



Research paper

Personalized learning strategies for considering students' interests

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ABSTRACT

Personalized learning is an approach to teaching that focuses on fostering students' sense-making and engagement in school. A key strategy within this approach is the consideration of students' interests in the design and implementation of learning activities. This qualitative study explores how a primary school teacher in Spain incorporates students' interests into a project-based educational practice. Drawing on a sociocultural perspective of interest and using a single case study design, we analyzed 31 classroom events and identified five teaching strategies for incorporating and transforming students' interests: Spark, Explore, Center, Deepen, and Evaluate. These strategies illustrate a sequential process through which interests are elicited, shared, refined, and transformed to support meaningful learning experiences connected to the curriculum. Our findings offer a typology of teaching strategies with specific actions for incorporating students' interests, highlighting teacher intentionality, the connection to inquiry-oriented projects, and the importance of reflection on personal learning interests.

1. Introduction

One of the main current challenges of education systems is to foster and sustain students' engagement with academic content and school tasks (Reber et al., 2018). Children have increasing access to a broad range of out-of-school activities which offer learning experiences that align with their interests and provide them with satisfaction (Barron, 2006; Fredricks, 2011). By contrast, formal education often fails to establish such meaningful connections, thereby accentuating the growing divide between school learning and students' everyday lives (Kumpulainen, 2014). This disconnect has important implications: when school activities are perceived as lacking personal value or relevance, students tend to show lower interest and a higher risk of disengagement (Harackiewicz & Priniski, 2018; Oller & Fauré, 2025), a problem that has been widely documented in international studies (Gallup, 2016; Patall et al., 2024).

In response to this situation, various researchers and professionals have highlighted the need to incorporate students' voices into classroom practice (Conner et al., 2025). One pedagogical approach that aims to address this concern is known as *personalized learning* or *the personalization of school learning* (Bernacki et al., 2021; Bray & McClaskey, 2014; Coll, 2018a; Ramos & Engel, 2023). Personalized learning involves a set of instructional strategies oriented towards fostering students' sense-making and personal valuing of school learning by taking into

account their expectations, goals, and interests (Coll, 2018a). Rooted in learner-centered pedagogies, this approach considers learners' prior experiences, personal characteristics, and specific learning needs. However, it goes a step further by explicitly recognizing students' interests and goals, as well as their capacity to make decisions regarding certain aspects of their own learning process (Bray & McClaskey, 2014; Coll, 2018a). Thus, personalization necessarily involves integrating the learner's perspective into teaching and learning processes (Downes, 2015).

Within this framework, Coll (2018a, 2018b) has proposed a set of personalization strategies designed to support students' sense-making by linking school learning with aspects that are personally meaningful. According to Coll (2018a), the most valuable learning experiences allow learners to make sense of their immediate context, their past, and themselves, while enabling them to project into the future and act upon the world. Similarly, Priniski et al. (2018) distinguish three types of connections between learning content and personal relevance: associations with prior knowledge, perceived utility, and alignment with students' interests and passions. Therefore, considering students' interests and learning goals and linking them with the school curriculum is regarded as a central personalized learning strategy (Solari et al., 2023).

Despite the potential of personalized learning strategies to foster meaningful learning and reduce the risk of disengagement, existing frameworks (e.g., Bray & McClaskey, 2014; Coll, 2018a) offer limited

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guidance on specific teaching strategies in everyday practices (Gunawardena et al., 2024). In particular, there is a lack of detailed approaches that: (a) provide empirical evidence of how and why teachers can incorporate students' interests, (b) do so from a contextual and dynamic perspective of interest, consistent with a constructivist and sociocultural framework, and (c) focus specifically on primary education. Moreover, few studies offer in-depth qualitative evidence from real classroom practices, which limits our understanding of how these strategies are enacted in everyday educational settings. The present study seeks to address this gap by examining how teaching strategies that consider students' interests can be effectively integrated into primary school curricula, contributing to both theoretical knowledge and practical applications in the field of personalized learning and interest development.

In the next section, we present the conceptualization of interest underlying our approach to personalized learning and review studies that have identified specific teaching strategies related to students' interest, before outlining the research objectives of the present study.

2. Theoretical framework

2.1. Understanding interests from a sociocultural perspective

From various perspectives, researchers have clearly demonstrated the positive relationship between students' interest and their levels of attention and engagement in school learning (Beek et al., 2024; Wild, 2023). However, how can teachers implement personalized learning strategies aimed at incorporating students' learning interests? Conceptualizing the notion of interest with specific ontological and theoretical principles shapes the way students' interests are integrated into the classroom (Solari et al., 2023). Therefore, when investigating how this personalization strategy can be concretized, it is crucial to make explicit how the phenomenon of interest is understood.

Interest can broadly be defined as a psychological state of preference toward an object—whether physical or psychological—that generates satisfaction and predisposes the individual to engage with it in a relatively enduring manner (Akkerman & Bakker, 2019; Beek et al., 2024; DiGiacomo et al., 2018). Interest encompasses an affective dimension associated with the positive attitudes and emotions that accompany engagement; a cognitive dimension, related to representations of the domain of the object of interest; and a behavioral dimension, connected to agency and individuals' actions (Ainley, 2006; Hidi & Renninger, 2006). Although this definition is widely shared in the literature on the subject, some discrepancies exist regarding three main axes: its origin, its scope, and its stability (Solari et al., 2023).

2.1.1. Origin of interests

Traditionally, interests have been conceptualized as a predominantly individual and internal mental process, derived from personal cognitive factors or even biological and evolutionary aspects. Within these frameworks, interest is viewed as a natural predisposition toward certain stimuli or activities, related to information processing, curiosity, and individual motivation (Hidi & Renninger, 2006; Krapp, 2007). However, more recent approaches have emphasized the role of contextual or external factors in the origin and development of interests (Slot et al., 2020). These perspectives aim to overcome biological reductionism and recognize that interests originate through participation in situated social practices within a network of relationships and interactions with other people and cultural artifacts (Azevedo, 2011). Thus, the material conditions of a specific historical-cultural moment shape a structure of practice (Dreier, 2009), with particular opportunities and limitations for participation that mediate the formation and maintenance of new interests.

