Interview Guide

(A) Introduction and Justification of the Interview:

As part of the Doctoral Program in Educational Sciences at the University of Évora, this interview is an integral component and represents one of the studies included in the doctoral thesis project in Educational Sciences, entitled "Practical work in Natural Sciences Education in Portugal: a reading from the third cycle of basic education."

More specifically, this interview aims to gather in-depth characterising elements regarding the importance of practical work, the obstacles and constraints to its implementation, and the impact that the Essential Learnings (ELs) have had on the adoption of this methodology in the subject of Natural Sciences within Lower Secondary Education (3rd Cycle of Basic Education).

Given that teachers routinely engage in collaborative work within disciplinary groups -whether in school clusters or non-clustered schools - it is essential to gather insights from educators in Recruitment Group No. 520 (Biology and Geology), who are responsible for teaching Natural Sciences in the 3rd Cycle of Basic Education. To this end, the present interview has been designed with an exploratory focus and a semi-structured format. The teacher's participation as an interviewee is vital to the success of this study, and I would like to express my sincere gratitude for your willingness to contribute.

I assure that under no circumstances will your identity be disclosed, and I guarantee the absolute confidentiality of the information provided, which will be subject only to content analysis. I also request your permission to record the interview, in order to ensure the most complete collection of information possible. Furthermore, I guarantee that, following transcription, the interview will be made available to you so that you may review the accuracy of your responses.

(B) Ethical and Legal Considerations:

This research complies with the ethical principles governing the Social Sciences and adheres to the Personal Data Protection Law (Law No. 58/2019, of August 8). It also aligns with the responsibilities and best practices in scientific research as defined by the University of Évora's Code of Ethics, as well as the ethical guidelines outlined in the Ethical Charter of the Portuguese Society of Educational Sciences. Interviews are conducted following informed consent, and the anonymity of the interviewee is ensured at all times. The interview recordings will remain in the researcher's custody until the doctoral defence, after which they will be destroyed. Confidentiality is guaranteed throughout the entire data processing procedure.

(C) Referents:

a) Specialised literature: theoretical-conceptual framework.
b) Administration: curricular and legislative framework.

(CI) Covered dimensions:

1 – Conceptual dimension (5 items)

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2 – Limitations dimension (6 items)

3 – Advantages dimension (6 items)

4 – Evaluative dimension (6 items)

5 - Operationalisation Dimension (9 items)

6 – Textbook dimension (4 items)

7 – Curricular dimension (8 items)

1 – Conceptual dimension

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
Concept	Typology of Practical Work Implementation	- Characterise the concept of practical work (PW). - Characterise the types of skills promoted by the PW. - Unveil how PW enables the development of knowledge-based skills.	1 - What do you understand by PW? 2 - What typologies of PW do you identify? Which do you most frequently apply in your teaching practice, and why? Please illustrate with a concrete example. 3 – In your opinion, do students acquire knowledge-based skills during the execution of PW? In what ways do they acquire these types of skills?	- Definition. - Examples. - Typologies. - Knowledge-based skills (critical thinking, memorisation, concentration ability, self-motivation, understanding, and conceptual mastery). - Practical skills (handling materials and instruments, performing technical operations following appropriate methodology, developing fine motor skills, and transforming or creating products adapted to different contexts).	- Time management. - Evidence of the relationship between the scope of Essential Learnings (ELs) and the selected PW typology. - Implementation of field work - Implementation of experimental work - Implementation of laboratory work - PW involves the mobilisation of scientific knowledge in order to enable the understanding of the processes behind certain phenomena, aligned with a 'minds-on' approach that fosters critical thinking. - PW involves the mobilization of scientific knowledge to enable the understanding of the	(Martins et al, 2017) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Costa et al., 2022) (Dourado, 2001) (Leite, 2001) (Ferreira & Morais, 2014) (Erduran et al., 2020) (Fadzil & Saat, 2019) (Harrison, 2016) (Itzek-Greulich & Vollmer, 2017) (Karpin et al., 2014) (Oyoo, 2012) (Pols et al., 2021) (Ramnarain & de Beer, 2013) (Xu and Clarke, 2012) (Adamu & Achufusi-Aka, 2020) (Preethlall, 2015) (di Fuccia et al., 2012) (Malathi & Rohini, 2017) (Wilson, 2018)

