

Learning on the Fly: A Qualitative Study Exploring Workplace Experiences That Contribute to Residents' Development as Teachers

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ABSTRACT

Background While residents play a critical role as teachers in the clinical learning environment, knowledge of how they develop the necessary skills to teach and how graduate medical education programs can support their development as teachers remains limited.

Objective This study aims to use the pedagogical content knowledge framework to explore how residents' workplace-based experiences influence their development as clinical teachers.

Methods This qualitative study used focus groups and semistructured interviews with senior residents across departments of emergency medicine, general surgery, and internal medicine at the University of California, San Francisco. We used purposive sampling to recruit participants. Twenty-five residents agreed to participate. We interviewed participants based on availability and ceased data collection when we stopped identifying new concepts. We conducted 2 focus groups and 13 interviews with 18 participants, with data collection occurring between July 2023 and March 2024. The authors used thematic analysis with pedagogical content knowledge as a sensitizing concept to identify themes.

Results The authors identified 3 themes characterizing how residents learn to teach through their workplace-based experiences: learning from being a learner, developing teaching skills through experience, and gathering and responding to feedback. The process of residents' development as teachers was largely similar across all 3 specialties. Differences in the specific experiences that shaped residents' development were influenced by specialty-specific workplace demands and differences in practice contexts.

Conclusions Residents' development as clinical teachers occur through the integration of their experiences as learners, expanding clinical and teaching expertise, and feedback and reflection on their ongoing teaching practice.

Introduction

Residents are critical teachers in the clinical learning environment (CLE), supporting the education of near-peer and junior trainees.¹⁻⁶ Several graduate medical education regulatory bodies identify development of residents as teachers as essential in graduate medical training.⁷⁻¹⁰ Consequently, institutions have developed resident-as-teacher programs to provide foundational knowledge and teaching experiences; however, they often do so in an environment separated from residents' authentic teaching context: the CLE.^{2,11-15} Current knowledge of how residents gain the necessary skills to translate their clinical and pedagogical knowledge into a teaching practice is limited to insights from structured workshops or formal curricula. Understanding how residents learn to

teach through their informal teaching experiences in the CLE can support educational leaders and program directors seeking to design or redesign resident-as-teacher programs responsive to the realities of the CLE and aligned with the developmental trajectory of resident educators.^{2,6,16}

Teunissen and colleagues' exploration of experiential learning in the workplace highlights workplace participation as a core driver of resident development.¹⁶ These experiences catalyze learning by providing opportunities for observation, direct engagement, reflection, and feedback.¹⁶⁻²⁰ Faculty development literature similarly shows that clinical educators refine teaching skills through ongoing engagement in patient care, adapting to learner needs, clinical pace, and the CLE's structural realities.²¹⁻²⁷

This knowledge for teaching, developed through workplace-based experiences, aligns with Shulman's conceptual framework of pedagogical content knowledge (PCK).^{28,29} PCK describes the integration of teachers' understanding of content (eg, patients and

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their clinical problems), pedagogy (eg, clinical teaching, supervision strategies), learners (eg, how they conceptualize topics and their common misunderstandings), and context (eg, various CLEs) into a teaching practice, and has been used as a model for understanding faculty clinical teachers' development.³⁰⁻³² We aim to expand understanding of clinical teacher development using PCK as a framework to explore how residents' workplace-based experiences influence their development as clinical teachers.

Methods

Design

This qualitative study is based on an interpretivist paradigm.³³ We used thematic analysis with an inductive approach to identify themes from the data and used PCK as a sensitizing concept for analysis.^{34,35}

Subjects and Setting

We used purposive sampling of senior residents in emergency medicine, general surgery, and internal medicine at the University of California, San Francisco, a quaternary academic medical center with a graduate medical education program of ~1500 trainees. We chose these specialties to enhance transferability and capture a variety of CLEs (eg, emergency department, operating room, medical/surgical inpatient wards, and outpatient clinics). We chose senior residents because they have had time to develop and apply teaching skills. We defined senior residents by specialty based on faculty and trainee perspectives about when residents assume prominent teaching roles: emergency medicine: postgraduate year (PGY) 3 or later; general surgery: PGY-4 or later; internal medicine: PGY-2 or later.