Nevertheless, this does not disregard the personal nature of the phenomenon of being interested. The opportunities and limitations within the structure of practice are mediated by the subjectivity and

agency of the individual (Membrive et al., 2022). From a Vygotskian perspective, experiencing a reality is more than a mere translation of external or objective conditions into the psyche of the subject; it is an intersection between the situation and the individual (Vygotsky, 1994/1934; Veresov, 2016). Within this framework, interest is situated in the subjective experience, where both contextual and personal characteristics are intertwined. Ultimately, interest has an origin that is both social and contextual, while also being personal and experiential, due to the interpsychological nature of individuals' interactions in collective practices.

2.1.2. Scope of interests

Regarding the scope of interests, the scientific literature has primarily focused on studies where the object of interest corresponds to specific topics. However, interest is not limited solely to a particular subject but can extend to broader domains that encompass themes and ideas, as well as tasks, events, activities, and social practices (Akkerman & Bakker, 2019; Hecht et al., 2019; Slot et al., 2020). In this regard, Renninger and Hidi (2016) suggest that interest can fluctuate between specific (e.g., being interested in plant care) and general (e.g., having an interest in nature as a whole).

In turn, Solari et al. (2023) categorize the scope of interests into three levels: topic-centered, domain-centered, and practice-centered. A topic-centered interest is one that is restricted to a specific subject. For example, an individual may be interested in the books of a particular series, the plot, characters, or specific development of the story. However, this interest can also expand into a broader domain-centered interest, such as interest in the fantasy literature genre, which would involve exploring other authors or related genres. Finally, the interest may encompass associated social practices, such as interaction with other people and artifacts. Continuing with the example, a person might not only be interested in a literary series or the fantasy genre, but also in being part of a fan community, creating content such as fanfiction, engaging in cosplaying, or exchanging ideas and theories on social media. Similarly, interest could focus on more transversal motives, such as interacting and having fun with others (even with specific people), engaging in creative activities, or seeking new learning experiences.

Moreover, interests have often been conceived within the boundaries of the themes, areas, and practices associated with academic disciplines studied in school. However, it is important to recognize that interests are not limited to academic objects but include topics, domains, and practices linked to broader trajectories of participation and learning throughout life (Membrive et al., 2022).

2.1.3. Stability of interests

The final point of debate in the field concerns the static versus dynamic nature of interests. The first position aligns with theories that conceptualize interest as an individual, internal construct with a strong biological component. In contrast, in terms of approaches that emphasize the social component, it can be argued that interests transform, evolve, and even disappear over time, depending on contextual support and obstacles to their maintenance (Azevedo, 2017; Hecht et al., 2019).

Among these proposals, one of the most prominent is Hidi and Renninger's (2006) four-phase model of interest development, which posits that interest evolves from a situational, context-dependent state to a more enduring commitment. In the first phase, the triggered situational interest is activated by environmental stimuli and is characterized by momentary attention to the content. In the second phase, situational interest is sustained as the individual begins to develop a deeper understanding of the content. As the individual delves further into the learning associated with a particular interest, a predisposition to continue engaging with the subject begins to form, leading to the emergence of individual interest, where the individual actively seeks more information and forms a more autonomous relationship with the content. Finally, in the fourth phase, interest becomes well-developed, with the individual engaging autonomously and persistently,

integrating the content into their life and demonstrating a positive attitude even in the face of challenges (Hidi & Renninger, 2006; Renninger & Hidi, 2016). Thus, the model not only highlights the existence of both fleeting and relatively stable interests, but also outlines dynamics that explain how they transform and how one can progress from one to another.

2.2. Considering and reshaping interests in the classroom

Thus far, we have portrayed interest as an experiential phenomenon that is both personal and social, with objects of interest fluctuating between specific topics and broader practices, and evolving and transforming over time. From this conceptualization, it follows that considering students' interests in the classroom is more than simply asking what students already find interesting. Considering students' interests in the classroom requires recognizing the teacher's ability to transform those interests into an object of educational influence. Several studies propose teaching strategies that contribute to this goal.

For example, Reber et al. (2018) have focused on personalized learning strategies aimed at promoting situational interests. Specifically, they highlight three types of intervention. The first involves context personalization, that is, incorporating information about students and their preferences into the content explanations and learning activities. The second is providing choice, which involves allowing students to choose between different options, whether or not they are directly relevant to the specific content of the task. The third is active personalization, whereby students themselves connect the learning materials with their preferences and aspirations.

Belland et al. (2013), for their part, propose an intervention to scaffold students' motivation. This includes three strategies to foster interest and increase the value of a learning task. First, they suggest that students choose an aspect of the problem under consideration that aligns with their individual interests. Second, they recommend that teachers use language that aligns with the everyday experiences of the learners when it comes to describing tasks and content. Finally, they propose incorporating guiding questions that spark curiosity and whose answers require exploring the study material.

On the other hand, Harackiewicz et al. (2016) identify four types of educational interventions that can enhance interest. First, creating environments that capture attention through activities incorporating structural features such as novelty, complexity, surprise, or incongruity in visual stimuli. Second, personalizing the context to connect academic content with students' interests, whether through superficial references (such as mentioning a favorite movie) or by establishing deeper connections to their hobbies and personal experiences. Third, designing learning activities that involve solving complex problems which evolve progressively and encourage students to ask new questions throughout the process. Finally, using strategies that highlight the relevance of the content, demonstrating how the task can be useful or meaningful for the students' future goals.

A final example of teaching strategies is the support proposed by Hidi and Renninger (2006) and Renninger and Hidi (2019), compiled and organized in the work of Skalsstad and Munkebye (2022). In this context, teacher interventions are proposed in such a way as to develop student interest from the first to the fourth phase of their model. To trigger situational interest, the teacher can encourage peer support, create engaging instructional designs, propose surprising and challenging tasks, connect with students' prior interests, or make the value of the task explicit. Some of these interventions can also be used to sustain situational interest, offering opportunities to re-engage with the content, deepen and expand knowledge, and place value on the content beyond the task itself. When interest becomes more individual, the teacher can offer challenging experiences and opportunities for external support from peers and experts. Finally, when individual interest is well developed, these supports are maintained, and students are allowed to explore and formulate their own questions, with time and autonomy

when it comes to seeking answers.

