0,910

Note: Matrix after Varimax rotation, with Kaiser normalization, KMO=0.876, Bartlett test with significance 0.000.

The first factor (F1 - Stimulates collaboration and access to content) - refers to allowing students access to class material, allows students to collaborate with each other, work as a team and in groups, prepare presentations, have access to content related to the subject, have access to more up-to-date content, facilitate access to information, familiarity with collaborative tools is an important knowledge for the future of students , to help students acquire important skills for their future, such as group work. The second factor (F2 - Stimulates motivation to learn) refers to the contribution to greater literacy, motivates learning, helps social development, gives tools to students to explore, motivate students to study, captivate students for the subject taught, arouse curiosity, facilitate entry into the labor market. The third factor (F3 - Stimulates motivation to learn) refers to receiving more feedback, faster feedback from teachers and colleagues, allow students to actively participate.

Factor 1 (F1 - Stimulates collaboration and access to content) presents an average of 4.3 that tends to "quite advantageous", with a minimum of 2.2 that tends to "un advantageous" and maximum of 5 that tends to "very advantageous" and with a standard deviation of 0.6.

Factor 2 (F2 - Stimulates motivation to learn) presents an average of 4.2 that tends to "quite advantageous", with a minimum of 2 that tends to "un advantageous" and a maximum of 5 that tends to "very advantageous" and with a standard deviation of 0.6.

Factor 3 (F3 - Stimulates motivation to learn) has an average of 3.2 that tends to "advantageous", with a minimum of 1 that tends to "nothing advantageous" and a maximum of 5 that tends to "very advantageous" and with a standard deviation of 1.1.

4.3 Test whether gender influences the use of technological tools

In order to verify whether the average use of technological tools is similar between men and women, the t-test was performed since the use of technological tools treated as quantitative (dependent variable) and gender is treated as nominal (independent variable), which defines the groups as being independent, for which it is intended to verify whether their means of use are equal, the application of the t test for independent samples is justified.

Verification of assumptions:

The group of female gender teachers are independent of the group of male gender teachers, so the assumption of sample independence is verified.

As one has two large samples ($n_F = 71 > 30$ and $n_M = 33 > 30$) one can consider the central limit theorem, since the samples are not very asymmetric that the distributions follow the normal distribution.

Group Statistics

	2. Gender	N	Mean	Std. Deviation	Std. Error Mean
Video Conference (e.i. Google Hangouts, Skype, Cisco Webex...)	Male	33	1.39	.933	.162
	Female	71	1.45	.752	.089
Audio Conference (ex: Google Hangouts, Skype, Cisco Webex...)	Male	33	1.64	1.168	.203
	Female	71	1.41	.767	.091
Telephone	Male	33	3.27	1.306	.227
	Female	71	3.35	1.110	.132
Personal contact	Male	33	4.15	1.503	.262
	Female	71	4.45	1.119	.133
E-mail	Male	33	3.70	1.075	.187
	Female	71	3.59	.965	.114
File sharing applications with no editing possibility (ex: Dropbox, WeTransfer, Google Drive, Jumpshare)	Male	33	2.52	1.302	.227
	Female	71	2.42	1.065	.126
File sharing applications with the ability to edit (ex: Google Drive, OneDrive...)	Male	33	2.18	1.158	.202
	Female	71	2.17	1.028	.122
Video Sharing (Youtube, Vimeo...)	Male	33	2.45	1.034	.180
	Female	71	2.24	1.165	.138
Shared presentations (SlideShare, Google Slides, Prezi...)	Male	33	2.21	1.193	.208
	Female	71	2.01	1.153	.137
Instant messaging using your smartphone (SMS, Twitter, WhatsApp, Facebook Messenger, Skype...)	Male	33	2.09	1.284	.223
	Female	71	1.61	1.049	.124
Computer-based instant messaging (WhatsApp Web, Facebook Messenger, Skype...)	Male	33	1.97	1.104	.192
	Female	71	1.55	.968	.115
Blogs	Male	33	1.39	.788	.137
	Female	71	1.30	.763	.091
E-learning (Adobe Captivate, Elicidat...)	Male	33	1.42	.751	.131
	Female	71	1.35	.719	.085
Social Networks - Twitter	Male	33	1.33	.736	.128
	Female	71	1.23	.721	.086
Social Networks - Youtube	Male	33	1.91	1.156	.201
	Female	71	1.72	.929	.110
Social Networks - Instagram	Male	33	1.42	1.001	.174
	Female	71	1.23	.680	.081
Social Networks - Messenger	Male	33	1.61	1.116	.194

	Female	71	1.32	.807	.096
Social Networks - WhatsApp	Male	33	1.64	.962	.168
	Female	71	1.38	.884	.105
Social Networks - Facebook	Male	33	1.58	1.001	.174
	Female	71	1.39	.902	.107

Table 1 - Check whether gender influences the use of technological tools Group Statistics

After verifying the assumptions, the t-test was carried out to verify the equality of means (cf. Annex 7) having the following hypotheses:

H₀ – the average use of collaborative tools by teachers is the same for both sexes/genders

H_a – the average use of collaborative tools by teachers is different for both sexes/genders

Decision rule: Since the test results all presented a Sig>0.05 does not reject H₀, that is, there are no significant differences in the use of collaborative tools between genders/genders. Both have higher averages in the use of personal contact, email, and telephone contact that tend to "Often".