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	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
					processes behind certain phenomena, in line with a "minds-on" approach that promotes critical thinking. • Evidence of the development of knowledge-based competencies within the areas defined by the Student Profile at the End of Compulsory Schooling (SPECS), namely: • Languages and texts • Information and communication. • Reasoning and problem-solving. • Critical and creative thinking. • Interpersonal relationships • Personal development and autonomy	(Musasia et al., 2012) (Ruparanganda et al., 2013) (Viswarajan, 2017) (Mamlok-Naaman & Barnea, 2012) (Šorgo & Špernjak, 2012)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
					• Well-being, health, and environment • Aesthetic and artistic sensitivity • Scientific, technical, and technological knowledge • Body awareness and control	
	Mobilisation of skills (minds-on and hands-on approaches)	- To describe how students and the teacher engage in the development of inquiry-based PW.	4 - Let us focus on inquiry-based learning, in which students lead their own investigative process and may even define the problem to be explored. Do you usually implement this type of practical work? Could you provide an example?	- Identification/characterisation of inquiry-based PW. - Identifying how students develop inquiry-oriented questions.	- Mobilising practical skills in material manipulation within investigative scientific processes. - Mobilising conceptual skills within investigative scientific processes. - PW involves strong engagement in the process of developing research questions and designing experimental procedures, aligned	(Oguoma et al., 2019) (Toplis, 2012) (Abrahams et al., 2014) (Abrahams et al., 2013) (Akuma & Callaghan, 2019) (Erduran et al., 2020) (Fadzil & Saat, 2019) (Hamza & Wickman, 2013) (Harrison, 2016) (Itzek-Greulich & Vollmer, 2017) (Köksal, 2018) (Karpin et al., 2014) (Kennedy, 2013)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
					with the principles of Inquiry-Based Learning.	(Abrahams & Reiss, 2012) (Phaeton & Stears, 2017) (Ramnarain & de Beer, 2013) (Sharpe & Abrahams, 2020) (Wei et al., 2019) (Wei & Li, 2017) (Wei & Liu, 2018) (Adamu & Achufusi-Aka, 2020) (Preethlall, 2015) (Anza et al., 2016) (Danmole, 2012) (di Fuccia et al., 2012) (Malathi & Rohini, 2017) (Wilson, 2018) (Musasia et al., 2012) (Ruparanganda et al., 2013) (Viswarajan, 2017) (Lowe et al., 2013) (Mamlok-Naaman and Barnea, 2012) (Šorgo & Špernjak, 2012)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
	Learning through real-life experiences	- Identifying the ways in which PW can support the resolution of real-life problems.	5 – In your opinion, does the practical work (PW) developed help identify ways to solve everyday problems? Please provide an example.	- Evidence of the implementation of practical activities where PW contributes meaningfully to the resolution of real-life problems.	- Learning through everyday phenomena as a driver of student motivation and engagement, emerging from meaningful learning episodes drawn from selected experiences and contexts.	(Musasia et al., 2016) (Ramnarain and de Beer, 2013) (Wei & Li, 2017) (Xu & Clarke, 2012)