Research on teaching strategies grounded in a view of interest as outlined here is still in its early stages. Although some strategies have been proposed to promote the generation and maintenance of interest, they rarely form part of a coherent, intentional design of personalized learning practices centered on students' interests (Reber et al., 2018; Harackiewicz & Priniski, 2018). There is still limited fine-grained evidence on how teachers concretely work with students' interests in everyday classroom interaction, and on how such work can be described as a set of interrelated teaching strategies. This study directly addresses these gaps as we aim to observe an educational practice implemented within the framework of an institutional project for personalized learning. Specifically, our research objectives were:

- To identify the educational supports provided by the teacher that aim to consider and/or develop students' interests.
- To analyze these educational supports in terms of their objectives, the activities involved, and their characteristics.
- To propose a categorization of these supports as teaching strategies, facilitating both the analysis of such educational actions and the design and implementation of personalized learning initiatives focused on students' interests.

3. Method

In this study, we have developed a single case study which allows us to investigate the behaviors of both the teacher and the students in the natural context in which they occur, and take into account their dynamic and changing nature. Specifically, it is an instrumental and intrinsic case (Stake, 1994; Yin, 2018). It is instrumental because we are interested in studying the situation in depth to advance a deeper conceptualization of the implementation of certain personalized learning strategies. It is intrinsic because the case itself holds intrinsic value for us, as it constitutes a unique educational practice that, a priori, contains all the elements we wish to study. This single-case study aims to explore how these personalized learning strategies are designed and implemented in practice and to contribute to an analytically grounded typology that may inform future research and practice.

3.1. Context and participants

We selected a public primary school recognized for its track record of educational innovation focused on personalized learning. The school is located in a medium-sized town near Barcelona, and the families are from middle-to-upper socioeconomic backgrounds. Within this framework, we chose a complete instructional sequence, including objectives, content, teaching and learning activities, and assessment activities, implemented during the 2022-2023 academic year.

The instructional sequence is called *Inquiry*, with the goal of considering students' interests, and it follows a project-based learning approach. A total of 50 fifth-grade students participated, along with three teachers, and three different projects were carried out. For our study, we selected one of the projects, led by Luis, a teacher identified by the school leadership as experienced in implementing personalized learning strategies, particularly in terms of considering students' interests. Luis has five years of teaching experience and has been working at the primary school under study for the past four years. The project involved 18 students, 9 boys and 9 girls, aged between 10 and 11. The project was conducted over 20 sessions, each lasting between 1.5 and 3.5 h. Throughout this period, the project was organized into four distinct phases.

Phase 1, Shake and Generate (3 sessions), began after the three 5th-grade groups participated in an assessment to evaluate their understanding of natural science concepts. Following the test, students and teachers came together to reflect on the topics covered, the questions the test had sparked, and what areas they were curious to explore further.

The teachers took note of the students' reflections and later met to review their questions. From this collection, they selected three inquiries, reformulated them to align with curriculum goals, and decided which teacher would lead which project. In the next session, the three selected inquiries were presented to the students: a) *What are the differences between human reproduction and animal reproduction?*, b) *How is weather predicted and how do meteorological phenomena form?*, and c) *Do we eat what we need?* After this presentation, students returned to their classrooms with their reference teachers to choose the Inquiry they would work on. This marked the moment of reasoned choice, when students were asked to justify their selection and reflect—individually and collectively—on their own interests, preferences, and those of their peers.

Phase 2, Investigation (8 sessions), began once the student groups for each Inquiry were formed. For this study, we focused on the Inquiry entitled *What are the differences between human reproduction and animal reproduction?*, involving Luis and 18 students (9 boys and 9 girls). At the start of this phase, Luis explored the students' prior knowledge of the topic and the questions they had about it. Drawing on this initial discussion, the group worked together to refine the research question and decide what they wanted to investigate. As different interests emerged among the students, Luis organized them into three subgroups, each focusing on a specific theme: genetics, animal reproduction, or human reproduction.

Phase 3, Communication (7 sessions), focused on the preparation and presentation of each subgroup's findings. Each team developed a visual presentation to communicate the topic they had explored and presented it to the rest of the class. In addition, the teacher proposed the construction of a rubric to assess the group work. Together, the class agreed on the assessment dimensions and the levels of expertise for each one. Once the rubric was finalized, the presentations were delivered, with the teacher intervening when necessary to clarify and reinforce key learning points. Finally, the students applied the rubric to evaluate both their peers' presentations and their own.

Phase 4, Evidence (2 sessions), began with the writing of a reflective text in which students reviewed the development of the project and the learning they had achieved. Following this, the group discussed what kind of products they could create to showcase what they had learned. For instance, one group decided to build a model of a cell, another created a poster illustrating the gestation periods of different animals, and a third developed an infographic about different contraceptive methods.

3.2. Data collection

Data collection began with an interview with the teacher, Luis, aimed at understanding the design of the Inquiry, his expectations regarding its development, and the anticipated student learning outcomes. Throughout the implementation of the project, we video-recorded 17 sessions. In order to obtain more contextual information, a narrative record of each session was also made, and all the documents and materials used or elaborated by the participants were collected. We also attended the coordination meetings held by the three teachers involved in the Inquiries. All this information was used as the main data corpus for the study.

Prior to data collection, all students and the teacher were informed of the research objectives and the implications of their participation. As the students were minors, consent forms were signed by their parents or legal guardians, as well as by the teacher, and students also assented to participate, with the option to withdraw from the study at any time. Throughout the data collection process, we adhered to the ethical principles and guidelines promoted by the Bioethics Commission of the University of Barcelona (CBUB) and the University of Barcelona's Code of Integrity in Research, ensuring participant anonymity, data confidentiality, and full respect for human rights. All data were stored securely, anonymized for analysis, and accessed only by members of the

research team. Data collection concluded with a follow-up interview with Luis, aimed at gathering his reflections on the development of the Inquiry.

