

# Empowering Learning: Self-Directed Strategies of Internal Medicine Residents in an Academic Coaching Program

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## ABSTRACT

**Background** Self-directed learning (SDL) is crucial for physicians to remain current in a rapidly evolving medical environment, and graduate medical education (GME) is increasingly incorporating academic coaching to support this lifelong learning. Despite this, there is limited evidence on how residents practically implement SDL strategies, particularly within the cognitive load theory framework.

**Objective** To investigate how internal medicine residents participate in SDL within an academic coaching program, focusing on how strategies align with cognitive load theory.

**Methods** This qualitative study occurred in a single internal medicine residency program with a formal, longitudinal academic coaching curriculum. In October 2023, we conducted semistructured interviews with participating residents. We purposefully selected 16 of the 27 eligible residents (59%) and conducted semistructured interviews until we reached thematic sufficiency. We reanalyzed these transcripts using thematic analysis to identify SDL behaviors and resource utilization patterns.

**Results** Three key themes emerged: (1) personalization and structure in learning: residents developed individualized, goal-oriented learning plans; (2) diverse learning strategies with emphasis on retrieval practice: residents frequently engaged in active recall and multimodal resource integration; and (3) deliberate repetition and spaced learning for retention: residents intentionally used repetition and temporal spacing to consolidate knowledge.

**Conclusions** Internal medicine residents employ structured, cognitively informed SDL strategies when provided with academic coaching support.

## Introduction

Physicians face the constant pressure to stay abreast of the rapidly evolving medical landscape. This expansion of knowledge necessitates continuous learning, often through self-directed learning (SDL) strategies.<sup>1,2</sup> While various viewpoints on SDL exist, our understanding is informed by Knowles, who defines SDL as a process in which adult learners proactively identify their learning needs, locate and utilize appropriate resources and techniques, and actively monitor and evaluate their progress toward achieving their learning goals.<sup>3,4</sup> This process can occur independently or with the guidance of an academic coach.<sup>5,6</sup> While the importance of SDL for resident education has been widely acknowledged,<sup>7,8</sup> a gap remains in our understanding of how residents implement SDL strategies in practice. While emphasizing the importance of SDL principles,<sup>3,4</sup> existing literature provides limited insights into the specific strategies and resources residents employ, particularly within the context of structured

learning programs like academic coaching. Academic coaching specifically refers to a coaching archetype focused on cultivating SDL, metacognition, and goal setting to achieve academic and professional success.<sup>5,6,9</sup>

Building on prior quantitative improvements in Internal Medicine In-Training Examination (IM-ITE) scores and qualitative evidence of enhanced learner metacognition, learning structure, and accountability for completing learning plans achieved through academic coaching,<sup>6</sup> this study investigates how residents leverage resources and employ SDL strategies within the coaching framework. This inquiry, framed within the context of cognitive load theory, applies principles of human cognition to instructional design, optimizing learning.<sup>10,11</sup> According to cognitive load theory, working memory has limited capacity and duration.<sup>12</sup> Sweller et al explain that the demands on working memory can fit into 3 categories.<sup>10,11</sup> First, intrinsic cognitive load arises from the inherent complexity of the material itself. Second, extraneous cognitive load results from poorly designed instructional methods or tasks that unnecessarily burden working memory. Finally, germane cognitive load refers to the mental effort to process and integrate information, facilitating deeper understanding and knowledge construction.<sup>10,11</sup>

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*Editor's Note: The online supplementary data contains the interview guide used in the study.*

Effective instructional design minimizes extraneous cognitive load by presenting structured, real-life tasks that progress from simple to complex. This approach optimizes working memory, allowing learners to efficiently use cognitive resources and facilitating long-term storage.<sup>12,13</sup> However, program directors lack evidence-based insights into which SDL strategies residents employ and find most effective. With this knowledge, program directors can systematically incorporate successful strategies into curricula, programs, or targeted interventions to help their residents adopt more effective learning methods. By identifying the strategies residents successfully employ, we can better equip them to become independent learners. Such strategies ultimately allow them to best meet their ongoing learning needs over their careers. With this goal in mind, we asked: What strategies and resources do internal medicine (IM) residents use to support SDL in an academic coaching program?

We previously explored the impact of the academic coaching program on residents' SDL.<sup>6</sup> In this study we revisited our existing qualitative data to explore in greater depth residents' strategies and resources for supporting SDL within an academic coaching program to examine how residents develop strategies and utilize resources to support SDL within an academic coaching program. The findings aim to inform the design of more effective learning programs.

