

# From Hair to Feathers: Clinical Intuition, Ornithology, and Project-Based Learning in Medical Education

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## ABSTRACT

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This article explores the integration of project-based learning with insights from ornithological observation to foster clinical intuition in medical education, especially in dermatology. By adapting teaching strategies inspired by ornithology and project-based learning, educators can accelerate the development of clinical intuition. We would like to point out the intriguing parallels between birdwatching and clinical reasoning, offering a novel perspective on medical education through the lens of dermatology. Drawing analogies between the pattern recognition used in ornithological observation and the cultivation of clinical intuition, we advocate for project-based learning as an effective educational strategy. Context-rich, collaborative projects promote deep engagement with clinical material, enhance diagnostic skills, and foster critical competencies such as teamwork, motivation, and reflective learning. The integration of this method into dermatology teaching has shown promising results, with increased student engagement and improved clinical reasoning.

**Key words:** clinical intuition, medical education, ornithology, teaching methodology, dermatology.

## INTRODUCTION

The challenge of cultivating clinical intuition – an essential yet elusive skill in medical practice – remains a central concern in medical education. Traditional teaching methods, which often prioritize the transmission of factual knowledge, have demonstrated limitations in preparing students to recognize subtle diagnostic patterns and adapt to complex, real-world scenarios. In recent years, there has been a growing recognition of the importance of active learning methodologies, such as project-based learning (PBL), which engage students in authentic, context-rich tasks and promote deeper understanding and retention of knowledge [1].

Parallels between medical diagnosis and ornithological observation offer a unique lens through which to understand and teach clinical intuition. Both fields require practitioners to rapidly identify patterns, consider contextual cues, and integrate prior experience with new observations. The concept of “jizz” – a term used by birdwatchers to describe the immediate, gestalt recognition of a bird species – bears striking resemblance to the clinical intuition sought after in medicine [2, 3]. By harnessing the principles of active learning and inter-professional collaboration, educators can create learning environments that encourage reflection, critical thinking, and the development of diagnostic acumen.

Recent research underscores the benefits of supplementing traditional teaching with active method-

ologies. Studies have shown that approaches such as PBL, case-based learning, and small group discussions not only improve academic performance but also foster teamwork, responsibility, and autonomy among students. However, the effective integration of these methods requires careful consideration of curricular design, faculty development, and the unique needs of diverse learner populations.

This article aims to synthesize current evidence on active learning in medical education, explore the analogy between ornithological observation and clinical reasoning, and present practical strategies for fostering clinical intuition through project-based learning. The following sections will review relevant literature, discuss the application of ornithological principles to medical teaching, and provide recommendations for educators seeking to enhance student learning and professional development.

To better understanding the concept worth to show better some analogies, not as biological, but rather from educational perspectives between hair and feathers. Just as differentiating between chiffchaffs and willow warblers requires attention to subtle cues such as song and primary projection, distinguishing between similar dermatological conditions demands more than textbook features – it requires clinical “listening”, contextual awareness, and accumulated experience.

In birdwatching, observing a warbler in central Europe in mid-October immediately suggests migration, influencing the list of likely species. Likewise, dermatological conditions such as viral exanthems or pollen-triggered eczema may be suspected based on seasonal patterns – highlighting the diagnostic value of context and timing.

Birdwatching sharpens not only visual acuity but also fosters patience, humility, and attentiveness – traits equally essential in clinical practice. Both require stepping back, observing without haste, and acknowledging uncertainty.

From a neurobiological and evolutionary standpoint, tactile contact plays a profound role in human cognition and emotional bonding. In humans, hair-touching is an intimate act – reserved not only for medical examination but also for expressions of closeness, trust, and affection. Rózsa and Apari [4] propose that the behavior of leaning heads together – absent in apes but widespread among humans – may have once carried an adaptive function: the deliberate transmission of head lice to kin and close companions, potentially conferring early immune protection against more dangerous body-lice-borne diseases. While now maladaptive, this ancestral practice reflects an enduring link between touch, attention, and care. In this light, the act of examining a patient’s scalp, or of closely observing a bird’s plumage, be-

comes more than mere inspection – it is a moment of intimate epistemology. It is well known that hands-on contact with birds fostered emotional engagement far more powerfully than abstract knowledge acquisition. These converging insights suggest that both medical and naturalistic forms of knowing begin not with data, but with touch, proximity, and a willingness to be physically and emotionally present with another living being.