Table 1 provides an overview of the data sources, including the type and amount of data collected and the use made of the analyzed information (to understand the context of the educational practice, to describe the design of the educational practice, or to identify and categorize the educational supports).

3.3. Analysis dimensions and procedure

As summarized in Table 1, the different data sources played complementary roles in reconstructing the Inquiry and identifying educational supports related to students' interests. In a first phase, organizational documents, student-produced artifacts, audio recording and narrative records of 5th-grade teachers' meetings, and teacher interviews were analyzed to understand the institutional context and to describe the design and implementation of the educational practice. Building on this contextual and descriptive work, the second phase focused on the analysis of classroom interaction using a technique known as *analysis of joint activity* (Clarà et al., 2019; Mauri et al., 2017; Onrubia et al., 2022), which aims to identify the interactivity segments constituting each session. Interactivity segments are defined as fragments of the joint activity during a session that maintain both a relatively stable thematic focus or content and a stable participation structure, that is, a set of rules for social and task participation for teachers and students (Erickson & Schultz, 1997). Each session can therefore comprise one or more interactivity segments, which may vary in type depending on their thematic focus and participation structure.

An inductive–deductive procedure was applied to identify and characterize these segments, involving the following steps.

Table 1
Sources of information, type and number of evidence collected, and analytical use.

Source	Type of information -quantity-	Analytical use
Teacher	Organizational documents for the practice design –3–	Describing the design of the educational practice
	Documents and materials used in the classroom –14–	Identifying and categorizing educational supports
	Initial interview with regard to the Inquiry design and expectations for development and learning –1– <i>Transcription</i>	Describing the design of the educational practice Identifying and categorizing educational supports
5th-grade Teachers	Final evaluation interview with regard to the learning outcomes of the Inquiry and the consideration of students' interests –1– <i>Transcription</i>	Describing the design of the educational practice Identifying and categorizing educational supports
	Audio recording of the 5th-grade teachers' coordination meetings –3 (4.5 h)–	Understanding contextual information
	Narrative records and field notes from the 5th-grade teachers' coordination meetings –3–	Understanding contextual information
Teacher and students	Video recordings of classroom observations –17 (34.5 h)– <i>Transcription</i>	Identifying and categorizing educational supports
	Narrative records and field notes from classroom observations –17–	Identifying and categorizing educational supports
	Images from various moments during classroom observations –17–	Identifying and categorizing educational supports
Students	Documents produced by students –5 different product types–	Understanding contextual information

1. Review and description of project activities. We examined images, documents produced by teachers and students, narrative records, and video recordings to obtain an overall picture of the Inquiry and to inductively describe the sequence of activities.
2. Identification of interactivity segments. Using the joint activity framework, each observed session was segmented based on changes in thematic focus and participation structure, applying predominantly deductive coding criteria derived from previous research (Clarà et al., 2019; Mauri et al., 2017).
3. Coding of segments related to students' interests. Segments in which students' learning interests were explicitly or implicitly addressed were coded using a category system (Table 2). The initial categories were developed deductively from the theoretical framework (e.g., types of learning activity, scope of interest) and refined inductively through successive coding rounds, during which new categories were added and some labels adjusted.
4. Timeline elaboration. The coded segments were mapped across the phases and sessions of the Inquiry to visualize when and how work with students' interests occurred over time (see Table 3).
5. Construction of a typology of strategies. Finally, drawing on the coded segments and their distribution throughout the project, a typology of teaching strategies for personalized learning related to students' interests was constructed.

Table 2
Category system for interactivity segments.

Dimension	category	
Types of learning activity	identifying learning interests exploring what students are interested in learning expressing learning interests opening the conversation to learning interests comparing learning interests identifying shared interests reflecting on the relevance of learning interests refining broad interests into more specific learning interests providing information sources related to learning interests deepening students' own learning interests linking learning interests to curriculum content promoting reflection on learning interests	
Social organization of the activity	individual pairs small groups whole class	
Tools and procedures	type	guidelines
		instructions
		texts
		explanations
		audiovisual
		materials
		narratives
		oral
		written
		hybrid
Object of interest: scope and context of reference	scope	topic
		domain
		practice
		academic
		outside school
		general
Temporality	beginning intermediate end	

Table 3
Map of interactivity segments.

Phase	Session	Event	Description of the event	Strategy
Shake and generate	S1	-	No events	-
	S2	E1	Sharing ideas and refining questions	Spark
	S3	E2	Thinking about what they are interested in learning about from three topics	Explore
Investigation		E3	Justifying why a specific topic interests them	Explore
	S4	E4	Exploring prior knowledge and reasons for topic choice	Explore
		E5	Presentation of engaging multimedia content	Center
		E6	Exploring prior knowledge and reasons for topic choice	Explore
	S5	E7	Refining questions: what do we want to go deeper into?	Center
		E8	Refining questions and content presentation	Center
	S6	E9	Exploring topics they want to go deeper into	Center
		E10	Pair work with readings related to the Inquiry	Center
	S7	E11	Correcting and extracting information from texts	Deepen
		E12	Sharing hypotheses about the learning content	Deepen
		E13	Content presentation by the teacher	Deepen
	S8	E14	Choosing subtopics and forming subgroups	Center
		E15	Defining differentiated content and planning	Center
	S9	E16	Searching for information related to their questions	Deepen
Communication		E17	Searching for information related to their questions	Deepen
	S10	E18	Searching for information related to their questions	Deepen
	S11	E19	Sharing what each group has been working on	Deepen
		E20	Tutor meets with small groups	Deepen
	S12	E21	Tutor meets with small groups	Deepen
	S13	E22	Supervised independent work	Deepen
	S14	-	No events	-
	S15	E23	Group presentations	Deepen
	S16	E24	Group presentations	Deepen
	S17	E25	Group presentations	Deepen
Evidence	S18	E26	Reflecting on whether their interest has been satisfied	Evaluate
	S19	E27	Discussion about the construction of products and the exhibition	Deepen
		E28	Writing reflective texts	Evaluate
	S20	E29	Reading reflective texts	Evaluate
		E30	Presentation of reflective texts	Evaluate
		E31	Preparing presentations to share with peers from other projects	Deepen

Throughout this process, coding and category refinement were carried out collaboratively by the three authors through iterative discussion and consensus, in order to strengthen the credibility of the analysis. Table 2 presents the category system used to characterize the segments in which students' interests were considered.

