UNIVERSIDADE LUSÓFONA

CeiED CENTRO DE ESTUDOS INTERDISCIPLINARES EM EDUCAÇÃO E DESENVOLVIMENTO

Designing Courses on Research Methods in Education: ReMASE Framework

ReMASE
RESEARCH METHODS IN ADVANCED STUDIES IN EDUCATION

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Title: *Designing Courses on Research Methods in Education: ReMASE framework*

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FORWARD

There has been a shift across most countries to de-centralised decision-making in education, giving more responsibility and mandating to local authorities. Given the increasing availability of information on education, with less quality control, a more informed public and a greater diversity of policy makers, the role of research for evidence-informed policy in education becomes newly important.

In Portugal, research in education is mainly carried out by academics in higher education institutions where research methods courses are included in the study plans in a variety of master and doctoral programs (Matos et al., 2023).

It is non-controversial that a solid preparation on research methods provides important knowledge and skills to undertake better research and thus significantly contribute to the educational community. Quality teaching in research methods requires developing a clear understanding of the complex relationships between the explicit syllabus guidelines of the courses, the previous competences of students, and the pedagogical options of the teacher (Matos et al., 2023).

It is a great challenge to teach research methods in education as the target populations of students usually come with different prior knowledge and have diverse backgrounds, interests, and expectations. Therefore, preserving the complexity of the issue of creating and teaching a course on Research Methods in Education (RME), the present framework offers opportunities for reflection and action for teachers who take onboard that difficult task.

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Project *ReMASE* became possible thanks to those who teach courses on research methods in education in Portuguese higher education institutions, namely in master and doctoral programs. The contribution of the teachers – through their time and effort in filling a long questionnaire and participation in focus-group interviews – is reflected in the present framework.

List of acronyms

ADDIE – Analysis Design Development Implementation Evaluation

CeiED – Centro de Estudos Interdisciplinares em Educação e Desenvolvimento

FCT I.P. – Fundação para a Ciência e Tecnologia

ReMASE – Research Methods in Advanced Studies in Education

RME – Research Methods in Education

I. AN OVERVIEW OF PROJECT ReMASE

The literature on teaching-learning research methodologies in education reflects several controversies regarding students' methodological understanding of research (Nind et al., 2019) and pedagogical challenges experienced by teachers (Ross & Call-Cummings, 2020). For example, it is reported anxiety and 'fear' of methodologies (mainly quantitative) by students (e.g., Turner et al., 2018; Saeed & Al Qunayeer, 2021), complexity of epistemological understanding and its applicability in life (e.g., Llamas & Boza, 2011; Ivankova & Clark, 2018), and lack of specific training of teachers in research methods together with a variety of conceptions about research in education (e.g., Küçükaydin & Gökbulut, 2020; Talbott & Lee, 2020). Additionally, the literature reveals a lack of empirical, epistemological, and methodological reflection on teaching research methods in education (e.g., Wagner et al., 2019), indicative of the need to identify and understand a pedagogical culture in that domain (Lewthwaite & Nind, 2016). This complex scenario of scientific engagement consolidated the need for a research-based approach and debate about what makes quality research methods courses, and it is the origin of the Project Research Methods in Advanced Studies in Education – ReMASE.

Project ReMASE pursued the idea that teachers in higher education would benefit from the use of a framework as a tool to design and implement research methods courses in education. The project takes the idea that the quality of research in education will impact the quality of its results. This leads to the need for rethinking the design of research methods courses and the pedagogical approaches taken. Therefore, the aim of project ReMASE was to identify and provide research-based principles and guidelines for the design of research methods courses in education, to be put together as a framework. The research team is constituted both by experienced researchers teaching research methods in advanced programs in education, as well as by young researchers, embracing the task of interrogating and improving the design and implementation of research methods courses. The key research question of the project is: *what principles and guidelines are appropriate to constitute a framework for the design of research methods courses in advanced studies in education in Portugal?*

The ReMASE project (2022-2023) was organised in three phases – Phase I concerned with mapping the field (theoretical and empirical), Phase II was dedicated

to data collection and analysis (a survey-questionnaire followed by focus-group interviews were implemented), and Phase III when the results of the theoretical mapping and the empirical results were taken to produce a framework – constituted by principles and corresponding guidelines – for the design of research methods courses (Matos et al., 2023).

II. THE STRUCTURE OF THE FRAMEWORK

II.1. RATIONALE FOR A STRUCTURING MODEL FOR THE FRAMEWORK

The present framework emphasizes the call for a research-based pedagogical culture. A research-based pedagogical culture involves inquiry-based learning, evidence-based practice, reflective practice, collaboration, professional development, and data-driven decision-making. By emphasizing these elements in the teaching of RME courses, teachers can model effective research practices and prepare students to conduct high-quality research in their practice (Matos et al., 2023).

Teaching RME implies a comprehensive overview of research methods (Matos et al., 2023). It is important to provide students with a comprehensive overview of research methods in education, including quantitative, qualitative, and mixed-methods approaches. This includes teaching students about research design, sampling techniques, data collection methods, and data analysis techniques.