The transition from hair to feathers is not merely a metaphor for shifting pedagogical paradigms – it is also an evolutionary story. Feathers evolved from reptilian integument via a modular, hierarchical process of innovation and diversification [5]. Among the most intriguing outcomes of this evolutionary trajectory are filoplumes: slender, hair-like feathers with tufts at their tips, structurally and functionally reminiscent of mammalian hairs. Rohwer *et al.* [6] demonstrate that these structures serve as highly specialized mechanosensors, enabling birds to monitor the position and condition of their flight feathers in real time. In this light, the resemblance between filoplumes and human hair becomes more than superficial – it hints at deep homology in how vertebrates use keratin-based structures to sense and interpret their physical environment. For medical learners, the act of parting a patient’s hair to inspect the scalp may unconsciously echo this evolutionary intimacy: a sensory engagement with the living surface of another being, rich with diagnostic and symbolic meaning. This convergence invites us to treat both feathers and hair not merely as coverings, but as interfaces – tactile thresholds between perception, memory, and care.

#### CLINICAL INTUITION AND THE ‘JIZZ’ CONCEPT

Clinical intuition is often described as the ability to rapidly recognize patterns and synthesize complex information to arrive at a diagnosis or therapeutic decision, sometimes even before all the facts are explicitly articulated [7, 8]. This skill, central to expert medical practice, is difficult to teach using traditional didactic methods, which tend to emphasize rote memorization and stepwise reasoning rather than holistic pattern recognition.

Interestingly, parallels can be drawn between clinical intuition in medicine and the concept of “jizz” in ornithology [2, 3]. The term “jizz”, derived from birdwatching, refers to the immediate, often subconscious recognition of a bird species based on its overall appearance, behavior, and context, rather than on a checklist of specific features [9]. As Chapman [9] observed, “There is generally more character in the flight of a bird than there is in the gait of a man. Both are frequently indescribable but perfectly diagnostic, and you learn to recognize bird friends as you do hu-

man ones". This insight underscores the importance of gestalt perception in both fields.

The development of clinical intuition – or “jizz” – requires repeated exposure to a wide variety of cases, opportunities for reflection, and the ability to integrate contextual cues. In medicine, this process is often slow and variable, largely dependent on the breadth and depth of clinical experience. However, as recent work by our group [2, 3] has noted, by shifting the focus from nomenclature to underlying principles and processes, educators can help students develop the kind of intuitive understanding that characterizes expert practice.

Recent advances in educational theory suggest that active learning strategies, such as PBL, can accelerate the acquisition of clinical intuition by immersing students in authentic, context-rich scenarios [1, 10]. PBL encourages learners to engage with complex, real-world problems, collaborate with peers, and reflect on their experiences – processes that mirror the development of expertise in both medicine and ornithology. By emphasizing pattern recognition, contextual reasoning, and experiential learning, educators can help students bridge the gap between theoretical knowledge and practical expertise.

## THE ORNITHOLOGY ANALOGY

The analogy between ornithology and medical practice offers a rich framework for understanding and teaching clinical intuition. Both disciplines rely heavily on pattern recognition, contextual reasoning, and the integration of prior knowledge with new observations. In ornithology, the ability to identify a bird species often hinges not only on specific features such as plumage or song but also on the broader context – such as habitat, time of year, and behavioral cues [11, 12]. Similarly, in medicine, diagnostic reasoning is enhanced by considering the patient’s history, environment, and the broader clinical picture, rather than focusing solely on individual symptoms or signs.

A notable example from ornithology is the concept of “migration patterns”. Just as knowing the seasonal movements of birds allows birdwatchers to narrow down potential species in a given location, understanding epidemiological trends and disease prevalence can help clinicians prioritize diagnostic hypotheses [11]. For instance, a bird spotted in a wooded area immediately eliminates aquatic species and large raptors from consideration. Analogously, a 13-year-old girl presenting with a two-year history of facial skin changes is more likely to have acne than a rare dermatological condition, based on prevalence and context.