4.4 Discussion of the Results

The results show that the collaborative tools that most teachers use are personal contact, email, phone, file sharing without the possibility of editing. This trend has certainly changed recently since because of the COVID pandemic classes had to be online. Teachers use these tools often and rarely use social networks in the context of their work.

According to the results teachers consider that the main advantages of collaborative and cooperative learning are that they promote learning, students benefit from learning in a technological rich environment, increase collaboration, increase motivation and promote personal development (Slavin, 1989; Gillies, 2016).

The type of information the users find most important is verbal information.

The results supported Beldarrain's (2006) findings, participants found that the main advantages of collaborative tools are facilitating access to information, students have access to class materials and more up-to-date content, working in a group and contribute to technological literacy.

The main factors that hinder the adoption of collaborative tools are lack of time to adapt the curriculum, lack of resources, high number of students, internet network (non-existent or with unsatisfactory functioning) and the lack of didactic tools, just like

Miranda (2007) found simply adding these tools to classrooms will not have a positive result, the curriculum has to be adapted and these factors that hinder this adoption have to be managed.

Results indicate that gender does not influence significantly the use of collaborative tools by teachers.

Chapter 5 - Conclusions

The collaborative tools in secondary education were not widely used in this context, however and given the positive contributions it may have it is important to understand why and if there is a perception on the part of the population under study of the importance that this type of tools can have, specially in the current pandemic situation we live in where social distancing has to be maintained. Since these results were obtained before this pandemic crisis, it gives us a glimpse of what were the opinions before this pandemic and will allow for a future comparison, allowing for a clearer before and after picture.

In order to better understand teachers' opinions regarding collaborative tools and to achieve the objectives of this work, a questionnaire was created and distributed and the results were analysed and we can conclude the following.

The results point to a use of collaborative tools with the use of infrequent computer use by teachers, the most used remain the most traditional ones such as personal contact and contact by email. Following, phone contact and file sharing without possibility of editing that are sometimes used. The rest such as video sharing, editing file sharing applications, shared presentations, smartphone instant messaging, computer-escing instant messaging, audio video conferencing, e-learning tools, blogs point to a rare or non-existent use.

Social networks as collaborative tools are not widely used by teachers Youtube, WhatsApp and Facebook point to a rare use and tools such as Messenger, Instagram and Twitter point to a non-existent use.

Considering the results obtained, teachers consider that collaborative and cooperative learning is important and all factors obtained in the analysis of main components present an average that points to high levels of agreement about the advantages of this type of learning for students. Through the analysis of the results of the correlational tests, we can observe that there was no significant relationship between the importance that the participants give to collaborative tools and the gender/gender of the participants, both of which classify it with high importance.

Regarding the types of information that are most important to teachers, they classified all types of information as important (textual, spatial or graphic, emotional, photographic, video), with emphasis on verbal information that was considered very important.

It was found that gender/sex does not show a significant difference in the use of collaborative tools.

Although teachers indicate that they do not use the collaborative tools much, the results obtained indicate that teachers consider all the factors presented are advantageous for students, highlighting the following, the possibility of collaborating and communicating, accessing relevant content and information, the importance of learning in a technological environment, motivation, sharing provided by social networks, increased productivity and usefulness of tools. The aspects that presented a lower average, even if they are considered advantageous, were to receive feedback and allow students to participate.

According to the participants, the factors that most hinder the adoption of collaborative tools are lack of time to adapt the curriculum, lack of resources, the high number of students, internet network (non-existent or unsatisfactory functioning), the effort to adapt the curriculum and lack of didactic tools.

A limitation on this study was the number of participants, that does not allow to extrapolate to the entire population, no qualitative analysis was done which would allow to have a do a more comprehensive study regarding this topic. Future works should aim for a larger sample, and perhaps more specific (e.g., only physics teachers).

Understanding teachers' opinions regarding these tools is of particular importance given the current pandemic situation, where both teachers and students are forced to stay in their homes and work remotely. The only way for this remote work to function is through the use of emerging technologies, and a large effort to quickly adapt our workflow to them is being undertaken. This article aims to provide a deeper understanding regarding teachers' perspectives on collaborative tools and elaborates on what are the factors that need improving in order for teachers to use them. It also opens a window for future work that could further explore the adoption of collaborative tools in this context.

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Annex

Annex 1 – Questionnaire

Ferramentas colaborativas na escola

Este estudo enquadra-se numa dissertação de mestrado em Informática e Gestão, a decorrer no Instituto Universitário de Lisboa (ISCTE-IUL). O estudo centra-se na opinião e utilização por parte dos professores em relação a ferramentas colaborativas e redes sociais no contexto escolar. O questionário demora cerca de 5 minutos a preencher. A sua participação é anónima, confidencial e voluntária. Os dados serão tratados estatisticamente, não sendo divulgadas informações que possam identificar as pessoas que participaram neste questionário. Não existem respostas certas ou erradas, gostaríamos apenas que nos desse a sua opinião pessoal sincera. Caso tenha alguma dúvida ou comentário sobre o estudo, poderá contactar a autora da dissertação (Maria Nunes, mdmpd@iscte-iul.pt).