Additionally, critical thinking and problem-solving skills should be addressed. RME courses should encourage those by teaching students to evaluate research studies and to identify effective research practices. This involves teaching students how to critically appraise research studies and to apply this knowledge to their own research design and analysis.

Participation through collaboration is a crucial approach. RME courses should encourage collaboration approaches by providing opportunities for students to work together on research projects and to engage with scholars from other disciplines to help students to broaden their perspectives and to apply knowledge and skills from other fields to their own research.

But that puts hands-on experience at the kernel of the teaching and learning activity. RME courses should provide real hands-on experience with research design, data collection, and data analysis. This may involve having students designing and conducting their own research studies, analyse data from existing research studies, and present their findings to their peers and other scholars.

RME courses should emphasize ethical considerations in research, including informed consent, confidentiality, and protection of human participants and discuss that in the scope of research integrity. This involves that students acquire consolidated ideas and understand ethical guidelines and regulations and apply them in their own research practice.

Resources are crucial in any learning setting and context. Therefore, RME courses should provide ongoing support and resources to help students develop their research skills and to apply these skills in their own practice. This can involve providing workshops, mentorship, and access to research databases and other resources.

From the perspective presented above, it becomes clear that the task of designing a RME course, implement and evaluate it, is a rather complex task. Additionally, teachers must be scientifically and pedagogically prepared to teach a RME course. This would benefit from the deep and central involvement of teachers in the design of the course. The vocation of the present framework is to constitute a tool that teachers may take and use the think and operationalize a RME course according to their learning objectives.

For the structure of the framework, we decided to choose the well-known model **ADDIE** – **A**nalysis **D**esign **D**evelopment **I**mplementation and **E**valuation. Using the ADDIE model to structure the present framework we assume would help the teachers who teach and design the RME courses in advanced studies in education given that, in general, they are also responsible for its implementation.

The framework provides not just a set of hints but research-based principles that give birth to respective guidelines. Even though, the framework should be used by teachers as a tool that users must interrogate and adopt or adapt according to their purposes, following the general principle of *fitness to purpose*.

II.2. THE ADDIE MODEL

The design of a RME course may follow several curricular models. For providing foundational background to the framework structure, it is now presented a brief characterization of the ADDIE model phases that structures the present framework.

Analysis

In the ADDIE model the first step is to understand the issues that the course will solve. This means to identify and understand the students' profile and their academic context together with a clear definition of the aims of the RME course and its place and role in the Master of Doctoral study program, the next step being to state clearly the students' learning objectives. Depending on the nature of the RME course, it may be useful to make a diagnosis of students' knowledge and competencies to know in detail their profile. If a performance gap is identified, the teachers need to determine the associated instructional goals, to identify the required resources, to choose the methodologies to be used and finally to elaborate a management plan. The output of the stage of analysis is an executive plan of what will be developed, and it feeds the design phase.

Design

The previous analysis creates conditions to put forward a set of learning scenarios (i.e., modular plans that emphasize learning and students' activity) that include learning objectives, content, activity scripts, feedback strategies, interfaces with other courses of the same master or doctoral programs, etc. Within this phase it is usually useful to produce prototypes of activities and make decisions about types of technological resources used. This is possible if the typology of tasks included in the learning scenarios are specified with the proper detail, the learning objectives were defined, and general feedback strategies were made explicit.

Development

During the development phase, the parts developed in the previous step are brought together creating a coherent unit – the RME course plan. The quality of the development phase depends on the availability of resources as well as on the quality of the analysis and design made in previous phases. The development phase should make sure that the learning scenarios and respective contents are generated, resources are selected or developed and guidance for the student is prepared.

Implementation

The developed course is put in place. At this stage, efforts should focus not on the course material itself, but on facilitating its use by students with the guidance of the teacher – facilitating access, providing on-time feedback, supporting students' questions, etc. The learning arena should be ready to receive the students and engage them in the activities.

Feedback, Assessment and Monitoring

According to the ADDIE model, the evaluation stage should be clear. However, it is an ongoing process that puts in dialogue several aspects of other stages. During this phase, conclusions should be made whether the objectives established have been achieved and eventually to make the necessary corrections. Some RME teachers (acting as course designers) suggest that feedback from peers (teachers of other courses in the same academic program) is rather useful to adjust and create interfaces among different courses of the program. The ReMASE framework does follow the linear perspective of the ADDIE model which considers evaluation as final step. In fact, the framework adopts the terminology of feedback, assessment, and monitoring.

Table II.1., next page, provides an example of a roadmap that provides a general view of the creation of a RME course according to ADDIE model.

Table II.1.

Example of a general roadmap for the creation of a RME course

Analysis	Design	Develop	Implement	Evaluate (*)
		Concept		
Identify the need for RME and possible probable causes for performance gap.	Identify the desired performance and appropriate feedback, monitoring, and assessment methods.	Generate the learning paths and resources.	Prepare the learning environment and engage the students in activities.	Assess the quality of the resources and processes, both before, during and after implementation.
		Common procedures		
1. Locate the RME course within the program and state its aims. 2. Identify the students' profile. 3. Formulate the learning objectives. 4. Identify required resources. 5. Create potential activities. 6. Compose a pedagogical proposal made of learning scenarios.	7. Conduct a theme inventory. 8. Specify thematic learning scenarios. 9. Define appropriate typology of resources. 10. Generate feedback strategies. 11. Define the elements of the pedagogical culture.	12. Generate activity proposals within the learning scenarios. 13. Develop guidance strategies. 14. Conduct formative revisions.	15. Setup the stage for the RME course. 16. Carry on the RME course activities.	17. Apply criteria.