2 – Limitations dimension

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
Limitations	Limitations to the Implementation of PW	- To identify the key constraints affecting the implementation of PW in Natural Sciences education, with particular attention to pedagogical, organisational, and time management factors.	6 - Based on your teaching experience, what do you consider to be the main limitations to implementing practical work (PW) in Natural Sciences lessons? Please provide, if possible, examples related to the following areas: • Material conditions and available resources (e.g., laboratories, equipment, technical support). • Organisational and administrative aspects of the school. • Curricular load and time available to plan, implement, and assess PW. • Other factors (e.g., teacher motivation, professional development, class size, etc.). 7 - What suggestions would you propose to overcome these limitations?	- Identify potential limitations: *a)* at the student level (knowledge, motivation, behaviour, etc.), *b)* at the teacher level (training, professional content knowledge, etc.), *c)* in terms of material resources (laboratory equipment, consumables, school facilities, etc.), *d)* at the curricular level (curriculum adequacy and scope); and at the school level (the value attributed to PW). - Satisfaction with the school facilities and the organisational/bureaucratic environment of the school cluster or non-clustered school. - Availability of a laboratory and satisfaction with its	- The school environment and organisational structure are rigidly defined, which hinders Inquiry-Based Learning. When combined with bureaucratic demands, this discourages teachers from engaging students in open-ended investigations that require significant time investment. - Lack of a laboratory equipped with up-to-date materials, adequate spaces, and the presence of a laboratory technician.	(Oguoma et al., 2019) (Martins et al., 2017) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Oguoma et al., 2019) (Ramnarain & de Beer, 2013) (Adamu & Achufusi-Aka, 2020) (Anza et al., 2016) (Musasia et al., 2012) (Tesfamariam et al., 2014)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
				physical resources and human support. - Arrangement of desks in the classroom.		
		- To understand the adequacy of initial teacher training and continuing professional development, in relation to the emphasis placed on effective classroom communication.	8 – Turning our attention now to the topic of teacher training, do you believe that your initial training provided adequate preparation for the development of PW? Please elaborate. 9 – Considering your current professional knowledge, do you believe there is adequate continuing professional development for PW in science education? What are the reasons for your view?	- Adequacy of teachers' professional content knowledge.	- The use of language for effective classroom communication—as a pedagogical skill—is not sufficiently emphasised in the initial training of science teachers, nor in their continuing professional development programs. This aspect is reflected in the frequency and quality of the implementation of PW.	(Oyoo, 2012)
	Motivational effects	- To recognise the reasons why students prefer PW compared to more theoretical approaches. - To understand whether PW can be a source of stress and anxiety for students,	10 – How do Natural Sciences students react to the implementation of PW? Based on your experience, do you believe students prefer PW when compared to more theoretical approaches, or are there other motivations/justifications? What are they?	- Relevance of PW from the perspective of students and teachers. Satisfaction with the skills and motivation developed through PW.	- The preference for PW only arises when compared to other, more theoretical strategies/approaches. - PW may offer minimal contributions to the acquisition of professional	(Babalola et al., 2020) (Itzek-Greulich & Vollmer, 2017) (Wilson, 2018) (Oguoma et al. (2019) (Toplis, 2012) (Abrahams et al., 2014) (Abrahams et al., 2013)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
		and to identify ways to mitigate these feelings. - To demonstrate how PW is structured in a way that aligns with how scientists investigate and work.	11 - Do you believe that the PW developed in your Natural Sciences classes aligns with the way scientists work?	- Relevance of implementing PW from an emotional perspective. - Coherence between the approaches/methodologies used in PW and the work carried out by scientists and researchers.	and personal skills, not sufficiently enhancing student motivation. - The implementation of PW can become a source of stress and anxiety, thereby neutralising potential educational benefits. - PW is not consistent with the way scientists work, as it is limited to describing what was done and observed.	(Akuma & Callaghan, 2019) (Erduran et al., 2020) (Fadzil & Saat, 2019) (Hamza & Wickman, 2013) (Harrison, 2016) (Köksal, 2018) (Karpin et al., 2014) (Kennedy, 2013) (Abrahams & Reiss, 2012) (Phaeton & Stears, 2017) (Ramnarain & de Beer, 2013) (Sharpe & Abrahams, 2020) (Wei et al., 2019) (Wei & Li, 2017) (Wei & Liu, 2018) (Adamu & Achufusi-Aka, 2020) (Preethlall, 2015) (Anza et al., 2016) (Danmole, 2012) (di Fuccia et al., 2012)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
						(Malathi & Rohini, 2017) (Musasia et al., 2012) (Ruparanganda et al., 2013) (Viswarajan, 2017) (Lowe et al., 2013) (Mamlok-Naaman & Barnea, 2012) (Šorgo & Špernjak, 2012)