Antes de iniciar, confirme a seguinte informação:

1. Estou consciente de que a minha participação é voluntária e posso interromper em qualquer momento, simplesmente fechando a página;
2. As minhas respostas são confidenciais e anónimas;
3. As minhas respostas serão utilizadas exclusivamente para fins de investigação e acedidas apenas pelos/as investigadores/as envolvidos/as no projeto.

Aceito participar ___

Não aceito participar ___

1. Idade ___

2. Género/Sexo ___

3. Anos de escolaridade que leciona (ex: 10º, 11º....) ___

4. Disciplina que leciona _____

5. Com que frequência utiliza estas ferramentas no contexto do seu trabalho?

	1 Nunca	2 Raramente	3 Às vezes	4 Frequentemente	5 Muito frequentemente
5.1 Vídeo Conferência (ex: Google Hangouts, Skype, Cisco Webex...)					
5.2 Áudio Conferência (ex: Google Hangouts, Skype, Cisco Webex...)					
5.3 Contacto telefónico					

5.4 Contacto pessoal					
5.5 E-mail					
5.6 Aplicações de partilha de ficheiros sem possibilidade de edição (ex: Dropbox, WeTransfer, Google Drive, Jumpshare)					
5.7 Aplicações de partilha de ficheiros com a possibilidade de edição (ex: Google Drive, OneDrive...)					
5.8 Partilha de Vídeo (Youtube, Vimeo...)					
5.9 Apresentações partilhadas (SlideShare, Google Slides, Prezi...)					
5.10 Mensagens instantâneas com recurso ao smartphone (SMS, Twitter, WhatsApp, Facebook Messenger, Skype...)					
5.11 Mensagens instantâneas com recurso ao computador (WhatsApp Web, Facebook Messenger, Skype...)					
5.12 Blogs					
5.13 E-learning (Adobe Captivate, Elicidat...)					
5.14 Redes Sociais - Twitter					
5.15 Redes Sociais - Youtube					
5.16 Redes Sociais - Instagram					
5.17 Redes Sociais - Messenger					
5.18 Redes Sociais - WhatsApp					
5.19 Redes Sociais - Facebook					

6.Tendo em conta as ferramentas que mais utiliza até que ponto considera que...

	1	2	3	4	5
	Discordo	Discordo Parcialmente	Indiferente	Concordo Parcialmente	Concordo Totalmente

6.1 Aumentam a sua produtividade					
6.2 Ajudam a comunicar com os seus alunos					
6.3 São úteis para si					
6.4 Ajudam no seu trabalho					
6.5 Potenciam e facilitam a aprendizagem dos seus alunos					
6.6 É importante para os alunos aprenderem num ambiente tecnológico					
6.7 Facilitam a comunicação com o mundo exterior (entidades externas às escolas)					
6.8 Facilitam a comunicação interna (na escola)					
6.9 Aumentam a sua literacia tecnológica					

Aprendizagem colaborativa

Aprendizagem colaborativa é um método que usa a interação social como base para a construção do conhecimento, é referente ao trabalho em grupo de duas ou mais pessoas de modo a atingir um objetivo comum, respeitando as colaborações individuais (Paz, 2000), o método colaborativo caracteriza-se pela existência de grupos de trabalho em que os seus membros trabalham para um objetivo comum.

7. Quais considera como as principais vantagens da aprendizagem colaborativa entre os seus alunos?

	1 Discordo	2 Discordo Parcialmente	3 Indiferente	4 Concordo Parcialmente	5 Concordo Totalmente
7.1 Promove a aprendizagem					
7.2 Alunos participarem ativamente					

7.3 Aumenta o sentimento de comunidade de aprendizagem					
7.4 Aumento da capacidade de colaboração					
7.5 Desenvolvimento de estruturas cognitivas (padrões de ação física e mental subjacentes a atos específicos de inteligência)					
7.6 Promove a aprendizagem de conceitos teóricos					
7.7 Desenvolvimento do pensamento formal					
7.8 Torna a aprendizagem mais eficaz, com uma maior probabilidade de retenção dos conhecimentos a longo prazo					
7.9 Promove desenvolvimento pessoal					
7.10 Aumenta a capacidade de resolução de problemas					
7.11 Promove o raciocínio lógico					
7.12 Ajuda a consolidar o conhecimento adquirido nas aulas pela disponibilização de ferramentas didáticas					
7.13 Ajuda a consolidar o conhecimento adquirido nas aulas dado que disponibiliza informação					
7.14 Aprender num ambiente tecnologicamente rico é vantajoso para os alunos dado que estes têm mais acesso a ferramentas didáticas					

7.15 Aprender num ambiente tecnologicamente rico é vantajoso para os alunos dado que têm acesso a mais informação					
7.16 Aumenta a motivação					
7.17 Promove a socialização					
7.18 Os alunos beneficiam de um ambiente tecnologicamente rico					

8. Até que ponto considera que as ferramentas colaborativas...

	1 Discordo	2 Discordo Parcialmente	3 Indiferente	4 Concordo Parcialmente	5 Concordo Totalmente
8.1 Contribuem para o processo de ensino-aprendizagem					
8.2 Contribuem para dinamizar a sala de aula					
8.3 Contribuem para preparar aulas					
8.4 Contribuem para os alunos estudarem					
8.5 Contribuem para os alunos fazerem trabalhos individualmente					
8.6 Contribuem para os alunos fazerem trabalhos em conjunto					
8.7 As redes sociais permitem manter o contacto					
8.8 As redes sociais facilitam a troca de ideias					
8.9 As redes sociais simplificam a partilha de recursos					

8.10 As redes sociais facilitam o trabalho em conjunto para um objetivo comum					
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9. Como classifica cada um dos seguintes tipos de informação (envolvidos na colaboração)?