Study Investigators

The research team included: M.L.D., a fourth-year medical student (now PGY-2) with teaching and mentoring experience; B.K.D., a second-year medical student (now third year) with prior experience in curriculum development and teaching; J.K.Q., a medical education research fellow who had completed emergency medicine residency; K.E.H., a senior faculty member with teaching experience in internal medicine clinic and inpatient wards and extensive experience in medical education and qualitative methods; and J.C.P., a junior faculty member in internal medicine, with teaching experience in the emergency department and inpatient wards.

Data Collection

Four investigators (M.L.D., B.K.D., K.E.H., J.C.P.) developed the focus group guide based on the

KEY POINTS

What Is Known

Residents are crucial teachers in the clinical setting, but there is limited understanding of how they develop teaching skills.

What Is New

A qualitative single-site study of senior residents in emergency medicine, general surgery, and internal medicine found that residents learn to teach by reflecting on their own experiences as learners, developing skills through practice, and gathering and responding to feedback. This process was found to be largely consistent across all 3 specialties.

Bottom Line

Program directors designing curricula for residents-as-teachers can support this development through intentionally challenging them to integrate their own learning experiences, expand their expertise, and engage in continuous feedback and reflection on their clinical teaching practice.

literature^{12,13,21-24} and their experience as clinical teachers and learners, with PCK as a sensitizing concept (online supplementary data).^{28,29,35} Focus groups and interviews queried how residents teach, learn to teach, and adapt their teaching to learners' needs and the demands of the CLE. One investigator (M.L.D.) conducted a pilot focus group with 2 internal medicine chief residents and 1 recent internal medicine graduate. After 4 investigators (M.L.D., B.K.D., K.E.H., J.C.P.) reviewed the pilot, we made minor changes to question formatting and wording. No questions were removed, and hence, we included pilot responses in our analysis.

We conducted focus groups and interviews between July 2023 and March 2024. We initially planned focus groups because participants can respond to others' ideas and experiences, thereby facilitating discussion.³⁶ We recruited residents via email. Subsequently, we offered individual interviews to meet participants' scheduling constraints amid their clinical responsibilities.³⁷ Interview questions were similar to the focus group guide, adjusted for the individual format. Two focus groups were conducted with internal medicine residents, where participants reacted to and compared their teaching styles with one another. While expanding our methods to include semistructured interviews meant participants could not react to other viewpoints, the timing of interviews enabled participants to provide in-depth responses, and allowed investigators to probe based on findings from earlier data collection, creating a rich and deep dataset.³⁶ We conducted focus groups and interviews until we stopped identifying new themes or concepts overall or within each specialty, suggesting thematic sufficiency.³⁸

One investigator (M.L.D.) conducted all focus groups and interviews virtually with videorecording (Zoom Video Communications), which another investigator

(B.K.D.) later reviewed for observatory notes and feedback.^{39,40} Focus groups and interviews were transcribed using Otter.ai Transcription Software (Otter.ai Inc), reviewed by M.L.D. or J.C.P. for accuracy and de-identified prior to analysis. Each participant received a \$25 electronic gift card.

Data Analysis

Data analysis occurred concurrently with data collection. All data were manually coded and then organized and analyzed in Dedoose v9.0.107 (SocioCultural Research Consultants LLC). Elements of PCK that served as sensitizing concepts included knowledge of content, learners, pedagogy, and context, as well as integration of these elements into teaching practices.^{28,29} M.L.D., B.K.D., and J.C.P. independently reviewed a focus group and an interview transcript with internal medicine residents to identify preliminary codes. M.L.D. and J.C.P. organized the codes, considering PCK as a sensitizing concept, into a codebook, which was reviewed and refined by 2 investigators (B.K.D., K.E.H.). Investigators iteratively reviewed and updated the codebook throughout transcript analysis from surgery, emergency medicine, and internal medicine residents. Two investigators coded each focus group or interview: M.L.D. and at least one other study investigator. Investigators discussed differences in coding until consensus. M.L.D. and J.C.P. synthesized recommendations from excerpts coded as “improving teacher development,” which are listed in the BOX. All study investigators participated in team discussions to identify themes from the coded data.

To promote trustworthiness of results, we implemented member checking.⁴¹ We invited all participants by email to review a synthesis of results and a preliminary draft (BOX). Five responded. All endorsed the findings. Two offered reflections that prompted minor revisions to the analysis, such as highlighting contributors to empathy for learners and suggesting strategies for improving feedback on teaching.