## Methods

### Sample and Setting

Pragmatism is a research paradigm that focuses on what works to address real-world problems. It values practical outcomes, blends methods, and emphasizes the usefulness of results for stakeholders and society.<sup>14,15</sup> Guided by a pragmatic orientation, this study was conducted within a midsize IM residency program, starting in October 2022. Residents who scored below the 35th percentile on the IM-ITE were required to participate in the academic coaching program, while other residents could choose to participate voluntarily. Based on the American Medical Association Coaching Implementation Workshop, the program aimed to enhance residents' SDL.<sup>16</sup> The intervention started with structured workshops, with participants developing individualized learning plans (ILPs) in a specific, measurable, achievable, relevant, and time-bound (SMART) goal format for the academic year.<sup>17</sup> Thirteen faculty coaches from IM and related specialties volunteered and received training via a 1-hour faculty development session that covered reflective practice frameworks, scripts, and contracts. These coaches met bimonthly with assigned residents, independently of advisor meetings, and received monthly

### KEY POINTS

#### What Is Known

Academic coaching is increasingly used in graduate medical education to support the lifelong skill of self-directed learning, though we know little about how residents implement this skill.

#### What Is New

This single-site qualitative study of internal medicine residents in a coaching program found they use structured, cognitively informed strategies, including goal setting, retrieval practice, and spaced repetition.

#### Bottom Line

The results of this study can be used by program directors to inform the design of more effective learning programs in their residency programs.

check-in emails. While the meeting format (in-person or virtual) was flexible, academic coaching materials focused on enhancing residents' SDL skills.<sup>6</sup>

### Design and Intervention

The academic coaching program aimed to facilitate the development of SDL by equipping residents with the skills to independently assess their learning needs, set meaningful goals, and identify the resources and strategies required for success. The workshops included formative exercises that focused on critiquing and developing SMART goals. Based on these goals, each resident created an ILP that guided their learning throughout the academic year.

### Data Collection

We performed a secondary analysis of qualitative data collected to explore the impact of the academic coaching program on residents' SDL.<sup>6</sup> Residents who had met with their assigned coach at least once were invited to participate in semistructured interviews conducted virtually via Google Meet in October 2023 (interview guide provided as online supplementary data). The interviews explored residents' experiences with the academic coaching program, focusing on their perceptions of the relationship between coaching and SDL, and the strategies and resources they employed in their SDL journeys. The authors digitally recorded, transcribed, and verified all interviews for accuracy. Data collection for the primary analysis continued until we achieved thematic sufficiency for our initial study question, ensuring a rich, comprehensive dataset for analysis; in this analysis, we did not perform additional interviews but did critically analyze the data from the existing interviews to ensure it was sufficient to robustly address our research question. We reached this consensus through discussion with all

authors that involved mapping our final themes to our research question.<sup>18</sup>

## Data Analysis

We analyzed interview data using thematic analysis following Braun and Clarke's 6-step approach.<sup>19</sup> Four authors independently coded transcripts using open, inductive coding. While we developed a codebook to track codes between authors, this codebook was not predetermined and continued to evolve in an iterative fashion with each round of analysis. Coding remained open throughout each round so that authors could continue to analyze and reflect upon the meanings that each drew from the data, and the outcome of our analysis was theme development and refinement.<sup>19,20</sup> The team held frequent discussions throughout the analytic process to iteratively reflect upon insights and connections made, and we used memos to process and record our approaches, assumptions, and thoughts during the primary analysis.

In this secondary analysis, one author (K.M.B.) reviewed the coded data to identify specific strategies and resources residents used to support SDL. Four additional authors (J.D.H., H.M., M.E.K., K.R.W.) independently reviewed the coded data to capture all relevant passages. The research team then met to refine and develop themes aligned with the research question, focusing on how residents' learning strategies and resource utilization interacted with cognitive load.

Guided by cognitive load theory, our analysis examined how residents managed intrinsic, extraneous, and germane cognitive load when engaging in SDL. We specifically explored how academic coaching influenced their ability to optimize cognitive resources, mitigate unnecessary cognitive burden, and enhance meaningful learning. This approach allowed us to contextualize residents' SDL strategies within the cognitive demands of medical training, providing insight into how academic coaching can support their development as autonomous learners.