This analogy extends to the teaching of both disciplines. In ornithology, new birdwatchers are encour-

aged to immerse themselves in field experiences, participate in group outings, and engage in citizen science projects. These activities foster rapid learning through repeated exposure, feedback, and collaborative problem-solving [12]. Similarly, in medical education, project-based learning (PBL) and case-based learning (CBL) provide students with opportunities to apply theoretical knowledge to real or simulated clinical scenarios, thereby accelerating the development of diagnostic skills and clinical intuition [1, 13].

Personal experience further illustrates the value of this analogy. The author’s own journey from dermatology to ornithology and back has highlighted the importance of modifying teaching methods to emphasize context, pattern recognition, and experiential learning. By drawing on the strategies used by birdwatchers to rapidly acquire and apply knowledge, educators can design curricula that promote deeper understanding and more robust clinical reasoning.

In summary, the ornithology analogy provides a powerful lens through which to view and teach clinical intuition. By emphasizing context, pattern recognition, and experiential learning, educators can help students develop the kind of flexible, adaptive expertise that is essential for both birdwatching and medical practice.

## PROJECT-BASED LEARNING IN MEDICAL EDUCATION

PBL is an instructional approach that engages learners in complex, authentic challenges designed to foster deep understanding and the application of knowledge [1]. In contrast to traditional lecture-based methods, PBL emphasizes active participation, collaboration, and the integration of theory with practice. This approach is particularly well-suited to medical education, where the ability to solve real-world problems, work in teams, and adapt to evolving clinical scenarios is essential [10, 14].

## CORE PRINCIPLES OF PROJECT-BASED LEARNING

- PBL is characterized by several key features:
- **Driving Question or Problem:** projects are anchored in real-world questions or challenges that motivate students to seek solutions.
  - **Student Autonomy:** learners take an active role in planning, executing, and evaluating their work, fostering responsibility and self-directed learning [14].
  - **Collaboration:** teamwork is central, reflecting the interprofessional nature of modern healthcare [15].
  - **Authentic Context:** projects are situated in meaningful contexts, allowing students to see the relevance of their learning.

- Reflection and Feedback: regular opportunities for reflection and feedback help students refine their understanding and skills.

### EVIDENCE FOR EFFECTIVENESS

A growing body of evidence supports the effectiveness of PBL in health professions education. Meta-analyses and systematic reviews indicate that PBL enhances not only knowledge acquisition and retention but also critical thinking, problem-solving, and communication skills [10]. For example, a review by Prince [10] found that active learning strategies, including PBL, significantly improved student performance and engagement compared to traditional lectures.

Moreover, PBL has been shown to foster interprofessional collaboration, a core competency in contemporary healthcare [15]. By working on projects that require input from multiple disciplines, students develop the ability to communicate effectively, respect diverse perspectives, and work toward common goals.

### APPLICATION TO CLINICAL INTUITION AND DIAGNOSTIC REASONING

The principles of PBL align closely with the development of clinical intuition. By engaging students in authentic, context-rich projects, PBL provides repeated opportunities for pattern recognition, contextual reasoning, and reflective practice – key components of both clinical intuition and the ornithological “jizz” [1, 8]. For example, case-based projects in dermatology might require students to analyze patient histories, interpret clinical findings, and propose management plans, mirroring the real-world challenges faced by practitioners.

### GROUNDING CLINICAL INTUITION IN CONTEMPORARY NEUROBIOLOGICAL THEORY

The definition of clinical intuition cited at the beginning of our work – as the ability to rapidly recognize patterns and synthesize complex information to arrive at a diagnosis or therapeutic decision before all the facts are explicitly articulated [7, 8] – finds strong support in modern neurobiological understandings of brain function.

According to the predictive processing framework, the brain should not be seen as a passive receiver of sensory data, but rather as an active organ that constantly generates predictions and models of reality. This paradigm shift suggests that perception and decision-making are fundamentally based on the brain’s attempts to infer the most likely causes of incoming sensory signals, rather than on the accumulation and processing of external stimuli alone [16, 17].