(*) ReMASE framework interprets ADDIE evaluation as feedback, assessment, and monitoring and takes it from a non-linear perspective.

III. ReMASE FRAMEWORK FOR RME COURSE DESIGN

The framework is organized in five major clusters that refer to key general phases of designing a RME course unit:

(i) Analysis;

(ii) Design;

(iii) Development;

(iv) Implementation;

(v) Feedback, Assessment, and Monitoring.

For each cluster, a set of principles and guidelines are presented. Each cluster is organized in a separate table that displays the principles for that cluster with a brief description and the associated specific guidelines.

Table III.0 in the next page summarizes the categories considered for each cluster and the associated principles.

Table III.0.

Outline of the framework to design a RME course

Category	Principles
1. ANALYSIS	
1.1. Design Principles for the Creation of a Baseline	Level (master / advanced studies) Audience profiling
1.2. Design Principles for Setting Standards for Acceptable Performance	Mapping of concepts and skills Performance objectives Classification of objectives Specification of criteria
2. DESIGN	
2.1. Design Principles for a Research-based Pedagogical Culture	Inquiry practices Data-driven decisions Collaboration Professional development Participation Rigor
2.2. Design Principles for the Definition of the Learning Tasks	Realism Fidelity Variability Scaffolding Support Guidance
2.3. Design Principles for Resources	Quality of text resources Multimedia resources Heuristics information Applications
2.4. Design Principles for Learning Scenarios	Organizational environment Responsibility Narrative Participative design Situated action Reflection and regulation
3. DEVELOPMENT	
3.1. Design Principles for Managing Teaching Practice	Social learning spaces Pedagogies Time and pace
3.2. Design Principles for Articulating Learning Objectives and Themes	Parsimony Alignment Coherence Adaptability Temporal contiguity with other courses Redundancy
4. IMPLEMENTATION	
4.1. Design Principles for Implementation	Students' navigation within the curriculum Personalization for engagement
5. FEEDBACK, ASSESSMENT, & MONITORING	
5.1. Design Principles for Feedback	Meaningful feedback Locating feedback within the learning path Flexible formats of feedback Feedback as constitutive part of learning
5.2. Design Principles for Student' Learning Assessment	Alignment of assessment with standards and criteria Assessment formats Preserving complexity in instrumentation
5.3. Design Principles for Monitoring the RME course	Continuous improvement through monitoring Quality assurance indicators Students' participation in monitoring Effectiveness

III.1. ANALYSIS

Analysis is the first step when conceptualizing a RME unit. It may involve different methodological approaches depending on the detail of the existing knowledge about the intended audience. A basic information is the level of studies: graduate, master, doctoral and post-doctoral studies in education have a different nature. In most cases additional information is needed according to the scope of application of the RME unit, its open or restricted access (which influences the potential variability of the audience at large) and its objectives.

For the cluster **Analysis**, the design principles focus on two categories: Course Baseline and Standards for Acceptable Performance.

III.1.1. Design Principles for the Creation of a Baseline

Knowing the target audience and understanding its profile is important to design learning activities, to define the necessary resources and supportive information, and to decide on specific forms of feedback and monitoring. The principles formulated in this category refer to orientations that should be operationalized according to the level of the RME course and the target audience itself. The focus is on constructing a baseline that serves as a reference to further decisions.

Table III.1.1. presents and describes the principles for creation of a baseline and the associated specific guidelines.

Table III.1.1.

Design Principles for Creation of a Baseline

Principle	Description	Guidelines
Level (beginners/ advanced studies)	The level of training – a well-defined part of the domain of practice where students will be involved – should be clearly defined.	Describe the level of training for the RME course unit and its role in the program study plan and other existing broader training initiatives. Specify the scope and borders of the training level (e.g., what skills are in, out or at the border of the training level). Make explicit possible hierarchies of topics included in the training domain.
Audience profiling	The target audience should be defined in detail to be profiled.	If there is shortage of data, apply a survey instrument to collect data from the target audience (e.g., age, previous practice in RME, cultural background, digital skills, writing skills, expectations, aspirations, etc.). Profile the audience according to dimensions such as previous practice, cultural background, native language, digital skills, writing skills.

III.1.2. Design Principles for Setting Standards for Acceptable Performance

Taking the general information collected about the target audience, the preparation of the design process should start with the definition of objectives and standards for acceptable performance of students.

Standards are useful and necessary to plan both students' learning assessment tasks as well as the activities themselves, locating feedback in appropriate moments. The competences associated to the RME course should be explicitly formulated and mapped according to their hierarchical and/or mutual relations.

Subsequently, the key learning objectives of the RME course should be formulated in line with the identified skills or competences to be developed.