	1 Nada Importante	2 Pouco Importante	3 Importante	4 Bastante Importante	5 Muito Importante
9.1 Verbal					
9.2 Textual					
9.3 Espacial ou gráfica (mapas ou desenhos)					
9.4 Informação emocional					
9.5 Informação fotográfica					
9.6 Vídeo informação					

10. Quanto à utilização de ferramentas colaborativas por parte dos alunos, classifique os seguintes aspetos...

	1 Nada Vantajoso	2 Pouco Vantajoso	3 Vantajoso	4 Bastante Vantajoso	5 Muito Vantajoso
10.1 Permitir aos alunos acesso ao material das aulas					
10.2 Permite aos alunos colaborar entre si					
10.3 Trabalhar em equipa					
10.4 Facilitar a entrada no mercado de trabalho					
10.5 Receber mais feedback					

10.6 Receber feedback mais rápido acerca de dúvidas por parte dos colegas					
10.7 Receber feedback mais rápido acerca de dúvidas por parte dos professores					
10.8 Preparar apresentações					
10.9 Permite aos alunos participar ativamente (colocar dúvidas, sugerir tópicos...)					
10.10 Ter acesso a mais conteúdos relacionados com a matéria					
10.11 Ter acesso a conteúdos mais atualizados					
10.12 Trabalhar em grupo					
10.13 Facilitar o acesso à informação					
10.14 Despertar a curiosidade					
10.15 Cativar os alunos para a matéria lecionada					
10.16 Motivar os alunos para estudar					
10.17 A familiaridade com ferramentas colaborativas é um conhecimento importante para o futuro dos alunos					
10.18 Contribuir para que os alunos adquiriram competências importantes para o seu futuro , como o trabalho em grupo					
10.19 Dão ferramentas aos alunos para explorar					
10.20 Ajudam no desenvolvimento social					
10.21 Motivar para a aprendizagem					

10.22 Contribuir para uma maior literacia tecnológica					
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11. Em que medida os seguintes factores dificultam a adopção de métodos colaborativos

	1 Não tem Influência	2 Influência Pouco	3 Influência	4 Influência Bastante	5 Influência Muito
11.1 Falta de tempo para adaptar o currículo					
11.2 Falta de tempo para conhecer o software					
11.3 Falta de tempo para adquirir competências necessárias					
11.4 Elevado número de alunos					
11.5 Pouca cooperação entre docentes					
11.6 Falta de proficiência dos professores					
11.7 Falta de recursos					
11.8 Exige um esforço para adaptar o currículo					
11.9 Falta de formação					
11.10 Falta de ferramentas didáticas					
11.11 Rede internet (inexistente ou com funcionamento insatisfatório)					
11.12 Falta de interesse por parte dos alunos					

Obrigada pela sua colaboração

Annex 2 - Descriptive statistics

Estatísticas Descritivas									
	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	
						Std. Error			
1. Idade	104	35	23	58	42.55	.777	7.925	62.813	
Valid N (listwise)	104								

Table 2- Descriptive statistics table for age distribution

2. Gênero/Sexo				
	Frequência	Porcentagem	Porcentagem válida	Porcentagem acumulada
Masculino	33	31.7	31.7	31.7
Feminino	71	68.3	68.3	100.0
Total	104	100.0	100.0	

Table 3 - Descriptive statistics table for Gender/Sex

4. Disciplina que lecciona				
	Frequência	Porcentagem	Porcentagem válida	Porcentagem acumulada
Biologia e Geologia	9	8.7	8.7	8.7
Desenho	6	5.8	5.8	14.4
Direito e Economia	1	1.0	1.0	15.4
Economia	7	6.7	6.7	22.1
Educação Especial	2	1.9	1.9	24.0
Educação Física	6	5.8	5.8	29.8
Filosofia	6	5.8	5.8	35.6
Física e Química	7	6.7	6.7	42.3
Francês	3	2.9	2.9	45.2
Geografia	6	5.8	5.8	51.0
Geometria Descritiva	5	4.8	4.8	55.8
História	9	8.7	8.7	64.4
História de arte	1	1.0	1.0	65.4
Inglês	7	6.7	6.7	72.1
Matemática	9	8.7	8.7	80.8
Português	13	12.5	12.5	93.3
Psicologia	3	2.9	2.9	96.2
Química	2	1.9	1.9	98.1
Sociologia	2	1.9	1.9	100.0
Total	104	100.0	100.0	