In the analyzed practice, we identified 31 interactivity segments aimed at generating and developing students' interests; in the following, we refer to these segments as *events* for the sake of clarity. After examining their characteristics using the category system, we grouped the 31 events into five types of teaching strategies based on shared patterns in their aims, activities and position within the Inquiry. Each event was independently assigned by two researchers to one strategy, following a categorization process based on specific operational criteria defined for

each strategy. To ensure the reliability of this classification, interrater agreement was calculated using Cohen's kappa, which yielded a value of .80, indicating good agreement between raters (Altman, 1991); discrepancies were resolved through discussion with a third researcher until full consensus was reached.

In line with qualitative research principles, reflexivity was considered an important element throughout the study. We adopted a critical and self-aware stance regarding our role as researchers, acknowledging that our experiences, pedagogical beliefs, and epistemological positions could influence methodological decisions and interpretations. To address this, the analysis involved ongoing discussion and comparison of interpretations among the three authors, allowing us to examine assumptions critically and refine analytic decisions. In addition, we sought to enhance transparency by providing detailed descriptions of the context, data sources, and analytic procedures.

4. Results

Based on the analysis, the five strategies proposed are: a) spark interests, b) explore interests, c) center interests, d) deepen interests, and e) evaluate interests. Table 3 presents the event map, which relates the phases and sessions of the Inquiry to the events, their descriptions, and the strategies to which they belong.

We present below the five identified strategies, characterized according to the proposed dimensions of analysis.

4.1. Spark interest

With this strategy, teachers aim to spark students' learning interests by exposing them to experiences that are relevant within their context. The goal is to broaden the scope of the conversation towards potential topics that might interest them, inviting them to reflect on what aspects they would like to learn about, in order to trigger a wide range of potential learning interests.

In the events oriented towards sparking interest, teaching and learning activities focus, first, on presenting students with one or more practical situations, activities, or initiatives that are culturally and socially relevant. Second, they aim to provide students with specific support to help them identify and express their learning interests. In the case studied, the teaching team decided that the starting point of the Inquiry would be the students' recent participation in the regional natural sciences competency tests.

As for the social organization of the activity, a combination of small-group and whole-class work is used. We observed that this strategy begins with the students exploring their interests in small groups, followed by a phase of sharing, discussion, and reflection with the whole class on the questions and interests that emerged in the small groups.

Regarding the tools and procedures used to implement the strategy, we mainly observed the use of evaluation booklets containing questions and problems, along with verbal instructions from the teacher. Teacher-led explanations and discussions were essential in guiding this process. In addition, the teacher used a whiteboard to project students' contributions. Overall, a combination of oral and written elements was employed to support students in expressing and gathering emerging learning interests.

Furthermore, we found that the object of interest in these events is thematic and primarily focused on interests related to curricular content linked to the natural sciences tests. The topics that emerged were specifically related to nutrition, human and animal reproduction, genetics, molecules, and states of matter, all of which are directly connected to the content addressed during the test preparation process. However, the teaching team also encouraged students not only to articulate interests directly related to this experience, but also to present personal interests originating from outside the classroom context.

Finally, in terms of temporality, this strategy is carried out during the first sessions of the teaching sequence, corresponding to the initial

'Shake and Generate' phase. It is at the start of the Inquiry, given that the intention is to awaken students' interests and lay the foundation for the subsequent development of the learning project.

4.2. Explore interests

The objective of this strategy is to identify the learning interests students have regarding a specific topic, domain, or social practice in a broad sense. The aim is to open up possibilities for topics of interest to work on, based on the experiences lived in previous sessions.

In the observed practice, the teacher encourages students to think about what they are interested in learning regarding three major topics that emerged in the previous session, insisting that they not only consider the present but also what they might need to know in the future. Based on this strategy, the teacher designs activities for students to explain why they are interested in these topics and to help them explore their prior knowledge on the subject.

Regarding the social organization of the activity, there were moments of whole-group work when students share with the whole class what they would like to learn. There were also individual work moments when students justified their choices in writing through argumentative texts. Finally, there were more whole-group moments when each student shared their written arguments with the rest of the class.

The tools and procedures used in this strategy include the use of the whiteboard as a visual support for the learning interests proposed by the students. At certain moments, the teacher asks students for help in writing ideas on the board, while he also records ideas in a PowerPoint presentation. Additionally, students are given guidance on how to write the argumentative text in such a way as to justify their choices.

The main object of interest, similar to the previous strategy, is topic-centered or domain-centered and primarily focuses on academic topics that have emerged from the students' participation in the experiences prepared by the teacher. When the teacher notices that the students are drifting towards other topics, he intervenes and helps reorient the conversation towards the curricular themes.

In terms of timing, the *Explore* strategy primarily takes place at the beginning of the Inquiry. More specifically, it occurs at the end of the first phase (Shake and Generate) and at the start of the second phase (Investigation).

4.3. Center interests

In contrast to the previous strategy, which aims to open up interesting themes, the goal of *Centering interests* is to focus on those interests that were previously defined broadly, and refine them into concrete learning interests. Therefore, the purpose of this strategy is to help students evaluate which of the general learning interests expressed by the group regarding a topic are of greater importance, usefulness, or value.

Thus, the teaching and learning activities and the teacher's actions are aimed at helping students make decisions about the relevance of the group's learning interests and prioritize those they consider most central. In the observed practice, the teacher explicitly asks the students which specific content related to reproduction or genetics they would like to delve into. The students share their specific interests, and the teacher suggests they discuss them further. To define the topics, the teacher helps them connect with prior experiences, inviting them to share anecdotes and life experiences that can justify the personal relevance of their choices. Additionally, the teacher highlights some specific topics that he considers relevant, for example, presenting multimedia content about praying mantises and sexual differences in the animal world, or steering the conversation back when he feels it is drifting away from an important topic.