Learning objectives should be addressed from the point of view of students' learning and contain action verbs to characterize the specific aspect of the skill or competence, the conditions for the stated action, the objects and tools used and

standards for acceptable performance. Objectives can be subjected to a process of classification according to their complexity, routine, or non-routine character.

Table III.1.2. below presents and describes a set of principles and the associated guidelines with the purpose of setting-up standards for acceptable performance.

Table III.1.2.

Design Principles for Setting Standards for Acceptable Performance

Principle	Description	Guidelines
Mapping the concepts and skills	A map of the constitutive concepts and skills enabling the competency in RME should be created as it provides an overview of the different relevant aspects to be considered in the course design.	Produce a map of the concepts and skills that constitute the competency in RME. Make explicit the connections between those skills. Make explicit existing hierarchical relations between the skills and sub-skills. Make explicit existing temporal relations between the skills and/or sub-skills.
Specification of performance objectives	Performance objectives for the RME course constitutive skills and concepts should be made explicit and operationalized in actions.	Formulate performance objectives for all constitutive skills and sub-skills. Address objectives to students. Use action verbs. Provide contextual conditions. Refer to objects or artefacts to be acted upon.
Classification of objectives	Objectives may be classified using the main disjunctive categories: non-routine, routine, or fully automated routines.	Classify objectives in one of the categories: — Non-routine, if it requires supportive information; — Routine, if it requires only procedural information.
Specification of criteria	Criteria for standard performance should be specified for each objective.	Define criteria that allow the assessment of students' performance and development. Express criteria according to levels of performance using an even number scale (to feed individualized feedback).

III.2. DESIGN

The design phase includes several interrelated dimensions that should be operationalized in a way that preserves their mutual relationships – both applying the principles linearly when appropriate as well as using the principles and guidelines articulating its several dimensions.

The Design Phase includes three dimensions:

(i) Design principles for a Research-based Pedagogical Culture;

(ii) Design for Learning Tasks;

(iii) Design for Resources and Supportive Information; and

(iv) Design for organizing Learning Scenarios.

III.2.1. Design principles for a Research-based Pedagogical Culture

Research produced by project ReMASE (e.g., Matos et al., 2023) point to the notion that a teaching culture based on research should adopt principles that value the participation of students in research. This approach would entail (i) emphasis on inquiry practices, promoting the use of inquiry-based learning approaches and encouraging students to investigate problem situations and generate working hypotheses as well as forms of addressing them with the proper research tools; (ii) data-driven decisions by the RME teacher (defined in a recursive process), assuming that a research culture should include the use of data to inform teacher's decisions on the pedagogic strategies to use with students and the feedback to monitor students' progress and adjust activities accordingly; (iii) collaboration among teachers and with other researchers to share ideas and create opportunities to learn and practice research; (iv) intentional professional development actions, prioritizing ongoing professional development opportunities informed by research to support teacher growth and continuous improvement; (v) student-centeredness assuming that a research-based pedagogical culture places a strong emphasis on participants' research practices (and thus, on learning), through the design of learning scenarios that are responsive to the needs and interests of learners; and (vi) critical rigor in the analysis and discussion of pieces of research, informed by the relevant literature.

Table III.2.1. in the next page presents the key principles for cultivating a research-based pedagogical culture within a RME course.

Table III.2.1.

Design principles for a Research-based Pedagogical Culture

Principle	Description	Guidelines
Inquiry practices	Inquiry-based learning approaches should inform the general design of the teachers practice.	Encourage students to investigate problem situations and generate working hypotheses. Lead students to problematize situations or phenomena in education and formulate appropriate research problems. Stimulate students to include in the formulation of research problems some sort of strategy to address them in the empirical field.
Data-driven decisions	Teachers' decisions on the design and implementation of the RME should be informed by situated empirical data.	Collect data from the students in order to make decisions about research themes and personal interests. Survey students' competences on research methods and use its analysis to make decisions about level of conceptual development, pedagogic strategies and forms of feedback to monitor students' progress.
Collaboration	Cultivating collaboration among teachers and other researchers creates opportunities to learn and practice research.	Include students in tasks of real research projects. Create opportunities for dialogue and collaborative analysis and discussion with other teachers and researchers.
Professional development	Intentional teacher professional development activities are crucial to sustain a research-based pedagogical culture.	Prioritize activities that intentionally promote RME teachers' professional development. Set-up activities informed by research to support teacher learning and continuous improvement.
Participation	Teachers should assume in full that learning is an integral part of participation in social practices.	Place strong emphasis on the design of students' research practice. Design research practices through learning scenarios that are responsive to the needs and interests of learners.
Rigor	Critical rigor is central in productive analysis and discussion of pieces of research.	Establish a practice of critical rigor informed by the relevant literature. Design for strategies of peer review among students, stimulating critical rigor .

III.2.2. Design principles for Learning Tasks

The definition of the learning activity is one of the most complex parts in designing a RME unit. For the purpose of designing a RME course, learning activity is made of learning tasks. The starting point for the design of learning activities is an analysis of the real-life research practice. Researchers should describe and illustrate the skills or competences and the knowledge to be acquired by students.