In this view, the brain builds and updates internal models that anticipate incoming sensory inputs. These predictions are then compared with the actual inputs, and discrepancies – known as prediction errors – lead to a refinement of the models. In other words, instead of constructing a representation of the world from the ground up, the brain superimposes its expectations onto the world and continuously tests them against new information.

From an educational perspective, this framework highlights the importance of fostering flexible and coherent predictive models in medical training. Encouraging the development of such internal models enables future clinicians to intuitively detect pathological patterns that align with pre-existing mental representations of disease and treatment processes. In this context, clinical intuition emerges not from guesswork but from the refined use of predictive models honed through experience and learning.

### CHALLENGES AND CONSIDERATIONS

Despite its benefits, implementing PBL in medical education is not without challenges. These include the need for faculty development, curricular flexibility, and adequate resources to support project work [8]. Additionally, assessment strategies must be carefully designed to capture the complex skills and competencies developed through PBL.

### APPLICATION TO DERMATOLOGY TEACHING

The integration of PBL and ornithological principles into dermatology education offers a transformative approach to teaching clinical intuition and diagnostic reasoning. Drawing from the analogy between birdwatching and medical diagnosis, educators can design curricula that emphasize context, pattern recognition, and experiential learning. This section describes practical strategies for applying these concepts in dermatology teaching, highlighting the author’s own experiences and the broader implications for medical education.

### MODIFYING TEACHING METHODS

Recognizing the limitations of traditional didactic approaches, the authors adapted teaching methods to incorporate the principles of PBL and ornithological observation. Central to this shift is the emphasis on mastering concepts rather than memorizing names. By focusing on underlying processes and patterns, students are encouraged to develop a deeper, more intuitive understanding of skin diseases.

For example, in teaching sessions, students are presented with clinical images and brief patient histories, mirroring the way birdwatchers use contextual cues to identify species. Students are asked to consider the broader clinical picture, including patient demographics, lesion distribution, and temporal evolution, rather than relying solely on isolated features. This approach fosters the development of clinical intuition and prepares students for the complexities of real-world practice.

## CASE-BASED PROJECTS

Case-based projects form a cornerstone of this revised curriculum. Students work in small groups to analyze authentic clinical scenarios, such as a patient presenting with a chronic facial rash or a child with multiple pigmented lesions. Each project is structured around a driving question, such as “What is the most likely diagnosis for this patient, and how would you manage their condition?” Students are required to gather information, synthesize evidence, and present their findings to peers and faculty, simulating the collaborative and reflective processes of clinical practice.

These projects not only enhance diagnostic skills but also promote teamwork, communication, and self-directed learning. Feedback from students highlights the value of engaging with real-world cases and the opportunity to learn from peers’ perspectives. Faculty members report increased student engagement and a greater willingness to tackle challenging clinical problems.

## STUDENT AND TEACHER PERSPECTIVES

Student feedback underscores the benefits of this approach. Many students note that case-based projects help them connect theory with practice, build confidence in their diagnostic abilities, and develop a sense of professional identity. Teachers, in turn, appreciate the opportunity to guide students through the process of inquiry and reflection, fostering a more dynamic and interactive learning environment.

Moreover, the integration of ornithological principles – such as the importance of context and pattern recognition – has been well received. Students and faculty alike recognize the parallels between birdwatching and clinical diagnosis, and this shared understanding serves as a powerful metaphor for the development of clinical intuition.

## BROADER IMPLICATIONS

The application of PBL and ornithological principles in dermatology teaching has implications be-

yond the classroom. By emphasizing active, experiential learning, this approach prepares students for the lifelong learning required in modern medicine. It also supports the development of essential competencies, such as critical thinking, collaboration, and adaptability, which are increasingly recognized as vital for success in healthcare [8, 15].

In summary, the integration of project-based learning and ornithological principles into dermatology teaching offers a robust framework for fostering clinical intuition and diagnostic reasoning. Through case-based projects, contextual learning, and reflective practice, students develop the skills and mindset necessary for expert practice in dermatology and beyond.