## Reflexivity

K.M.B., the residency program director, co-developed the academic coaching program with K.R.W., the associate program director. Given K.M.B.'s primary goal of evaluating how residents engage in their SDL, the research team adopted a pragmatic approach to data analysis. M.E.K., a general pediatrician and former program director with expertise in qualitative research, and H.M., a health education researcher specializing in coaching and qualitative methods, brought critical methodological knowledge to the study. M.R.K. and E.J. conducted interviews with residents required to participate in the academic coaching program to

minimize potential biases and enhance participant comfort.<sup>6</sup>

The study received ethical approval from the Wright-Patterson Medical Center Human Research Protection Program under protocol #FWP20230008N, with a "Not Research" designation.

## Results

Seventy-six out of 77 residents (99%) participated in a 2-hour interactive session designed to introduce the concept of academic coaching within graduate medical education. These residents included the 29 identified as academically at-risk (38% of all residents) who were required to enroll, and 11 of the remaining 48 residents (23%) who chose to participate voluntarily. Further details can be found in Table 1 of our prior publication.<sup>6</sup> Of the 77 residents, 27 (35%) completed at least one academic coaching session. From these 27 eligible residents, we purposefully sampled participants until thematic sufficiency was achieved after 16 interviews.<sup>6,18</sup> This study identified 3 key themes that directly address the research question, highlighting residents' SDL strategies and methods: (1) personalization and structure in learning; (2) diverse learning strategies with emphasis on retrieval practice; and (3) deliberate repetition and spaced learning for retention.

### Personalization and Structure in Learning

Residents in the academic coaching program created personalized study plans tailored to their specific needs, such as focusing on organ systems, responding to IM-ITE feedback, or preparing for board examinations. One resident shared, "Part of the academic coaching program also had individualized learning plans. So, I created a spreadsheet and an individualized learning plan for what I was going to study ... on this date, I reviewed this, and if I had to, then modified the plan afterward." (Resident 2) Another resident highlighted the balance between structure and flexibility, saying, "That learning plan was the 30 000-foot overview of what I needed to do. But, the methods I could use were flexible depending on my schedule." (Resident 1) Residents often adapted their learning plans to fit their clinical schedules, using lighter clinical months to address more learning objectives. Ultimately, the structured ILPs helped residents transition from initial disorganization to increased confidence and more effective learning. As one resident reflected, "It was nice to have everything in one place ... just having it in one place and then kind of checking it off as I moved along." (Resident 7)

## Diverse Learning Strategies With Emphasis on Retrieval Practice

Residents employ various learning methods to maintain engagement and reinforce knowledge, tailoring their approaches to individual preferences and needs. These methods include reading textbooks (eg, *Harrison's Principles of Internal Medicine*<sup>21</sup>), answering board-style questions, listening to podcasts, watching online videos, using UpToDate (Wolters Kluwer Health), and participating in structured didactics. Retrieval practice is a key strategy for assessing progress, primarily through question banks such as the Medical Knowledge Self-Assessment Program (MKSAP) and UWORLD's question banks.

One resident explained, "Early in residency, it was very much Harrison's and reading textbooks, and that was not efficient... I started transitioning more to online videos... or other forms of audio podcasts, which are things that I could try to do while doing something else to promote learning." (Resident 1) This allowed residents to multitask, utilizing passive review methods, such as listening while exercising or driving, to address their learning objectives. Another resident shared the value of adapting active learning methods: "I focused a lot on question banks, which is the way I learned best, but... being a chief now has opened my eyes to what I missed in the problem-based learning sessions by not being active in my learning." (Resident 9) This suggests that, while question banks were effective, incorporating additional active learning modalities, such as project-based learning, could deepen understanding.

Residents also emphasized the importance of flexibility in their SDL approaches. As one stated, "When I think of self-directed learning, I think of very much what am I doing on my own time to further my education, whether that's reading UpToDate at work, reading MKSAP, listening to podcasts, or watching YouTube videos to learn." (Resident 5) This adaptability enables residents to stay engaged and continuously assess and adjust their learning strategies.

## Deliberate Repetition and Spaced Learning for Retention

Residents in the academic coaching program developed effective strategies that held them accountable for their learning, operationalizing accountability through regular self-assessment and structured review. They consistently assessed their performance using metrics such as question bank completion and topic mastery, prioritizing gaps for review. As one resident stated, "Repetition is the key to learning... hammer things over and over again to make it stick, spending less time on each pass." (Resident 6) This approach

helped residents identify areas needing improvement and track their progress, ensuring they focused on mastering key concepts.