Because the context of training is school based (and therefore, not on-the-job or in a immersive research environment), the learning activities should focus on the most relevant issues as well as replicating the variety of the associated real-life situations avoiding blurring the existing differences in practice.

Support should be part of the learning activity and should be designed according to the target audience profile and take the form of examples, completion and reverse tasks, etc. Guidance should be provided by the teachers according to students' needs.

Table III.2.2. below describes the key principles for design of Learning Tasks and provides the associated guidelines.

Table III.2.2.

Design principles for the Definition of Learning Tasks

Principle	Description	Guidelines
Realism	Realistic learning tasks should be taken from the professional research practice as a starting point for the design of learning activity.	Establish clear links of new knowledge and skills to real professional research tasks. Illustrate the whole task before going through the part tasks sequences.
Fidelity	Activity (and its context) should preserve a high degree of fidelity and likelihood to professional research practice.	Preserve the complexity of the tasks as real as possible. Avoid the oversimplification of the tasks.
Variability	Learning tasks should be representative of the variability of the real tasks in professional practice .	Adapt the real task degrees of freedom to the corresponding learning task. Avoid unique representations that unrealistically compress the real-world variation of tasks.
Scaffolding	A scaffolding strategy in the design of tasks provides the adequate degree of support and guidance to students.	Adapt support and guidance to learning making it to decrease as tasks develop and students get more experience. Take into account the location of the RME unit in the study plan to decide about degree of support.
Support	Enough support to students should be provided.	Present illustration of the more complex tasks. Adopt in a systematic way the strategy of asking students to complete partially given solutions to complex tasks.
Guidance	A systematic guiding approach to the key processes of training should be clear in learning tasks.	Clearly show to students the path to be followed in the complex learning tasks as well as the possible options.

III.2.3. Design Principles for Resources

Resources are crucial for students to perform both routine as well as non-routine aspects of learning tasks – especially those which require analysis, search for information, problem solving or decision making. The knowledge provided by resources is relevant when the student seeks for ways to make sense of the task and to identify characteristics of specific aspects of research in education that should be

understood as conceptual, structural, or procedural according to its nature. In a RME course unit, the key resources are research articles and research methods textbooks. However, they have distinct roles: research articles are the representation of research practices, in fact, they reify research and are its outputs. Therefore, the quality of the articles is crucial. Students should gain sensitivity to the criteria of quality of research articles. The analysis of research articles stimulates students to critically compare their own understandings with those of old-timers or researchers whose knowledge is represented in the research reports.

Textbooks represent supportive information and should be available for consultation. This sort of supportive information should be provided by the teacher for consultation and analysis, in order to cover possible gaps between students' skills and the tasks, especially in the case of non-routine tasks.

Because feedback is at the centre of any learning activity, we should consider the role of the resources as sources and instances of feedback mechanisms. The need for this kind of supportive information depends on the level of complexity of the non-routine task involved in the RME course unit; therefore, it is not necessarily shown to the student before the learning task. The control and responsibility to call for supportive information should be at the hands of the student.

Resources should not be restricted to text. All sorts of multimedia resources should be considered for study, exploration, analysis, etc. according to the objectives of the proposed activity.

Table III.2.3. below presents the design Principles for Resources and the correspondent guidelines. The guidelines may be refined and get more granularity depending on the complexity of the task.

Table III.2.3.

Design principles for Resources

Principle	Description	Guidelines
Quality of text resources	The resources (e.g. journal articles) should be carefully selected using quality criteria.	Selection criteria should be clear in selection of articles. Balance between articles in Portuguese and in English. Balance between theoretical and empirical articles. Balance between quantitative-oriented, qualitative- oriented and mixed-methods studies. Priority should be given to the quality of the articles selected.
Multimedia resources	Multimedia objects should be included as learning resources.	Open resources in video should be carefully selected under quality criteria (e.g., TED talks).
Heuristics information	Heuristics and strategic clues should be included in supportive information .	Add systematic approaches to problem solving as supportive information. Include general purpose heuristics as supportive information.
Applications	Digital applications should be included as resources.	Students should be encouraged to explore and use digital applications in writing tasks (e.g., Mendeley). Students should be encouraged to explore and learn how to fruitfully use applications for data analysis (e.g., SPSS, WQDA). Students should be encouraged to explore and learn how to fruitfully use applications based on AI (e.g., ChatGPT).

III.2.4. Design for Learning Scenarios

Scenarios have been used in different domains (e.g., marketing, software development, medicine, game development, economy and others) as structuring resources to plan for the future, thus anticipating situations and producing possible solutions for identified future problems. Constructing and implementing learning scenarios is a key strategy to stimulate reflection while planning teaching activities in RME learning spaces.

A learning scenario is a hypothetical situation of teaching-learning (purely imagined or with real substance, widely changeable) composed of a set of elements that (i) describe the context in which learning takes place, and (ii) structures the environment in which learning will happen. Scenarios stimulate creative ways of thinking; thus they do help people to break out of established ways of addressing situations and problems.