Table 4- Descriptive statistics table for disciplines taught by teachers

Descriptive Statistics

	N Statistic	Range Statistic	Minimum Statistic	Maximum Statistic	Mean		Std. Deviation Statistic	Variance Statistic
					Statistic	Std. Error		
5.1 Vídeo Conferência (ex: Google Hangouts, Skype, Cisco Webex...)	104	4	1	5	1.43	.079	.810	.656
5.2 Áudio Conferência (ex: Google Hangouts, Skype, Cisco Webex...)	104	4	1	5	1.48	.090	.914	.835
5.3 Contacto telefónico	104	4	1	5	3.33	.115	1.170	1.368
5.4 Contacto pessoal	104	4	1	5	4.36	.123	1.253	1.571
5.5 E-mail	104	4	1	5	3.62	.098	.997	.994
5.6 Aplicações de partilha de ficheiros sem possibilidade de edição (ex: Dropbox, WeTransfer, Google Drive, Jumpshare)	104	4	1	5	2.45	.112	1.140	1.299
5.7 Aplicações de partilha de ficheiros com a possibilidade de edição (ex: Google Drive, OneDrive...)	104	4	1	5	2.17	.104	1.065	1.135
5.8 Partilha de Vídeo (Youtube, Vimeo...)	104	4	1	5	2.31	.110	1.124	1.264
5.9 Apresentações partilhadas (SlideShare, Google Slides, Prezi...)	104	4	1	5	2.08	.114	1.163	1.353
5.10 Mensagens instantâneas com recurso ao smartphone (SMS, Twitter, WhatsApp, Facebook Messenger, Skype...)	104	4	1	5	1.76	.112	1.145	1.311
5.11 Mensagens instantâneas com recurso ao computador (WhatsApp Web, Facebook Messenger, Skype...)	104	4	1	5	1.68	.101	1.026	1.054
5.12 Blogs	104	4	1	5	1.33	.075	.769	.591
5.13 E-learning (Adobe Captivate, Elicidat...)	104	3	1	4	1.38	.071	.727	.528
Valid N (listwise)	104							

Table 5 - Descriptive statistics table tools that teachers use the most in the context of their work

Descriptive Statistics

	N Statistic	Range Statistic	Minimum Statistic	Maximum Statistic	Mean		Std. Deviation Statistic	Variance Statistic
					Statistic	Std. Error		
5.14 Redes Sociais - Twitter	104	4	1	5	1.26	.071	.724	.524
5.15 Redes Sociais - Youtube	104	4	1	5	1.78	.098	1.004	1.009
5.16 Redes Sociais - Instagram	104	4	1	5	1.29	.078	.797	.634
5.17 Redes Sociais - Messenger	104	4	1	5	1.41	.090	.920	.847
5.18 Redes Sociais - WhatsApp	104	4	1	5	1.46	.090	.913	.833
5.19 Redes Sociais - Facebook	104	4	1	5	1.45	.092	.934	.871
Valid N (listwise)	104							

Table 6- Descriptive statistics social networking tools that teachers use the most in the context of their work

Descriptive Statistics

	N Statistic	Range Statistic	Minimum Statistic	Maximum Statistic	Mean		Std. Deviation Statistic	Variance Statistic
					Statistic	Std. Error		
6.1 Aumentam a sua produtividade	104	3	2	5	4.04	.063	.637	.406
6.2 Ajudam a comunicar com os seus alunos	104	4	1	5	3.96	.073	.749	.562
6.3 São úteis para si	104	3	2	5	4.19	.066	.669	.448
6.4 Ajudam no seu trabalho	104	3	2	5	4.13	.066	.669	.448
6.5 Potenciam e facilitam a aprendizagem dos seus alunos	104	3	2	5	4.15	.067	.679	.462
6.6 É importante para os alunos aprenderem num ambiente tecnológico	104	3	2	5	4.33	.066	.675	.455
6.7 Facilitam a comunicação com o mundo exterior (entidades externas às escolas)	104	3	2	5	3.95	.079	.805	.648
6.8 Facilitam a comunicação interna (na escola)	104	4	1	5	3.88	.079	.809	.654
6.9 Aumentam a sua literacia tecnológica	104	4	1	5	4.17	.068	.689	.475
Valid N (listwise)	104							

Table 7 - Descriptive statistics teachers' opinions regarding the importance and utility of collaborative tools

Descriptive Statistics								
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
7.1 Promove a aprendizagem	104	3	2	5	4.26	.055	.557	.311
7.2 Alunos participarem activamente	104	4	1	5	3.78	.091	.924	.854
7.3 Aumenta o sentimento de comunidade de aprendizagem	104	4	1	5	3.09	.128	1.308	1.711
7.4 Aumento da capacidade de colaboração	104	4	1	5	4.07	.066	.672	.452
7.5 Desenvolvimento de estruturas cognitivas (padrões de ação física e mental subjacentes a atos específicos de inteligência)	104	4	1	5	3.36	.098	1.004	1.008
7.6 Promove a aprendizagem de conceitos teóricos	104	4	1	5	3.70	.087	.891	.794
7.7 Desenvolvimento do pensamento formal	104	4	1	5	3.28	.099	1.009	1.019
7.8 Torna a aprendizagem mais eficaz, com uma maior probabilidade de retenção dos conhecimentos a longo prazo	104	4	1	5	3.75	.081	.821	.675
7.9 Promove desenvolvimento pessoal	104	4	1	5	4.02	.078	.800	.640
7.10 Aumenta a capacidade de resolução de problemas	104	3	2	5	3.71	.092	.942	.887
7.11 Promove o raciocínio lógico	104	4	1	5	3.46	.100	1.023	1.047
7.12 Ajuda a consolidar o conhecimento adquirido nas aulas pela disponibilização de ferramentas didáticas	104	4	1	5	3.85	.086	.879	.772
7.13 Ajuda a consolidar o conhecimento adquirido nas aulas dado que disponibiliza informação	104	4	1	5	4.05	.080	.817	.668
7.14 Aprender num ambiente tecnologicamente rico é vantajoso para os alunos dado que estes têm mais acesso a ferramentas didáticas	104	4	1	5	4.10	.079	.807	.651
7.15 Aprender num ambiente tecnologicamente rico é vantajoso para os alunos dado que têm acesso a mais informação	104	4	1	5	4.16	.087	.883	.779
7.16 Aumenta a motivação	104	3	2	5	4.01	.077	.782	.612
7.17 Promove a socialização	104	4	1	5	4.02	.091	.924	.854
7.18 Os alunos beneficiam de um ambiente tecnologicamente rico	104	4	1	5	4.15	.085	.868	.753
Valid N (listwise)	104							