3 – Advantages Dimension

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
Advantages	Development of research-based skills	- To identify advantages associated with the implementation of PW in classroom settings, outdoor environments, and/or non-formal education contexts.	12 - In your opinion, are there advantages associated with the implementation of PW in the Natural Sciences subject? What kind of advantages do you observe? 13 - And in outdoor environments, are there advantages to carrying out PW? Please justify.	- Observation of advantages associated with PW in outdoor settings and non-formal educational contexts.	- Conducting on-site investigations of objects, tools, cases, and events that cannot be brought directly into the school (e.g., museums, science centres, environmental parks, etc.)	(Köksal, 2018)
		- To understand the role of PW in sustaining interest in science and in encouraging further studies in this field of knowledge.	14 – From a more vocational perspective, to what extent does PW foster students' interest in science and encourage them to pursue further studies in this field?	- Relevance of Practical Work (PW) in fostering interest in science and its impact on future career choices.	- PW is key to maintaining students' interest in science, encouraging them to pursue further studies in this field.	(Babalola et al., 2020) (Shana & Abulibdeh, 2020) (Musasia et al., 2016) (Bohloko et al., 2019) (Fadzil & Saat, 2019) (Itzek-Greulich & Vollmer, 2017) (Kennedy, 2013) (Pols et al., 2021) (Ramnarain & de Beer, 2013) (Wei & Liu, 2018) (Anza et al., 2016) (Wilson, 2018) (Musasia et al., 2012) (Mkimbili & Ødegaard, 2019)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
						(Šorgo & Špernjak, 2012)
		- To understand how the implementation of PW enables the development of transferable skills.	15 – We recently identified the types of skills promoted by PW. Which of these do you consider transferable to everyday contexts?	- Relevance in the development of transferable skills.	- Development of transferable skills such as prediction, observation and interpretation, problem-solving, communication of ideas and information, creativity, leadership, conscientiousness, and demonstration of entrepreneurial abilities.	(Tesfamariam et al., 2014)
		- To investigate how PW can promote inclusion in the educational process. - To recognize the role of PW in specific situations, such as those involving students with individual educational plans, resulting from special health needs.	16 – How can practical work promote the participation of all students? 17 - What makes PW promote or not promote inclusion? And in relation to students with individual educational plans — such as those with dyslexia, hyperactivity, giftedness, or visual impairments?	- Coherent adaptation of PW dynamics to situations where pedagogical differentiation becomes essential. - Existence and relevance of pedagogical differentiation strategies.	- Concerns are identified that stem from the ability to refine or adapt PW tasks to specific situations. - All students have the right to full and effective access and participation in all educational contexts, embracing diversity from both socio-economic and	(Oguoma et al., 2019) (Portugal, 2018a) (Martins et al., 2017) (Portugal, 2018c)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
				- Availability of essential human and material resources for the development of PW. - Relationship between current legislation and curriculum guidelines with the implementation of PW.	cultural perspectives, as well as cognitive and motivational dimensions. - Implementation of multilevel measures — universal, selective, and additional — that prove to be appropriate for students' learning and inclusion. - There is alignment, diversity, and complementarity in teaching and learning strategies, as well as the production of descriptive information about students' performance.	

4 – Evaluative dimension

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
Evaluative	Assessment within a specific framework.	- To recognise the preferred assessment strategies in the implementation of PW, whether formative or summative. - Determine the relevance attributed to self-assessment and peer assessment, while simultaneously identifying the frequency and the moments when peer assessment is conducted.	18 – Let's talk about learning assessment—how do you usually assess the PW? 19 – How does formative assessment, which builds upon the PW, reflect in the summative assessment? 20 - What importance do you attribute to self-assessment and peer assessment, and at what moments do they occur? What do you do with the information obtained?	- Relevance of formative and summative assessment processes in the evaluation of practical work.	- The PW benefits from a formative assessment approach, allowing room for discussion and clarification of various issues. - Assessment through a specific framework and a system whose structure includes a set of strategies and tools specifically designed for a particular type of PW.	(Sund, 2016) (Abrahams et al., 2014) (Abrahams et al., (2013) (Akuma and Callaghan, 2019) (Andersson & Enghag, 2017) (Fadzil & Saat, 2019) (Hamza & Wickman, 2013) (Harrison, 2016) (Itzek-Greulich & Vollmer, 2017) (Abrahams & Reiss, 2012) (Pols et al., 2021) (Preethlall, 2015) (di Fuccia et al., 2012) (Wilson, 2018) (Musasia et al., 2012) (Sani, 2014) (Viswarajan, 2017)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
	Instruments and feedback	- To identify the assessment instruments used to monitor the development of PW. - Recognise whether the assessment process of the practical work includes the use of rubrics, and whether they are co-constructed with the students. - Identify the moment(s) when feedback is given to students. - Characterise the type of evaluative feedback given to students. - Determine the means by which assessment feedback is conveyed to students' guardians.	21 – Still regarding the assessment process of the PW, what instruments do you use with your students? Do you encourage the use of rubrics? What is the process for constructing these instruments? Provide a brief description. 22 – During the assessment process related to the PW, what type of feedback do you give to students? What impact does it have? At what moments is it provided? 23 - To what extent does the assessment of practical work influence the overall evaluation of students?	- Description of the instruments used in the assessment of practical work. - Relevance attributed to assessment rubrics, the process of their creation, and the dynamics of peer assessment. - Characterisation of the feedback on the assessment process of PW.	- Availability of tailored instruments specifically designed for assessing PW. - Providing feedback to students and guardians on the assessment of the PW carried out. - The assessment criteria take into account the diversity of information-gathering methods, using a variety of procedures, techniques, and instruments suited to their intended purposes, the diversity of learning, the target audience, and the circumstances in which they occur.	(Martins et al., 2017) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Costa et al., 2022) (Portugal, 2018c)