Scenarios are tools for action. As a tool, a learning scenario has structuring elements such as: a) the organizational environment design; b) roles and actors; c) plot line, strategies, actions and activities; and d) reflection and regulation. Matos (2014) points out a set of guidelines for the design of learning scenarios: (i) its construction should involve teachers and allow for students' input, therefore based on the idea of participative design; (ii) they should be based on the context and needs of their users; (iii) they should stem from a dynamic process of experimentation and reflection; (iv) they should give students and teachers challenges that will allow them to develop new habits of thinking and learning; (v) they should provide or indicate resources that can be mobilized in the different phases of the scenario implementation.

Table III.2.4. below shows the key principles and guidelines that inform the Design of Learning Scenarios.

Table III.2.4.

Design principles for Learning Scenarios

Principle	Description	Guidelines
Organizational environment	The organizational environment should be designed according to the specific contextual factors and characteristics.	The physical learning space should be redefined and/or re-arranged if necessary. The virtual learning space should be set-up accordingly to the tasks to be developed and in coherence with the physical space. Institutional rules and norms should be explicitly identified and assumed.
Responsibility	The roles of teachers and students should be clearly defined both assuming correspondent responsibilities.	The teacher acts as the pivot of the learning scenario and ultimately is responsible for all events. Students should be viewed as responsible participants in the tasks and the whole activity of the learning scenario.
Narrative	The specific actions (and its articulation) that teacher and students will perform should be described in general terms.	The teacher should make explicit the prospective scenario in the form of a narrative (written or audiotaped) as a preview of the plot line, strategies, actions and outputs of the learning scenario.
Participative design	The construction of the learning scenario should include the cooperation of students with the teacher.	Students should be called upon to contribute to the design of the learning scenario. Distribution of tasks and timing should be assumed by students from the very beginning of the scenario design.
Situated action	The design of the scenario should be based on the context and needs of students.	The learning scenario should address the needs of the students (e.g., previous knowledge or competences). The teacher should comply with the scientific repertoire coherent with the level of studies (e.g., master, doctoral, post-doc).
Reflection and regulation	Criteria should be defined to stimulate reflection and co-regulation.	The teacher should plan for reflection with the whole group of students as well as with small groups. As part of regulation, strategies of peer-review should be considered in specific parts of the learning scenario activity.

III.3. DEVELOPMENT

Traditionally, the development phase consists of bringing together the parts created in previous steps. However, some decisions about the design are still made during the phase of development because this is when the pedagogies to be implemented are more mature, resources are available and articulations between learning objectives, themes and pedagogic strategies are clearer.

That is why it is crucial to assure the quality of the development phase as it depends on the availability of resources as well as on the quality of the analysis and design made in previous phases. A set of principles is formulated and operationalized in guidelines to assure that the RME course has the characteristics that serve in full the objectives formulated. Those principles refer to two dimensions: managing teaching practice, and articulating objectives and themes.

III.3.1. Design Principles for Managing Teaching Practice

The RME teacher is crucial in leading the group of students participating in the course. The role of the teacher may see variations according to contextual factors that make up the very activity of teaching and learning. However, a set of principles should be taken into account while developing the RME course.

Table 3.1. below presents the principles and the associated guidelines to Manage Teaching Practice.

Table III.3.1.

Design Principles for Managing Teaching Practice

Principle	Description	Guidelines
Social learning spaces	Strategies should focus on creating a social learning space that encapsulates a research-based culture.	Systematically associate activities with reifications of those activities (e.g., oral presentations, leading discussions. Consider participation as the key issue in students' activity. Call for students' engagement in the organization of the RME activities.
Pedagogies	Make evidence-based decisions about the pedagogies to be adopted.	Consider Project-based learning and Problem-based learning as strategies to elect. Get data from the students in order to assess the fitness of the selected pedagogies to the purposes of the RME course and the profile of students.
Time and pace	Time should be considered as a driver of all activities.	Plan for time enough for students to appropriate concepts and processes making it flexible. Adapt to students' own pace. Introduce the students on the relevance of controlling their own working pace.

III.3.2. Design Principles for Articulating Learning Objectives and Themes[1]

The RME syllabus is typically and traditionally constituted of (i) general objectives of the RME, (ii) learning objectives, (iii) themes or contents, (iv) working methods or pedagogies, and (v) forms and instruments of assessment of students' learning.

Learning objectives and themes are closely interrelated: themes are not just items selected to achieve learning objectives, as most of learning objects integrate themselves specific themes.

Articulating learning objectives to themes poses the issue of 'which comes first'. Our view puts learning objectives before themes. The implication of this option is that

[1] Within this framework we consider themes as synonymous of contents, i.e., concepts and processes included in the domain of the RME course.

the selection and articulation of learning objectives and themes must address (i) a parsimony policy on selecting themes, (ii) keeping the coherence of the RME syllabus, (iii) making the articulation adaptable to students' previous knowledge , experience and needs, (v) keeping temporal contiguity with other courses (of the master or doctoral program) that go along with the RME course, and (vi) assume redundancy through a spiral-like roadmap for the themes.

Table III.3.2. below presents the principles and the associated guidelines for Articulating Learning Objectives and Themes.