Table 8- Descriptive statistics main advantages of collaborative learning

Descriptive Statistics								
	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
8.1 Contribuem para o processo de ensino-aprendizagem	104	3	2	5	4.23	.064	.657	.432
8.2 Contribuem para dinamizar a sala de aula	104	2	3	5	4.20	.057	.581	.337
8.3 Contribuem para preparar aulas	104	3	2	5	4.17	.065	.660	.436
8.4 Contribuem para os alunos estudarem	104	3	2	5	4.22	.063	.638	.407
8.5 Contribuem para os alunos fazerem trabalhos individualmente	104	4	1	5	3.89	.076	.775	.600
8.6 Contribuem para os alunos fazerem trabalhos em conjunto	104	2	3	5	4.48	.060	.607	.369
8.7 As redes sociais permitem manter o contacto	104	3	2	5	4.13	.074	.751	.564
8.8 As redes sociais facilitam a troca de ideias	104	3	2	5	4.06	.071	.722	.521
8.9 As redes sociais simplificam a partilha de recursos	104	3	2	5	4.29	.072	.733	.537
8.10 As redes sociais facilitam o trabalho em conjunto para um objetivo comum	104	3	2	5	4.20	.066	.674	.454
Valid N (listwise)	104							

Table 9 - Descriptive statistics teachers' opinion on collaborative tools

Descriptive Statistics								
	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
9.1 Verbal	104	2	3	5	4.61	.059	.598	.358
9.2 Textual	104	3	2	5	4.16	.071	.726	.526
9.3 Espacial ou gráfica (mapas ou desenhos)	104	3	2	5	3.90	.086	.876	.767
9.4 Informação emocional	104	4	1	5	3.71	.093	.952	.906
9.5 Informação fotográfica	104	4	1	5	3.63	.089	.905	.819
9.6 Vídeo informação	104	4	1	5	3.58	.091	.932	.868
Valid N (listwise)	104							

Table 20 - Descriptive statistics classification of each type of information

Descriptive Statistics									
	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	
10.1 Permitir aos alunos acesso ao material das aulas	104	3	2	5	4.42	.071	.720	.518	
10.2 Permite aos alunos colaborar entre si	104	3	2	5	4.32	.078	.792	.626	
10.3 Trabalhar em equipa	104	3	2	5	4.35	.075	.760	.578	
10.4 Facilitar a entrada no mercado de trabalho	104	4	1	5	4.12	.083	.851	.724	
10.5 Receber mais feedback	104	4	1	5	3.14	.123	1.250	1.562	
10.6 Receber feedback mais rápido acerca de dúvidas por parte dos colegas	104	4	1	5	3.16	.128	1.301	1.691	
10.7 Receber feedback mais rápido acerca de dúvidas por parte dos professores	104	4	1	5	3.06	.129	1.313	1.725	
10.8 Preparar apresentações	104	4	1	5	4.14	.081	.829	.688	
10.9 Permite aos alunos participar ativamente (colocar dúvidas, sugerir tópicos...)	104	4	1	5	3.55	.113	1.156	1.337	
10.10 Ter acesso a mais conteúdos relacionados com a matéria	104	3	2	5	4.23	.087	.884	.781	
10.11 Ter acesso a conteúdos mais atualizados	104	4	1	5	4.39	.070	.716	.513	
10.12 Trabalhar em grupo	104	3	2	5	4.36	.067	.681	.464	
10.13 Facilitar o acesso à informação	104	2	3	5	4.49	.061	.623	.388	
10.14 Despertar a curiosidade	104	4	1	5	4.11	.077	.787	.620	
10.15 Cativar os alunos para a matéria lecionada	104	4	1	5	4.06	.078	.798	.637	
10.16 Motivar os alunos para estudar	104	4	1	5	4.00	.084	.859	.738	
10.17 A familiaridade com ferramentas colaborativas é um conhecimento importante para o futuro dos alunos	104	3	2	5	4.35	.067	.679	.462	
10.18 Contribuir para que os alunos adquiriram competências importantes para o seu futuro, como o trabalho em grupo	104	3	2	5	4.27	.075	.766	.587	
10.19 Dão ferramentas aos alunos para explorar	104	3	2	5	4.24	.073	.744	.553	
10.20 Ajudam no desenvolvimento social	104	3	2	5	4.17	.085	.864	.746	
10.21 Motivar para a aprendizagem	104	3	2	5	4.18	.076	.773	.597	
10.22 Contribuir para uma maior literacia tecnológica	104	3	2	5	4.36	.068	.696	.484	
Valid N (listwise)	104								