Reflexivity

We attended to reflexivity throughout the research process. M.L.D. and J.C.P. kept journals to record reflexive discussions during data collection,⁴² including our reflections, perspectives, and biases, and how they influenced our data analysis at each research team meeting. The combination of students (M.L.D., B.K.D.), a graduate medical trainee (J.K.Q.), and faculty (K.E.H., J.C.P.) across specialties generated discussions of how our own stages of training and positions within the hierarchy of clinical teams, experiences as learners and teachers, and practice contexts informed our beliefs about teaching skill

BOX Recommendations to Support Residents' Development as Teachers

For Residents

- Use reflection on your positive and negative experiences with previous seniors and attendings as a starting point for developing your teaching methods and approaches.
- Talk to senior residents and attendings to explore teaching strategies and obtain resources for teaching.
- Query junior learners for explicit feedback on your teaching.
- Utilize check-ins with learners to identify their learning goals and gain a baseline understanding of their skills and knowledge.
- Afford learners space to troubleshoot and problem-solve during challenging moments if it does not compromise safe patient care.

For Faculty and Program Leadership

- Start preparing residents to step into teaching roles early in internship, for example by encouraging them to teach students.
- Provide residents with structured teachings on how to teach in a time-limited environment and an opportunity to practice and obtain feedback.
- Encourage attendings to observe and give structured feedback on residents' teaching.
- Create a structure within residency programs for residents within and across postgraduate year levels to reflect on and support one another in teaching skill development.
- Protect time for students to give anonymous feedback to residents on their teaching.
- Provide all residents with a list of evidence-based best teaching practices focused on the clinical learning environment.

development, and thus, our data analysis and interpretation. We considered potential power dynamics between study investigators and participants during data collection. To mitigate these dynamics, interviews were conducted by M.L.D., whose role as a student was least likely to influence participant responses. These discussions added depth and richness to our data interpretation and process of theme construction.

The University of California, San Francisco Institutional Review Board deemed the study exempt from full review (#373947).

Results

Twenty-five residents agreed to participate: 6 emergency medicine residents, 4 general surgery residents, and 15 internal medicine residents (6 emergency medicine, 4 surgery, 8 internal medicine). We interviewed participants in order of availability and ceased data collection when we stopped identifying new themes or concepts overall or within each specialty, which

occurred after interviewing 18 participants. We conducted 2 focus groups and 13 interviews with this group of 18 participants. Both focus groups included internal medicine residents, with 3 and 2 participants, respectively. The focus group with 3 internal medicine residents was the pilot focus group and included 2 chief residents and 1 resident who graduated the prior month.

We identified 3 themes characterizing how residents learn to teach through their workplace-based experiences: learning from being a learner, developing teaching skills through experience, and gathering and responding to feedback. These themes, the relationships between them, and how they relate to domains of PCK are elaborated below with participant quotations. Participant specialty (E: emergency medicine, S: surgery, M: [internal] medicine) and number are shown in parentheses.

Residents' development as teachers was similar across all 3 specialties. Differences in the specific experiences that shaped residents' development as teachers seemed influenced by specialty-specific workplace demands and differences in practice contexts (eg, inpatient medical or surgical teams, operating room, emergency department); we highlight examples below. The TABLE organizes our findings within the PCK framework and highlights specialty-specific differences.

Learning From Being a Learner

Role models from residents' experiences as learners were powerful influences on their approach to teaching.

Positive and Negative Learning Experiences: Residents described how their development as clinical teachers began during their time as medical students and junior residents, when they observed and experienced varied approaches to clinical teaching. Residents reflected on these experiences, both positive and negative, to inform their developing understanding of effective and ineffective teaching. One resident shared:

I think a lot of that comes from having been a medical student, where I've seen similar situations and had teachers on either end of the spectrum who are deliberate about teaching or who just move on to the next thing without talking to the medical students. So just seeing that modeled in different ways has helped me identify people who do well and try to adjust my behavior to act like they have acted. (S1)

Negative prior learning experiences, such as resident supervisors who paid little attention to students' engagement and understanding, fostered empathy for learners and motivated residents to employ teaching

strategies that prevented these negative experiences or supported learners in navigating the challenges of clinical learning. Residents sought to incorporate behaviors that residents and attendings modeled in positive teaching encounters; these experiences served as exemplars for promoting inclusion and belonging in the CLE.