The social organization combines large-group work when defining the questions the students would like to explore further; pair work, to work on readings related to the three main topics; and small-group

work, once the subtopics are selected, to create an outline and plan the remaining work. It was observed that when students work in pairs or small groups, the teacher resolves doubts and provides materials when requested or when he detects they are needed.

The instruments and procedures used in this strategy are diverse. On the one hand, the teacher constantly uses the whiteboard to write down relevant ideas, create maps, and make diagrams that serve as visual support for the students when it comes to exploring topics and identifying interests. The teacher provides books and readings sourced from the internet with regard to the topics under consideration for students to review specific content that might interest them. In addition, he encourages them to visit the library in search of more information. Furthermore, the teacher introduces dilemmas and personal provocations, such as asking what would happen if they didn't feed their pets for three days or if gender-based violence could be justified by human nature. Finally, he gives each small workgroup an inquiry template with the questions they should address in upcoming sessions, as well as a planning template to help them organize their remaining work for the Inquiry.

The main object of interest, like in the previous strategies of the case study, is specific (topic-centered or domain-centered), and the interests involved originate from both within and outside the school context.

The connection between the object of interest and the curriculum content is very close. Although the teacher constantly and explicitly asks about interests outside of school, he alternates these questions with explanations that guide the exploration of content related to reproduction and genetics. Occasionally, students tend to drift towards more socially-oriented topics, but the teacher manages to steer them back to the themes of the natural world. Additionally, it was observed that during the process of choosing and reflecting on interests, personal competencies and learning-to-learn skills were enhanced.

In terms of temporality, the *Center* strategy occurs exclusively in the second phase of the Inquiry.

4.4. Deepen interests

The objective of the strategy is to seek sources of information that allow students to expand and deepen their learning interests and/or generate new interests directly related to the curriculum content.

The teaching and learning activities and/or the teacher's actions focus on providing students with a variety of information sources in different content and formats (texts, videos, graphics, infographics, mind maps, images, etc.) that allow students to delve into their learning interests and also increase interest by allowing them to gain a deeper understanding of the topic being studied. For example, in the case studied, the teacher provides students with books with marked pages where they can find interesting information related to the focus of the project, or presents a list of links to videos about cell reproduction and the genetic code. Teaching and learning activities and the teacher's actions also focus on illustrating the relationship between curriculum content and learning interests, showing their usefulness. For example, in one of the identified events, the teacher highlights the usefulness of knowledge about the human reproductive cycle when it comes to using contraceptives.

The social organization of the activity is primarily in small groups. Each group is focused on developing the topic they have chosen, and the teacher closely monitors their progress and difficulties. In line with this monitoring, the teacher provides retroactive feedback on the work done (detecting misunderstandings, inaccuracies, or lack of information) and proactive feedback (providing guidance and materials for the students to orient their work or to encourage them to reflect on how to continue exploring). There are also events in which the teacher organizes the activity for the whole class. For example, when the class decides collectively on the type of products or artifacts they will create to share their learnings with the other 5th-grade students from other projects, and who prefers to participate in making each of these products. These

are also events where the teacher takes the opportunity to give general instructions, such as the importance of including charts or drawings that illustrate or clarify scientific information and data.

The instruments and procedures used in this strategy are mainly of two types. On the one hand, there is a wide variety of materials and sources of information (books, videos, websites, graphics, concept maps, idea maps, infographics, etc.) that the small groups can use to delve into and expand their chosen topic. On the other hand, there are the materials that the groups use to create their presentations (tools for representing information such as PowerPoint or Canva, for editing photographs, for creating graphs, etc.) or the products for the final exhibition (cardboard, papier-mâché, polystyrene, etc.).

The main object of interest, like in the previous strategies of the case study, is specific (topic-centered or domain-centered). However, there are also activities that take a broader approach focused on social practices. A good example of this is an event where the teacher proposes an activity that allows him to equate the procedure they are following in the Inquiry with the scientific method, emphasizing that this is the way of thinking and working that expert scientists follow to study the natural environment and its phenomena in an orderly and logical manner, based on observation and experimentation.

In this strategy, the correspondence between the object of interest and the curriculum content is very close. The teacher in the case studied plays the role of a companion, facilitator of resources, and a source of information for each aspect of the Inquiry developed by the small groups. He intervenes by taking advantage of and generating opportunities to relate each Inquiry with the curriculum content so that key learnings can emerge.

Regarding temporality, the *Deepen* strategy occurs in the Investigation and Communication phases of the Inquiry.

4.5. Evaluate interests

The objective of the strategy is for students to compare what they have learned throughout the development of the project by relating their initial learning interests with the current ones.

The teaching and learning activities, together with the teacher's actions, focus on promoting reflective processes aimed at comparing students' current interests with those expressed at the beginning of the project, assessing whether they have changed in intensity throughout the project, and anticipating actions that will promote their development in the near future. In the observed case, we find an event specifically aimed at checking whether they have managed to answer the questions posed at the beginning of the Inquiry, and another event focused on creating a personal reflective text about what they have learned, how they learned it, what helped them learn, when they noticed they were learning, and for what purpose the learned content will be useful. In the guidelines for the reflective text, the teacher insists that the texts must show the emotions they felt during the Inquiry process. The teacher works to create a task-oriented classroom climate, where the activities performed are valued, and students often consult the teacher about their work in order to receive feedback and use it to improve their task outcomes.

The social organization of the activities in this strategy as part of the studied case is highly varied, with individual, small group, and whole-class events. For example, the review of the initial Inquiry questions is first done in the whole class and then finished individually. On the other hand, the creation of reflective texts is first done individually and then shared with the large group.

The tools and procedures used in this strategy mainly include written texts and oral presentations and discussions. Additionally, supporting documents with guidelines on, for example, how to write a reflective text are used. These documents contain precise instructions on the steps to follow when writing the text: 1) add the title; 2) prepare the main ideas; 3) insert an introduction: why I am writing this text; 4) answer the questions (what have I learned?, how have I learned it?, etc.); 5) write a

conclusion; 6) review connectors; 7) check punctuation; 8) review spelling rules; 9) did you use your best handwriting?