Table 3 - Descriptive statistics classifying the advantages of aspects related to collaborative tools

Descriptive Statistics

	N Statistic	Range Statistic	Minimum Statistic	Maximum Statistic	Mean		Std. Deviation Statistic	Variance Statistic
					Statistic	Std. Error		
11.1 Falta de tempo para adaptar o currículo	104	3	2	5	3.70	.089	.912	.833
11.2 Falta de tempo para conhecer o software	104	4	1	5	3.43	.100	1.022	1.044
11.3 Falta de tempo para adquirir competências necessárias	104	4	1	5	3.11	.112	1.140	1.299
11.4 Elevado número de alunos	104	4	1	5	3.68	.099	1.007	1.015
11.5 Pouca cooperação entre docentes	104	4	1	5	2.88	.112	1.143	1.307
11.6 Falta de proficiência dos professores	104	4	1	5	2.97	.115	1.170	1.368
11.7 Falta de recursos	104	4	1	5	3.70	.098	1.004	1.007
11.8 Exige um esforço para adaptar o currículo	104	4	1	5	3.66	.076	.771	.594
11.9 Falta de formação	104	4	1	5	2.82	.117	1.189	1.413
11.10 Falta de ferramentas didáticas	104	4	1	5	3.58	.086	.878	.771
11.11 Rede internet (inexistente ou com funcionamento insatisfatório)	104	4	1	5	3.67	.091	.929	.863
11.12 Falta de interesse por parte dos alunos	104	4	1	5	3.13	.116	1.180	1.392
Valid N (listwise)	104							

Table 4- Descriptive statistics factors that hinder the adoption of collaborative tools

Annex 3 - Principal Component Analysis - Find out what teachers think about collaborative and cooperative learning

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.835
Bartlett's Test of Sphericity	Approx. Chi-Square	1105.448
	df	153
	Sig.	.000

Table 5 - Find out what teachers think about collaborative and cooperative learning KMO and Bartlett's Test

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.111	39.507	39.507	7.111	39.507	39.507	4.707	26.153	26.153
2	2.734	15.190	54.698	2.734	15.190	54.698	3.724	20.689	46.841
3	1.384	7.691	62.389	1.384	7.691	62.389	2.395	13.303	60.145
4	1.079	5.994	68.383						
5	.846	4.699	73.082						
6	.750	4.168	77.250						
7	.618	3.433	80.683						
8	.556	3.089	83.772						
9	.538	2.991	86.763						
10	.440	2.445	89.209						
11	.375	2.086	91.294						
12	.346	1.922	93.216						
13	.298	1.656	94.873						
14	.282	1.567	96.439						
15	.197	1.097	97.536						
16	.169	.937	98.473						
17	.153	.848	99.321						
18	.122	.679	100.000						

Table 6 - Find out what teachers think about collaborative and cooperative learning Total Variance Explained

Reliability Statistics

Cronbach's	
Alpha	N of Items
.897	9

Table 7- Find out what teachers think about collaborative and cooperative learning Reliability Statistics F1

Reliability Statistics	
Cronbach's Alpha	N of Items
.854	5

Table 8 - Find out what teachers think about collaborative and cooperative learning Reliability Statistics F2

Reliability Statistics	
Cronbach's Alpha	N of Items
.748	3

Table 9 - Find out what teachers think about collaborative and cooperative learning Reliability Statistics F3

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
PromoveAprendizagem	104	1.67	5.00	4.0684	.60627
DesenvolvimentoEstruturasC ogRaciocinioLogico	104	1.80	5.00	3.5115	.76467
ComunidadeActivaAprendiza gem	104	1.00	5.00	3.5224	.86245
Valid N (listwise)	104				

Table 18- Find out what teachers think about collaborative and cooperative learning Reliability Statistics Descriptive Analysis of the factors obtained

Annex 4 - Principal Component Analysis – Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 6

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.782	42.025	42.025	3.782	42.025	42.025	2.887	32.082	32.082
2	1.328	14.761	56.786	1.328	14.761	56.786	2.223	24.704	56.786
3	.867	9.638	66.424						
4	.831	9.234	75.658						
5	.664	7.382	83.040						
6	.507	5.628	88.668						
7	.408	4.538	93.206						
8	.328	3.644	96.850						
9	.283	3.150	100.000						

Table 19 - Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 6
Total Variance Explained

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.825	.826	5

Table 100 - Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 6
Reliability Statistics F1

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.680	.677	4

Table 21 - Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 6
Reliability Statistics F2

Annex 5 - Principal Component Analysis - Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 8

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.847
Bartlett's Test of Sphericity	Approx. Chi-Square	384.043
	df	45
	Sig.	.000

Table 11 - Principal Component Analysis - Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 8 KMO and Bartlett's Test

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.368	43.680	43.680	4.368	43.680	43.680	2.992	29.919	29.919
2	1.180	11.804	55.484	1.180	11.804	55.484	2.556	25.565	55.484
3	.929	9.292	64.776						
4	.889	8.890	73.666						
5	.659	6.593	80.259						
6	.530	5.299	85.557						
7	.493	4.925	90.483						
8	.445	4.453	94.935						
9	.288	2.879	97.814						
10	.219	2.186	100.000						