Teaching Strategy Development: Residents' experiences as learners also helped them develop initial teaching strategies and an understanding of which strategies may work under different circumstances (eg, probing questions and dialogue works well on rounds; structured teaching is challenging to deliver during time-pressured days). Some residents described learning procedural teaching techniques (eg, reviewing procedure kit contents, practicing the procedure away from the bedside before performing it, or explicitly planning how to provide students with hands-on experience in surgical cases), while others reflected on attendings who used probing questions after case presentations to help them develop organized frameworks for diagnosis and management.

Learners' Common Misconceptions: Residents shared how their own learning experiences with teachers shaped their initial understanding of learner's common misunderstandings and challenges. One resident described a clinical educator leaving them feeling more confused after discussing a moment of clinical uncertainty:

As a medical student ... it was really hard for me to hear someone just say, "oh, like the vibe is such that this patient is sick." [...] I don't know what that means. I don't have any experience; how am I going to study a "vibe?" [...] And so, as much as I can, I like to use data or explanations to help a learner better understand why we're doing something. (E4)

Emotional reactions to personal learning experiences, such as feeling confusion after incomplete or vague explanations of clinical decisions during rounds, feeling unsupported while performing a bedside procedure, or feeling insecure about how to execute clinical tasks, helped residents learn to anticipate where learners may struggle and where they may be particularly enthusiastic about participating in clinical care. These learning experiences fostered understanding of learners' challenges and an empathic teaching approach (TABLE).

Developing Teaching Skills Through Experience

Residents continued their development as clinical teachers through integration of their ongoing clinical and teaching experiences.

TABLE

Comparison of 18 Residents' Development as Teachers Across the Pedagogical Content Knowledge (PCK) Framework in Multiple Specialties

PCK Domain ^{27,28}	Definition	All Specialties	Emergency Medicine	General Surgery	Internal Medicine
Knowledge of content	Residents' medical, procedural, systems-based knowledge and clinical reasoning skills	Residents develop content knowledge for teaching through their own experiences as clinicians. They focus on topics that were challenging for them as junior learners and that enable safe and effective completion of patient care.	Residents vary widely on the content they choose to teach. The content of their teaching is primarily based on their knowledge gaps, challenges they encountered as junior learners, individual preferences, and cases encountered in the emergency department.	Residents focus on teaching surgical skills in the operating room (OR), particularly areas that were challenging when they learned surgical skills. Outside the OR, they focus on medical and systems-based knowledge for completing clinical tasks.	Residents focus on systems-based content (eg, discharging, task and time management) early in the academic year and teach more clinical knowledge as the year progresses. Residents develop a repertoire of teaching points based on commonly encountered topics that are easily delivered on the wards.
Knowledge of learners	Residents' understanding of learners' interests, knowledge, experiences, and skills	Residents' knowledge of learners is informed by reflection on their own learning experiences and experiences working with and teaching learners.	Minimal continuity with learners Residents developed knowledge of learners through rapid in-the-moment assessment via observation of patient care (eg, seeing and presenting patients), and procedural skills, as well as reflection on teaching experiences with peers.	Residents developed knowledge through longitudinal relationships over weeks and direct observation (primarily on rounds and in the OR).	Residents developed knowledge through relationships over weeks and direct observation (primarily on rounds, occasionally at the bedside).
Knowledge of context	Residents' knowledge of their clinical environment and specialty	Residents develop nuanced understanding of their practice context and learn to adapt their teaching to various features of the clinical environment.	Residents adapt what, when, how, and how much they teach to the department flow, patient census, and presence of critically ill patients.	Residents' primary teaching environment is the OR, and they must manage patient safety and OR flow as they identify and support learner participation in cases.	Residents learn to integrate their teaching into rounds and accommodate the call schedule, which requires them to adapt to time constraints, varying patient acuity and team census.

TABLE

Comparison of 18 Residents' Development as Teachers Across the Pedagogical Content Knowledge (PCK) Framework in Multiple Specialties (continued)

PCK Domain ^{27,28}	Definition	All Specialties	Emergency Medicine	General Surgery	Internal Medicine
Knowledge of pedagogy	Residents' knowledge and usage of various teaching approaches and style	Through trial and error, reflection, and feedback, residents develop dexterity with teaching strategies that will reliably support teaching amid patient care responsibilities.	Residents use a combination of dialogue and observation alongside clinical care to facilitate learning while minimizing disruption to patient flow. Residents deliver chalk talks or structured teaching during sign-out.	Residents augment learners' participation in cases based on their observation of learner's skillset and relationship with learner.	Most residents develop a preference for teaching-on-the-fly over prepared chalk talks to facilitate learning directly from cases in a time-limited setting. Some residents develop prepared chalk talks that they can deliver when there is time for formal, structured teaching.