5 - Operationalization dimension

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
Operationalization	Integration of digital technologies in practical work	- To understand how PW integrates Digital Information and Communication Technologies (DICT), identifying the most emphasised competencies. - To recognise how the use of DICT fosters collaborative work during the implementation of PW. - To identify the advantages and limitations associated with the use of digital simulators and/or remote laboratories during the implementation of PW.	24 - Let us now turn to more practical aspects. What phases do you follow when planning PW? 25 – Do you incorporate DICT into the planning of PW? Which tools do you use and in what ways? Which competencies are most emphasised? 26 – Have you ever implemented PW through the use of digital simulators and/or remote laboratories? If so, what key advantages and limitations did you observe?	- Coherence in the integration of DICT into PW dynamics.	- Promotion of collaboration across different communicative contexts, in an appropriate and safe manner, using various types of tools (analogue and digital), based on the conduct rules specific to each environment. - Aligning transformative actions and product development with diverse natural, technological, and sociocultural contexts through experimental activities, projects, and practical applications carried out in both physical and digital environments. - Selection and organisation of information from diverse sources in an increasingly	(Martins et al., 2017) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Costa et al., 2022)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
					autonomous way, valuing the use of digital technologies and integrating prior knowledge to build new knowledge.	
	Student performance	- To identify the relevance and the approach to operationalising collaborative work during the planning of PW.	27 – Are Natural Sciences students usually given the opportunity to plan any type of activity? What importance do you assign to collaborative work in the planning, implementation, and evaluation of PW? 28 - Have you ever implemented this type of work? Please describe in detail how you organise and facilitate it. 29 - Do you draw on Inquiry-Based Learning, Problem-Based Learning, or Team-Based Learning approaches in these activities? If so, why and in what way? 30 - On average, how much time do you dedicate to conducting practical work with students during your classes?	- Student participation in the processes of designing, implementing, and evaluating PW. - Relevance of collaborative work during the design, implementation, and evaluation of PW.	- Development of critical and autonomous thinking skills, creativity, collaborative work competence, and communication ability. - Organisation and development of cooperative learning activities aimed at the integration and exchange of knowledge, self-awareness, awareness of others and the environment, and the implementation of intra- and extracurricular projects.	(Martins et al., 2017) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Costa et al., 2022)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
					- Collaborative and project-based work enables the development of interdisciplinary learning within the domains of 'Interpersonal Relationships' and 'Personal Development and Autonomy,' in accordance with the Student Profile at the End of Compulsory Schooling (SPECS).	
	Strategic options	- To determine whether Practical Work (PW) is also organised around environments of transdisciplinarity, multidisciplinarity, and/or interdisciplinarity. - Recognise whether PW is promoted within the scope of the Domains of Curricular Autonomy	31 – Do you usually carry out PW in collaboration with colleagues from other subjects? Which ones, and in what ways? Have you ever tried promoting PW within the framework of the DCA? If so, can you provide examples? 32 - When developing PW, which SPECS competency areas do you work on most frequently?	- Characterisation of PW developed within a context of transdisciplinarity, multidisciplinarity, and/or interdisciplinarity. - Existence of PW within the scope of the DCA. - Relevance and limitations of PW during its implementation within the DCA.	- Interaction between different areas of knowledge in the planning, implementation, and evaluation of PW. - The DCA, through the intersection of learning from different disciplines, explore pedagogical and didactic pathways that prioritise Practical and/or experimental Work, as well	(Holbrook et al., 2020) (Davies et al., 2020) (Martins et al., 2017) (Portugal, 2018c) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Martins et al., 2017) (Portugal, 2018b)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
		(DCA) and provide some examples. - Identification of the SPECS competency areas most emphasised in the PW carried out during lessons. - Provide examples of the types of PW through which the different competency domains are explored.		- Alignment of PW strategies with the development of competency areas identified in the SPECS.	as the development of research, relational, and analytical skills. - Development of competencies outlined in the SPECS in coordination with the EL, within the scope of PW.	