Table 12 - Principal Component Analysis - Principal Component Analysis - Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 8 Total Variance Explained

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.736	.739	4

Table 24 - Principal Component Analysis - Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 8 Reliability Statistics F1

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.736	.739	6

Table 25 - Principal Component Analysis - Relevant factors for verifying teachers' opinions on the main advantages of using collaborative tools Q 8 Reliability Statistics F2

Annex 6 - Test t for equal means - Check whether gender influences the use of technological tools

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
5.1 Vídeo Conferência (ex: Google Hangouts, Skype, Cisco Webex...)	Equal variances assumed	.000	.990	-.331	102	.741	-.057	.171	-.397	.28
	Equal variances not assumed			-.306	52.051	.761	-.057	.185	-.429	.31
5.2 Áudio Conferência (ex: Google Hangouts, Skype, Cisco Webex...)	Equal variances assumed	4.301	.041	1.186	102	.238	.228	.192	-.153	.60
	Equal variances not assumed			1.023	45.279	.312	.228	.223	-.221	.67
5.3 Contacto telefónico	Equal variances assumed	1.350	.248	-.321	102	.749	-.079	.247	-.570	.41
	Equal variances not assumed			-.302	54.299	.764	-.079	.263	-.606	.44
5.4 Contacto pessoal	Equal variances assumed	4.586	.035	-1.134	102	.259	-.299	.264	-.822	.22
	Equal variances not assumed			-1.020	49.118	.313	-.299	.293	-.889	.29
5.5 E-mail	Equal variances assumed	.018	.894	.500	102	.618	.105	.211	-.313	.52
	Equal variances not assumed			.481	56.811	.633	.105	.219	-.334	.54
5.6 Aplicações de partilha de	Equal variances assumed	4.411	.038	.384	102	.702	.093	.241	-.386	.57

ficheiros sem possibilidade de edição (ex: Dropbox, WeTransfer, Google Drive, Jumpshare)	Equal variances not assumed			.357	52.652	.723	.093	.259	-.428	.61
5.7 Aplicações de partilha de ficheiros com a possibilidade de edição (ex: Google Drive, OneDrive...)	Equal variances assumed	.954	.331	.057	102	.955	.013	.226	-.435	.46
	Equal variances not assumed			.054	56.284	.957	.013	.236	-.459	.48
5.8 Partilha de Vídeo (Youtube, Vimeo...)	Equal variances assumed	.005	.944	.907	102	.366	.215	.237	-.255	.68
	Equal variances not assumed			.948	69.798	.346	.215	.227	-.237	.66
5.9 Apresentações partilhadas (SlideShare, Google Slides, Prezi...)	Equal variances assumed	.385	.537	.807	102	.422	.198	.246	-.289	.68
	Equal variances not assumed			.797	60.591	.429	.198	.249	-.299	.69
5.10 Mensagens instantâneas com recurso ao smartphone (SMS, Twitter, WhatsApp, Facebook Messenger, Skype...)	Equal variances assumed	1.859	.176	2.043	102	.044	.485	.238	.014	.95
	Equal variances not assumed			1.897	52.612	.063	.485	.256	-.028	.99
5.11 Mensagens instantâneas com recurso ao computador (WhatsApp Web, Facebook Messenger, Skype...)	Equal variances assumed	1.323	.253	1.971	102	.051	.420	.213	-.003	.84
	Equal variances not assumed			1.878	55.718	.066	.420	.224	-.028	.86

5.12 Blogs	Equal variances assumed	.292	.590	.604	102	.547	.098	.162	-.224	.42
	Equal variances not assumed			.597	60.709	.553	.098	.164	-.231	.42
5.13 E-learning (Adobe Captivate, Elicidat...)	Equal variances assumed	.320	.573	.469	102	.640	.072	.154	-.233	.37
	Equal variances not assumed			.462	60.077	.646	.072	.156	-.240	.38
5.14 Redes Sociais - Twitter	Equal variances assumed	1.185	.279	.706	102	.482	.108	.153	-.195	.41
	Equal variances not assumed			.701	61.340	.486	.108	.154	-.200	.41
5.15 Redes Sociais - Youtube	Equal variances assumed	1.650	.202	.901	102	.370	.191	.212	-.229	.61
	Equal variances not assumed			.832	51.956	.409	.191	.229	-.269	.65
5.16 Redes Sociais - Instagram	Equal variances assumed	4.654	.033	1.188	102	.238	.199	.167	-.133	.53
	Equal variances not assumed			1.036	46.241	.306	.199	.192	-.188	.58
5.17 Redes Sociais - Messenger	Equal variances assumed	4.061	.047	1.463	102	.146	.282	.193	-.100	.66
	Equal variances not assumed			1.302	48.121	.199	.282	.217	-.153	.71
5.18 Redes Sociais - WhatsApp	Equal variances assumed	1.724	.192	1.336	102	.184	.256	.192	-.124	.63
	Equal variances not assumed			1.295	57.961	.200	.256	.198	-.140	.65
5.19 Redes Sociais - Facebook	Equal variances assumed	1.310	.255	.922	102	.359	.181	.197	-.209	.57
	Equal variances not assumed			.887	57.005	.379	.181	.205	-.228	.59

Table 136 - Check whether gender influences the use of technological tools Independent Samples Test