Adapting Teaching to the Demands of Patient Care:

Many participants described initially feeling overwhelmed by the challenges of integrating teaching into patient care and set high personal expectations to prepare and deliver formal teaching talks (eg, "chalk talks"). As residents gained more clinical experience and increased their content knowledge and familiarity with practice contexts (eg, emergency department, operating room, inpatient wards, clinic), they described feeling more equipped to integrate teaching with patient care demands, including managing patient volume, acuity, and flow through different phases of care:

As I've moved through residency myself and gotten a better understanding of flow and what makes things move through the department, it's been easier for me to then give feedback and teaching that's more effective, just because I've also learned how to be more effective in the department. (E3)

Another resident described how their increased comfort with clinical practice helped them facilitate learning while supporting learners' participation:

The biggest change for me [...] is giving people time. When I was newly a senior, when something awry happened, it's like, oh my gosh, we have to figure this out right away. And I think for some emergency issues, that's still true, but then for other lesser things like, we need to figure out a new

medication, it's totally okay to give the intern or medical student time to figure it out on their own... so that they have that experience of making the decision. (M4)

Developing a Deeper Knowledge of Learners:

Residents' teaching experiences further strengthened their knowledge of learners. By working with and assessing different learners, they learned to better anticipate and identify learner knowledge gaps. As their knowledge of clinical content, learners, and practice contexts grew, residents expanded their knowledge of teaching strategies. They experimented with approaches that support spaced repetition and time-efficient teaching, and integrated teaching into authentic moments of clinical care. For example, residents in all 3 specialties used reinforcement strategies, such as email, to introduce new concepts or reinforce previously introduced concepts:

Our students will email us to remind us [of] what patients we saw together [...] And I'll follow up with either another teaching point, or just rehash that teaching point, or link to a resource [...] It's another way to reinforce the 3 things I thought were most important. (E4)

Expanding Their Repertoire of Teaching Strategies:

Many internal medicine residents expanded their teaching strategies to incorporate informal, on-the-fly

teaching during or outside of rounds. As one final-year resident shared:

I went from being worried about giving these complete kind of formal didactic talks to... becoming, more flexible about not only what topic [learners] need more information about, but what's the best way for them to learn and absorb that topic ... I say more with less. (M3)

Surgery residents observed learners' technical and clinical skills to guide their supported participation in surgical cases and clinical care, while emergency medicine residents developed routines for teaching that allowed them to quickly assess learners' areas for growth and facilitate on-the-fly teaching and supervised participation in clinical care (eg, seeing patients, performing point-of-care ultrasound or procedures; TABLE).

Through this integration of clinical and teaching experiences, residents developed increased confidence in identifying teaching topics and enacting strategies fit to learners' knowledge gaps and clinical context constraints.

Gathering and Responding to Feedback

Residents further refined their teaching by collecting and integrating often implicit or indirect feedback. Residents reported rarely receiving direct feedback from attendings about their teaching. Despite requirements for all students to evaluate all resident teachers, participants seldom mentioned teaching evaluations as drivers of their development. Surgery residents were an exception; some shared how written feedback from students prompted changes to their teaching, such as creating more time for teaching or augmenting participation in surgical cases.

Obtaining Indirect Feedback: In the absence of direct feedback, residents learned to monitor their teaching experiences for in-the-moment cues related to learners' body language, which provided indirect feedback about learners' bandwidth for teaching. For example, one resident shared:

Picking up on social cues is a lot of effective teaching. Because even if you have really great teaching, if you're picking the wrong time for that person, and then they're giving you body language or nonverbals that, "hey, this is not a great time for me," and you keep going. That's honestly harmful, not even helpful. (E2)

This attunement to social cues also helped residents infer learners' level of engagement and thus the quality and effectiveness of their teaching content and methods. Other strategies residents used to collect indirect feedback included probing and observing for

learners' understanding, retention, and application of teaching content. For example, residents asked learners to verbally walk through the steps of a procedure before performing it or posed follow-up questions related to key points from previous rounds. Residents synthesized these various sources of indirect feedback to adjust their teaching, including how to organize and scope content, use various strategies to promote increased engagement, and prepare learners for patient care or procedural tasks.