6 - Textbook dimension

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
Textbook	Overview of the textbook's main features	- Determine the relevance of the textbook for the implementation of PW in the subject. - Recognise some examples of TP suggested by the textbook. - Characterise the nature of the PW suggested by the textbook.	33 - Turning to the role of the textbook in teaching and learning, which textbook is adopted by your school for the 7th, 8th, and 9th grades? How do you use this resource in relation to PW? 34 - Regarding the PW proposals presented in the textbook, how would you evaluate them? 35 - Apart from the textbook, what other resources (digital tools, worksheets, platforms) do you use? 36 - Alternatively, or as a complement, do you develop your own PW proposals? If yes, could you share an example of a plan or instructional guide?	- Alignment between the PW strategies proposed in the textbook and those effectively put into practice. - Adaptability of the proposed PW to the diverse contexts of the students' realities. - Relevance and diversification of the PW strategies suggested by the textbook. - Schools' access to educational resources.	- Implementation of PW suggested by the textbook. - Implementation of PW is considered relevant but not suggested by the textbook. - Strictly follows the PW suggestions provided in the textbook. - Adapts the PW suggestions provided in the textbook. - Disregards the PW suggestions provided in the textbook. - Diversification of PW strategies through the use of varied materials and resources. - Carrying out PW of a demonstrative nature.	(Martins et al., 2017) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Costa et al., 2022)

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	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
					- Carrying out PW of an investigative nature. - Realização de TP sugerido pelo manual, sobre a resolução de problemas do quotidiano. - Facilitated access to material and human resources essential for the implementation of PW.	

7 - Curricular dimension

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
Curricular	Connection between curricular guidelines and how frequently PW is carried out.	- Recognise whether the frequency of PW actually carried out aligns with the curricular guidelines.	37 – In the final part of our interview, we'll explore how PW relates to curricular planning. What criteria guide your decisions regarding the themes and timing of PW activities?	- Alignment between the frequency of PW and what is recommended in the curriculum.	- Evidence of PW implementation on topics suggested by the curricular guidelines.	(Martins et al., 2017) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Costa et al., 2022)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
			38 – How frequently do you implement Practical Work (PW) in your teaching? Could you estimate the number of PW activities conducted per school term or semester? Are you satisfied with that frequency?		- PW conducted on a weekly, biweekly, or other basis.	
	Transition from the Curricular Goals (CG) to the EL.	- Identify the most relevant aspects in the transition from CG to EL, with regard to the implementation of PW.	39 - What effects did the official endorsement of the CG have on your practical work practices? 40 - What changes have you observed in experimental practice since the transition from the CG to the EL? 41 - The CG included descriptors with suggestions for PW framed within the different domains and subdomains of the content. In EL, these descriptors were removed. What effects might their introduction and subsequent elimination have produced?	- The nature of PW dynamics after the official endorsement of the CG. - The nature of PW dynamics after the official endorsement of the EL.	- Evidence of changes in PW dynamics associated with the general objectives and descriptors of the CG. - Evidence of changes in practical work dynamics associated with the alignment between SPECS and the EL.	(Martins et al., 2017) (DGE, 2018a) (DGE, 2018b) (DGE, 2018c) (Costa et al., 2022) (Bonito et al., 2014a) (Bonito et al., 2014b)
		- Recognise possible limitations within the curricular guidelines that may hinder the promotion of PW and identify suggestions for optimisation.	42 - Do you believe that the current curricular guidelines hinder the promotion of PW in science education? What suggestions would you offer for a more effective curricular design in this regard?	- Curricular coherence regarding the design, relevance, and guidance of PW in science education.	- Evidence suggests that the implementation of PW is limited by inadequately structured curricula, highlighting the need to	(Donnelly et al., 2013) (Phaeton & Stears, 2017) (Wei et al., 2019) (Wei & Liu, 2018) (Adamu & Achufusi-Aka, 2020)

	Subdimension	Objectives	Questions	Criteria	Indicators	Authors/Regulations
			43 - How do you envision the future of practical work in the teaching of Natural Sciences in Portugal? 44 - In conclusion, would you like to add anything else to what you've said or about a topic that hasn't been addressed?		pursue more effective curricular designs. - The approaches associated with PW may appear unfeasible in terms of assessment, given the constraints of an overloaded curriculum.	(Tesfamariam et al., 2014) (Viswarajan, 2017) (Šorgo & Špernjak, 2012)

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