## DISCUSSION

The integration of PBL with insights from ornithological observation presents a compelling model for advancing clinical intuition and diagnostic reasoning in medical education. This discussion synthesizes the evidence and experiences presented, highlighting the strengths, challenges, and broader implications of this approach.

## SYNTHESIS OF THEMES

Central to this article is the recognition that clinical intuition – often described as “jizz” in ornithology – is a complex, context-dependent skill that is best developed through repeated exposure, reflection, and active engagement with authentic problems [7, 8]. Both medicine and ornithology require practitioners to rapidly identify patterns, integrate contextual cues, and apply prior knowledge to new situations. By drawing on the principles of ornithological observation, educators can create learning environments that foster the development of these essential competencies.

Project-based learning, as outlined in previous sections, provides a robust pedagogical framework for achieving these goals. PBL immerses students in real-world challenges, encourages collaboration, and promotes self-directed learning – all of which are critical for the development of clinical intuition [1, 10]. The case-based projects described in the context of dermatology teaching illustrate how these principles can be operationalized in practice, leading to improved diagnostic skills, greater student engagement, and enhanced professional development.

## IMPLICATIONS FOR MEDICAL EDUCATION

The implications of this approach extend beyond dermatology to the broader field of medical educa-

tion. By emphasizing active, experiential learning, educators can help students bridge the gap between theoretical knowledge and practical expertise. This is particularly important in an era of rapid medical advances, where the ability to adapt, collaborate, and think critically is essential for success [15].

Moreover, the integration of ornithological principles offers a powerful metaphor for teaching clinical intuition. The parallels between birdwatching and medical diagnosis – such as the importance of context, pattern recognition, and reflective practice – resonate with both students and faculty, making abstract concepts more tangible and accessible.

### LIMITATIONS AND CHALLENGES

Despite its strengths, the implementation of PBL and ornithological-inspired teaching is not without challenges. Faculty development is critical, as educators must be equipped to facilitate project-based learning and support students through the process of inquiry and reflection [8]. Curricular flexibility and adequate resources are also necessary to ensure that projects are authentic, relevant, and well-supported.

Assessment presents another challenge. Traditional evaluation methods may not fully capture the complex skills and competencies developed through PBL, necessitating the development of innovative assessment tools that align with the goals of active, experiential learning.

### FUTURE DIRECTIONS

Looking ahead, there is significant potential to further integrate PBL and ornithological principles into medical curricula [18]. Future research should explore the long-term impact of these approaches on clinical performance, professional identity, and patient outcomes. Additionally, the development of faculty training programs and assessment tools tailored to project-based learning will be essential for sustaining and scaling these innovations.

In conclusion, the integration of project-based learning and ornithological principles offers a promising pathway for fostering clinical intuition and diagnostic reasoning in medical education. By emphasizing context, pattern recognition, and experiential learning, educators can prepare students for the complexities and uncertainties of modern healthcare.

### CONCLUSIONS

The journey from hair to feathers – from dermatology to ornithology and back – offers a unique and powerful lens through which to reimagine medical education. By drawing analogies between the pattern recognition and contextual reasoning required in birdwatching and the development of clinical intuition in medicine, this article has explored innovative strategies for fostering diagnostic expertise and professional growth.

Project-based learning, informed by the principles of ornithological observation, provides a robust framework for cultivating clinical intuition. Through authentic, context-rich projects, students are encouraged to engage deeply with clinical material, collaborate with peers, and reflect on their experiences. This approach not only accelerates the acquisition of diagnostic skills but also enhances motivation, teamwork, and lifelong learning – qualities essential for success in modern healthcare.

The integration of these methods into dermatology teaching illustrates their practical value, with students and faculty alike reporting increased engagement and improved clinical reasoning. However, the successful implementation of project-based learning requires ongoing faculty development, curricular flexibility, and innovative assessment strategies.

Looking ahead, there is significant potential to expand the application of these principles across medical specialties and educational settings [18, 19]. Future research should focus on the long-term impact of project-based and ornithology-inspired teaching on clinical performance, professional identity, and patient outcomes. By embracing the lessons of both fields, educators can prepare a new generation of physicians who are not only knowledgeable but also intuitive, adaptable, and equipped to meet the challenges of an ever-evolving healthcare landscape.

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### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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