The Role of Teacher-Learner Continuity: The duration of teacher-learner relationships in residents' practice environments influenced how they gathered and responded to feedback. For example, unlike surgery and internal medicine residents, emergency medicine residents rarely had continuity with learners. Thus, they prioritized in-the-moment observations of learners and reflective discussions with peers to explore how to refine their teaching (TABLE).

Many participants provided advice during interviews for future residents transitioning into their roles as educators. The BOX lists these recommendations based on our findings.

Discussion

This study illustrates how residents' workplace-based experiences shape their growth as clinical teachers. Residents describe an experiential learning process beginning earlier in their time as learners and deepening as their responsibilities expand to include clinical teaching. As junior learners, residents observe and experience positive and negative role models, providing an initial foundation for their teaching practice. As they transition into their senior resident teaching roles, they engage in the parallel and intertwined processes of clinical and teaching skill development, which expands their knowledge of clinical content and instructional strategies, capabilities in assessing learners and identifying knowledge gaps, and dexterity in adapting their clinical instruction to contextual factors. In the absence of robust direct feedback, residents developed strategies to gather indirect cues about their teaching, enabling both real-time adjustments and long-term refinement of their practice.

The finding that residents integrate clinical and pedagogical knowledge through their workplace experiences reinforces the evolution of their PCK. Residents described how on-the-job experiences as clinical teachers helped transform their clinical capabilities into teaching capabilities. This aligns with prior research that underscores the experiential nature of workplace learning^{16,18,19} and resonates with descriptions of PCK

development, wherein teachers refine their practice by transforming content knowledge into teachable forms, adjust their approaches based on learner responses, and reflect on their teaching effectiveness.^{22,23,28,29,31,43} While prior applications of PCK primarily focused on attending physicians or faculty educators, our findings illustrate how these same processes manifest earlier in training.^{22,23,31,32} Resident participants developed PCK through the rhythms, responsibilities, and relationships unique to their clinical roles, highlighting the organic and experiential origins of clinical teaching skills. To better support the development and refinement of PCK, resident-as-teacher programs can embed structured opportunities for practice, feedback, and reflection into the authentic CLE teaching context.

Participants described the importance of their personal histories as medical students and junior residents in shaping their clinical teacher development. While this is the first study to our knowledge that illustrates early clinical teacher development in medical education, it parallels research on classroom teachers that demonstrated how early learning experiences inform the trajectories of teachers' pedagogical practice.^{44,45} Earlier implementation of resident-as-teacher programs (eg, during internship or even the end of medical school) coupled with guided reflection on learning experiences may better align programmatic support with the process of residents' teaching skill development.

Our results highlight current challenges related to feedback in residents' development as clinical teachers. In response to limited direct feedback, residents developed monitoring strategies to stimulate in-the-moment adjustments and refine their approach to future teaching encounters. The lack of direct feedback on their teaching skills parallels residents' experiences across other domains of clinical practice.^{46,47} Furthermore, participants' development of personal monitoring strategies relates to prior work on the importance of informal feedback and learning cues in workplace learning.^{48,49} While informal feedback can contribute to expertise development, the extent to which individuals recognize and use these cues to support growth and development varies widely.^{48,49} Thus, complementing informal feedback with structured forms (eg, direct observation, feedback, reflection with attendings or near-peers) can help all residents recognize and synthesize meaningful learning from teaching encounters.

This study has limitations. We interviewed residents from a single institution at a single point in time. Thus, our findings may not transfer to other institutions or specialties. Residents' retrospective recall of learning to teach may differ from how this process actually unfolds prospectively; we did not

corroborate interview data with observations of residents' teaching practices. While we intentionally sampled senior residents with active teaching responsibilities, we did not collect detailed information about participants' prior teaching experience or interests in education. Thus, we may not have captured differences in how residents with varying levels of teaching interest or experience conceptualize their development as teachers. Future studies exploring residents' development of PCK through longitudinal designs incorporating direct observation of teaching could add important depth and richness to our understanding of how clinical teaching capabilities develop. Nonetheless, we believe our findings are transferable.⁵⁰ We provide contextual detail to support applicability, use representative quotes to promote resonance, and anchor our analysis in the PCK framework to offer theoretical engagement.

Conclusions

Residents' teaching capabilities emerge through integration of their experiences as learners, expanding clinical expertise, and ongoing teaching practice. Their development parallels theoretical frameworks of teacher development, particularly in how they develop PCK by transforming content knowledge into teachable forms through workplace experiences.

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