The main object of interest, as in the previous strategies of the case study, has a specific character (topic-centered or domain-centered).

Again, in this strategy, the correspondence between the object of interest and the curriculum content is very close. The teacher uses both individual and group events to expand and clarify the curriculum content related to the Inquiry, helping students to use natural sciences' scientific terminology.

In terms of temporality, the *Evaluate* strategy takes place during the Evidence phase of the Inquiry.

5. Discussion

Our results allow us to observe how primary education teachers can design and implement educational practices structured around the consideration of students' interests. Through the case analysis, we have identified and categorized a wide set of educational aids to incorporate and transform interests, resulting in five teaching strategies: Spark, Explore, Center, Deepen, and Evaluate. Taken together, these strategies allow for a systematic analysis of how teachers work with students' interests over time and can also inform the design and implementation of personalized learning initiatives focused on students' interests. Some of the most relevant findings are discussed below.

First, our results show that the different events involving work with students' interests primarily share the intentionality of the teachers. What defines that a teacher is incorporating students' interests is that it is done consciously, intentionally, and explicitly, regardless of the specific form taken by the organization of the joint activity and proximal aids (Colomina et al., 2001). This is consistent with the personalized learning framework (Coll, 2018a, 2018b), where the same strategy can be implemented in various ways while aiming to promote the sense-making of learning. For example, in terms of the *Spark* strategy, the teacher's goal is to decisively spark new interests. This is achieved by posing practical and relevant situations and helping students identify and express their interests. However, these practical situations could be framed in a variety of ways such as through participation in a trip or watching a movie, and the aids for identifying interests could be visual, written, or oral, among others. This finding also reinforces recent work that conceptualizes personalized learning not as a set of predefined instructional features, but as a complex and situated form of teaching work that relies on teachers' ongoing professional judgement (Gunawardena et al., 2024). What becomes central is not the specific activity format, but teachers' capacity to intentionally organize tasks, interactions, and supports.

Second, our results show that active and inquiry-oriented methodologies, which also support personalized learning (Coll, 2018b), particularly inquiry-based learning (Barron & Darling-Hammond, 2008; Sasse et al., 2025), create learning environments that are particularly conducive to working with and from students' interests. In inquiry-based learning, interests are incorporated by helping students pose their own research questions and seek ways to solve them. The process of inquiring and solving the problem or situation contributes to the development and maintenance of interest, and ultimately has a positive impact on learning outcomes (Blinkoff et al., 2023; Rotgans & Schmidt, 2011). These results are consistent with those of Harackiewicz et al. (2016), who suggest that authentic and complex problems that continuously lead students to ask additional questions can repeatedly trigger situational interest. They are also aligned with the findings of Belland et al. (2013), who add that these types of situations not only help capture students' interest, but also promote the value of the learning task.

An essential characteristic of inquiry methodologies is the work in small collaborative groups (Barron & Darling-Hammond, 2008). Our data illustrate that all the strategies involve a combination of different forms of social organization, with some moments of work in collaborative groups or pairs, and others in large groups or individually. Thus,

when students are asked to argue or justify a decision, individual tasks are posed, and during moments of sharing and contrasting interests, the activity is usually organized in small groups and with the entire class. However, we did not find sufficiently distinct forms of social organization among the five strategies to consider them an inherent characteristic of these strategies, nor did we identify procedures or instruments particular to each strategy.

Third, our results allow us to propose teaching strategies to structure a sequence of teaching and learning around working with students' interests. In Table 4, we present the objective of each strategy, the types of activities and actions that constitute it, and the phase of the practice in which it is carried out.

The proposal directly aligns with a conception of interest consistent with sociocultural constructivist approaches (Renninger & Hidi, 2019;

Table 4
Teaching strategies to consider students' interests.

Strategy	Objective	Teacher actions and activities	Temporality
Spark	Stimulate learning interests in students by exposing them to experiences relevant to their context.	Present practical situations and relevant problems for the students' context. Support for identifying and expressing new topics of interest.	At the beginning of the teaching and learning sequence.
Explore	Promote the identification of learning interests around a proposed topic, domain, or practice related to the stimulated interests.	Assistance in expressing and justifying interests. Exploration of prior knowledge. Opportunities to share ideas among peers, compare, and search for common interests.	At the beginning of the sequence, following the Spark interests strategy.
Center	Help students focus broad interests into specific learning interests, evaluate them, and establish a learning plan to address them.	Support for students to assess the relevance of their learning interests. Guidance in decision-making and prioritization of learning interests. Support in the search for questions and hypotheses. Encouraging connections with non-school experiences. Establishment of an action plan to satisfy learning interests.	In the intermediate phase of the teaching and learning sequence. At the start of the teaching and learning experiences related to curriculum content.
Deepen	Provide information sources to deepen learning interests, expand them, and learn the curriculum content.	Providing varied information sources to delve into interests and support learning. Reinforcing the relationship between curriculum content and learning interests.	In the intermediate phase of the sequence, focused on teaching and learning experiences related to the curriculum content.
Evaluate	Facilitate the contrast of initial and final learning interests and the evaluation of what has been learned.	Support for reflection aimed at contrasting initial and final interests. Review of answers and conclusions drawn. Promoting reflection on personal learning achievements.	At the end of the teaching and learning sequence. It can serve as the starting point for another educational practice.

Solari et al., 2023), since in all cases the work on students' interests is oriented towards their transformation. This is in line with other studies in the literature which we reviewed, while also highlighting some important distinctions.

For instance, similar to Reber et al. (2018), we found that offering students opportunities to choose is a predominant practice. However, these options are not solely proposed by the teacher but are also co-constructed with the students. Moreover, the options are not detached from the specific learning content, but are consistently embedded in it. Conversely, the markedly academic nature of the project analyzed results in less focus on connecting with students' personal interests beyond school, a crucial element in working with students' interests (Bernacki & Walkington, 2018; Skalsstad & Munkebye, 2022) and in personalized learning (Merino et al., 2025; Madrid & Oller, 2023).