Table III.3.2.

Design principles to Articulating Learning Objectives with Themes

Principle	Description	Guidelines
Parsimony	The variety and number of the possible themes to be included should be carefully considered.	Clearly define the key concepts and processes to be covered in the RME course. Avoid unnecessary too much detailed themes. Define themes, and their relationships, considering a hyper navigation-based organization.
Alignment	Themes should be selected in alignment with the intended learning objectives.	Choices of themes should be carefully considered in articulation with the stated learning objectives. A dialogical relation between contents/themes and learning objectives should be maintained while constructing the syllabus.
Coherence	Selection of themes must be fully coherent with the learning objectives	In addition to alignment, scientific coherence should be carefully considered while selecting themes
Adaptability	Themes selection should take into consideration the previous knowledge of students	In advance to the definition of contents, survey the students previous knowledge and identify gaps Create milestones (as moments to feedback) to support monitoring of students' progress
Temporal contiguity	Themes and learning objectives should consider the contents and processes of simultaneous unit courses of the program	Plan for timeline to approach themes assuring temporal contiguity with the syllabus of parallel course units
Redundancy	Themes should be selected and organized in order to allow redundancies that help students to appropriate them	Consider with intentionality the value of revisiting the same topic to serve different learning objectives

III.4. IMPLEMENTATION

III.4.1. Design Principles for Implementation

The implementation of the RME course involves a variety of elements – human resources (usually, the teacher), students, learning resources (such as space, technology, etc.).

We emphasize here the importance of taking into account the relationship between the design (mainly defined on the side of the teacher) and the emergent (what if fact happens when the teaching practice starts). The implementation consists of a dynamic process where the teacher uses all their capabilities to conduct students to learning based of pedagogical strategies, resources, working methods, etc. that make things happen. But the practice that we observe in a given RME class is not the consequence of the design but a reaction to the design. Independently of the pedagogies that the teacher decided to follow, the practices that we observe in a RME course implementation are mainly a mix of using "the" plan and a bricolage activity put in place with the input and contribution of the students.

Table III.4.1. below shows the design principles and guidelines for Implementation.

Table III.4.1.

Design principles for Implementation

Principle	Description	Guidelines
Students' navigation within the curriculum	The learning scenario should be understood as an itinerary that where students navigate with a certain degree of freedom.	The structure of the itinerary provided by the teacher should allow to informed choices on the part of the students. Hyper navigation should be encouraged avoiding linearity both in themes as well as in learning objectives.
Personalization for engagement	Personalization within the course activities is key to foster students' engagement.	Strategies for students' engagement should be based on personalization capturing their appropriated learning objectives.

III.5. FEEDBACK, ASSESSMENT AND MONITORING

While designing a RME course, teachers should consider two dimensions in the general domain of evaluation: a) students' learning assessment and feedback – an internal dimension that is related to the inner activities that the teacher develops with their students, and b) quality assurance of the RME course – related to a dimension of accountability towards the organizational structure where the RME course is delivered.

For this framework, the dimensions of feedback and assessment refer to the students, and monitoring is referred to the department that runs the program where the RME is located. The relations between the monitoring and evaluation of a RME course to the institutional structure where the academic program operates, would deserve more attention and development, however it is not within the scope of this framework.

III.5.1. Design Principles for Feedback

Feedback is an essential part of the work of the RME teacher. In fact, it is the key possibility available for the teacher to adjust students' understanding of many complex concepts involved in learning research methods. Whatever is the pedagogical approach that the teacher takes to work with students (e.g., project-based learning, problem-based learning, flipped classroom) the teacher should plan the time and space to provide feedback to students as part of the learning process.

Within a learning scenario designed to address a given set of objectives and related themes, the teacher should create milestones that mark the rhythm and serve as flags that announce proper moments and forms of feedback. For example, the feedback strategy may use a peer-review approach involving the students in reflection and placing them as 'external' evaluators of the products of their peers. Or the feedback process may take the form of audiotaped comments that the teacher offers to each student, timely providing detailed recommendations and appreciation of their work.

On Table III.5.1. we indicate a set of design principles and guidelines for Feedback aiming to suggest lines of development that the teacher may follow to include feedback in specific learning scenarios.

Table III.5.1.

Design principles for Feedback

Principle	Description	Guidelines
Meaningful feedback	Meaningful feedback improves significant learning.	Provide clear feedback to students. Design feedback sentences carefully in order to fit your purposes. Avoid directly mixing feedback with assessment marks.
Locating feedback within the learning path	Situated feedback provides opportunities to learning.	Define clearly in the learning scenario the moments and space to provide timely feedback Add feedforward to help students to locate themselves in their learning path
Flexible formats of feedback	Feedback may take different forms of representation according to the situations and objectives.	Use differentiate forms of feedback according to the learning objectives and the learning activity. Adjust forms of providing feedback to the time dedicated to the task (e.g., audiotaped feedback, written feedback, collective feedback).
Feedback as constitutive part of learning	Feedback is a constitutive part of learning in all situations.	Consider carefully the students' comments to the feedback provided to them. Include feedback as part of the research culture to be cultivated within the group of students.