Furthermore, as in the study by Renninger et al. (2019), we identified the promotion of autonomy, challenge, group work, hands-on activities, and instructional conversation. However, in our sequence, these do not operate as initial triggers but rather as strategies that sustain and address interest throughout the process. In addition, our approach does not strongly rely on novelty, surprise, or appealing activities (Azevedo, 2017; Renninger et al., 2019; Skalsstad & Munkebye, 2022), nor does it personalize context by incorporating information directly related to students' lives (Reber et al., 2018). Instead, the initial triggers are connected to the relevance of the content for students' academic lives. Central to our proposal are the emphasis on the utility value of the content (Harackiewicz et al., 2016; Skalsstad & Munkebye, 2022), peer support, active personalization (Reber et al., 2018) and, above all, the use of curiosity-provoking questions and a diversity of study materials to explore possible responses (Belland et al., 2013; Skalsstad & Munkebye, 2022).

Fourth, it is worth highlighting that the incorporation and development of students' interests is presented, across these strategies, as a sequential process. This begins with the emergence of new interests, which are subsequently shared, assessed, narrowed down, and transformed into specific learning interests accompanied by questions or hypotheses, and by a plan to address them. These interests are then further developed through inquiry, seeking to respond to them by means of learning experiences connected to the curricular content. Finally, students revisit their initial interests to evaluate whether or not they have been fulfilled. Throughout this process, successive levels of specificity and complexity emerge: specificity, in that each strategy requires learners to define, clarify, and deepen their interest more than the previous one; and complexity, in that each strategy encourages a higher level of reflection and/or learning. Thus, each strategy ideally provides a platform that enables the next one to unfold.

While the sequence identified is coherent with the model of interest development proposed by Renninger and Hidi (2019), it also allows us to further specify how the progression from situational to more sustained forms of interest can be materialized in everyday classroom practice. By detailing the teacher actions and forms of support associated with each phase, the analysis offers a practice-based reading of interest development within project-based learning in primary education. In the first strategy, the teacher seeks to trigger situational interest through the personal relevance of the projects. The subsequent strategies allow learners to re-engage with the content and to develop both knowledge and value for it. Support is provided to deepen interest, both from the teacher and from peers, connecting with learners' prior knowledge and experiences. Moreover, students are encouraged to reflect on their interests and, in particular, to formulate their own questions. In line with Beek et al. (2024), our findings also suggest that sustained interest is supported by the contextual characteristics of the activity, particularly by the teacher's actions. However, as the authors point out, it would be necessary to conduct person-centered analyses including students' perspectives, in order to better understand their state of interest at any one point in time.

Another finding related to the sequence is that it does not follow a

strictly linear path: there are moments in which a later strategy is anticipated or an earlier one is revisited. It is therefore possible that the process does not necessarily involve going through all the strategies in the same order. This may be due to the advances and setbacks typical of the scaffolding process itself (Colomina et al., 2001), but also to the high degree of openness and flexibility that characterizes educational proposals structured around personalized learning (Membrive & Engel, 2023). Thus, incorporating and developing interests with a different type of methodology might result in entirely different strategies.

One element that remains transversal throughout this sequential process of working with students' interests is reflection. Understood as a dialogic and interpsychological process of meaning reconstruction, reflection takes various forms depending on its goals, content, timing, and procedures (Membrive et al., 2020; Martín & Solari, 2024). For instance, initially, it is used to contrast interests among peers and identify shared ones; during the development of the sequence, to formulate questions and make decisions; and, at the end, to assess whether or not the initial interests have been satisfied and whether new ones have emerged. Therefore, while Renninger and Hidi (2019) point to the importance of being reflective about the content, and Coll (2018b), to the role of students' reflection on their own learning in order to enhance sense-making of school content, our study highlights the need to make students' learning interests a central focus of classroom reflection at multiple points in time and with varied purposes.

Beyond this specific case, the typology and sequence of strategies speak to broader questions in teaching and teacher education about how personalized learning can be enacted in concrete classroom practice (Gunawardena et al., 2024). They offer a shared language for analyzing and discussing how teachers recognize and reshape students' interests over time, which can be materialized in didactic guidelines and used both in initial teacher education and in ongoing professional development. This is particularly relevant in systems that implement competency-based curricula, where teachers are expected to design learning experiences that connect disciplinary knowledge with students' interests. Moreover, the proposed strategies open up possibilities for thinking about the relationship between work with students' interests and digital technologies, one of the main areas associated with personalized learning (Shemshack & Spector, 2020).

Future studies, however, will need to address some of the limitations of both the pedagogical proposal and our research. Firstly, in the analyzed practice, interests have mainly been approached as thematic interests rather than interests in broader social practices (Solari et al., 2023). Similarly, our analysis has focused on learning content as the object of interest, without considering interests regarding when, with whom, or how to carry out learning activities. Secondly, in order to concentrate in depth on the strategies employed, we have not addressed the facilitators and obstacles involved in the design and implementation of the educational practice. This highlights the need for further investigation into the affordances that make such practices possible. Thirdly, multiple data sources were collected and used in the analysis, but the study did not follow a formal triangulation design. While classroom interaction data provided the primary basis for identifying and categorizing teaching strategies, the remaining sources mainly supported contextualization and interpretation. Lastly, because the analysis focuses specifically on the design and implementation of teaching strategies in classroom practice, this study did not directly examine certain elements that should be explored in future work: the students' perspective, especially the psychological process of being interested; the relationship between the declared interests and the support provided by the teacher; and the learning outcomes and processes of sense-making experienced by students within these practices. Future research should integrate these dimensions in order to better understand the relationship between teaching strategies, students' sense-making, and learning outcomes.

All in all, this study enriches the body of work focused on the development of students' interests (Ainley et al., 2002; Renninger &

Hidi, 2019; Slot et al., 2020) and represents an original contribution to the field of teaching strategies for personalized learning (Bernacki et al., 2021; Bray & McClaskey, 2014; Coll, 2018b). Moreover, the proposal offers concrete strategies and useful examples that may assist teachers in incorporating students' interests, something that is increasingly necessary to counteract the progressive loss of meaning in school learning.

CRedit authorship contribution statement

Antonio Membrive: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **María Isabel Vizquerra:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Anna Engel:** Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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