III.5.2. Design Principles for Students' Learning Assessment

Assessment of students' learning represents the more visible outcome at the end of any RME course although it is generally recognized that final marks to not represent in full the 'whole story'. In a sense, assessment at the end of a course is a reification of processes of feedback that are themselves much richer than the final mark.

However, in most courses it is mandatory that the teacher classifies the students according to their performance against the learning objectives. In fact, a classification in whatever scale is a process of ranking the students and categorize them according to institutional criteria. The issue is: how can the teacher accommodate the institutional academic regulations on assessment without escaping the high-level learning objectives – such as developing a culture of research, creating habits of interrogation in education, taking a critical stance over problems, etc.? The answers to this question are on the hands of teachers who can – within the institutional limits and according to the ethical

principles that drive education – use the degrees of freedom that higher education institutions traditionally provide to academics.

Table III.5.2. presents a set of design principles for Students' Learning Assessment regarding the issues of aligning assessment with activities, formats of assessment and instruments. The importance of the topic would deserve a proper detailed framework but here it is restricted to the essential. Teachers are encouraged to explore other frameworks specifically dedicated to assessment in higher education.

Table III.5.2.

Design principles for Students' Learning Assessment

Principle	Description	Guidelines
Alignment of assessment with standards and criteria	Assessment should be aligned with activities, standards and criteria.	Align forms of assessment with the standards of the RME course. Define clearly the criteria to be used for learning assessment purposes in articulation with learning objectives and standards.
Assessment formats	Assessment may take different forms of delivery and representation according to the situations and learning objectives.	Use diversified formats of assessment adjusting them to the RME course purposes and learning objectives. Combine assessment in specific learning objectives with a holistic perspective of the learning.
Preserving complexity in instrumentation	Instruments for assessment students' learning should preserve to the most the complexity of the process.	Avoid the over-simplification of the assessment process through instruments that do not cover properly the several dimensions of assessment. Resist to over-simplify the learning objectives in order to make them evaluable through a given instrument.

III.5.3. Design Principles for Monitoring of the RME course

As in any course, teaching RME is not a linear task where the teacher follows a prescribed path. No form of education is independent of the audience. Therefore, monitoring the implementation of a RME course should be part of the teacher tasks. The outputs of monitoring processes are the background for decisions to review any dimension of a RME course implementation (e.g., revising learning objectives,

specifying topics to be addressed, changing forms of feedback, etc.) aiming to improve the quality of learning and the effectiveness of the academic program.

However teachers of RME courses recognize that implementing monitoring processes is very time-consuming and hard to accomplish with good quality, teachers recognize that it is worth the effort.

For the purpose of this framework, the categories for design guidelines are restricted to continuous improvement of the RME course, indicators for quality assurance, the role of students in the monitoring processes and the effectiveness of the whole monitoring actions.

Table III.5.3. below presents a summary of key principles and guidelines for Monitoring RME Courses.

Table III.5.3.

Design principles for Monitoring RME courses

Principle	Description	Guidelines
Continuous improvement through monitoring	Monitoring should not be viewed as a static one-time event but rather as dynamic process that includes reflection and adjustment.	Use data and feedback from students to identify areas of improvement (e.g. using regular surveys, focus-groups). Assure that monitoring processes are adaptive and responsive to changing circumstances.
Quality assurance indicators	Quality assurance indicators are essential to monitor the RME course development and should be considered as the course is designed.	Define clearly the indicators assuring that it is feasible to get them. Make sure that different dimensions of monitoring are represented in the indicators' structure.
Students' participation in monitoring	Involving students in the definition of monitoring processes would add relevance to the process.	Include students in co-designing the monitoring strategy to be used in the RME course.
Effectiveness	Monitoring the effectiveness of the RME course in achieving its objectives would benefit its improvement.	Consider process evaluation and monitoring to assess efficiency and effectiveness of the RME course. Consider using outcome-based monitoring to track progress towards achieving learning objectives of the RME course.

Concluding remarks

The framework just presented is based on the research developed within the Project ReMASE taking into account both (a) the literature review as well as (b) the empirical results obtained from (i) the analysis of the curricula and the syllabus of all the RME courses included in master and doctoral programs in Portugal, (ii) the survey questionnaire applied to all the teachers in the country involved in teaching research methods in education, and (iii) the focus group interviews with a sample of teachers selected among those who answered the questionnaire.

Certainly, not all the dimensions of the issue of teaching research methods in advanced studies in education were covered at the same level of detail. For example, issues related to assessment and supervision of students were not researched although they are part of the problem of teaching research methods.

In fact, Project ReMASE focused only on the analysis of the curricula and syllabus and on the views of teachers. At the moment this framework is delivered, a follow-up research project is being designed to address the students' views and the practices of teaching research methods in higher education institutions with special attention to master and doctoral programs.

Therefore, even if it is recognized that this framework presents limitations in its scope, it represents a step towards a more consolidated orientation document for the design of RME courses that the research team expects to have in print by the end of 2026.

All comments and criticisms to the present framework are welcome and in fact are crucial to create a culture of research in the very topic of teaching research methods in advanced studies in education.

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