Spacing out learning and revisiting topics at set intervals also played a significant role in reinforcing retention. As another resident explained, "I test what I gain through doing questions online or flashcards," (Resident 4) emphasizing the role of active recall in solidifying knowledge and preventing forgetting. One resident further shared, "And then I also have started integrating Anki decks into my studying, and so I'm creating those myself. Based on my reading and what I feel are high-yield topics from my reading and areas that I know I'm weak in," (Resident 5) underscoring their proactive approach to customizing study tools. Using tools like flashcards and question banks (eg, MKSAP, UWORLD), residents revisited missed content and tracked their progress over multiple attempts. Gradually decreasing review time allowed them to optimize SDL while increasing efficiency.

Through self-assessment and consistent review, the academic coaching program's structured approach to accountability empowered residents to actively engage in their learning and develop the skills necessary for lifelong SDL. By tying learning strategies to measurable progress and ensuring regular revision, the program helped residents prepare more effectively for high-stakes assessments.

## Discussion

This secondary thematic analysis identified 3 SDL strategies used by IM residents participating in an academic coaching program: personalization and structure in learning, diverse strategies with emphasis on retrieval practice, and deliberate repetition and spaced learning for retention. Each strategy aligns with cognitive load theory and reflects how residents managed intrinsic, extraneous, and germane cognitive load to enhance learning efficiency within the coaching framework (TABLE).

Residents utilized coaching sessions to develop and refine ILPs that strike a balance between structure and flexibility. These plans incorporated SMART goals and chronological frameworks to guide study, reduce extraneous cognitive load, and promote deeper learning through goal-oriented organization.<sup>10</sup> Coaching provided the structure and accountability needed to support implementation of ILPs, while allowing residents to tailor learning to their strengths, gaps, and schedules, which was key to managing intrinsic cognitive load.<sup>11</sup> This process aligns with Knowles' definition of SDL, in which learners identify their needs, select appropriate strategies, and monitor their progress.<sup>3</sup> Prior work has shown ILPs can support metacognition

TABLE

Interaction of Cognitive Load Types with Self-Directed Learning Strategies Among Internal Medicine Residents

| Cognitive Load Type                                    | Self-Directed Learning Strategies                                                                                                                                                                                         | Representative Quotes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intrinsic load (complexity of the material)            | Identify complex topics (eg, cardiology, rheumatology) and allocate more time to master challenging concepts. Break complex information into manageable segments (eg, study by organ system).                             | "I think I was like, wait, I still need to stick to a schedule. It really worked for me to focus on one organ system at a time within a set period. So, in that sense, it helped." (Resident 12)                                                                                                                                                                                                                                                                                                                                               |
| Extraneous load (unnecessary cognitive effort)         | Reduce disorganization using structured study plans, spreadsheets, etc. Minimize distractions by setting scheduled study times and focusing on high-yield topics. Reduce study time with each pass to improve efficiency. | "The learning plan gave me a 30 000-foot overview of what I needed to accomplish, but the methods I used were flexible depending on my schedule—whether I was getting married in a week, on an ICU rotation, or in clinic with free time on the weekends. That structure provided a solid framework and definitely supported a more positive workflow." (Resident 1)                                                                                                                                                                           |
| Germane load (deep processing for long-term retention) | Use repetition and spaced review to help encode information into long-term memory. Utilize flashcards, question banks, and mixed practice to facilitate deep, active learning.                                            | "Starting early in the year, if I felt weak in a subject like rheumatology, I'd give myself a full month to review all the content and complete related questions. A couple of months later, I'd revisit it for about 2 weeks, and then again for just a week before boards. I used a repetitive approach because repetition is key to how I learn—I need to go over material multiple times to make it stick. Each time, I'd spend a little less time on it, which allowed me to review more topics in the same structured way." (Resident 6) |

and accountability in coached environments,<sup>6</sup> although their use across specialties is inconsistent. For example, only 21% of emergency medicine programs required all residents to complete ILPs, and fewer than 60% of IM program leaders believed ILPs effectively reinforced SDL.<sup>22-24</sup> Given their potential to minimize extraneous cognitive load, a more standardized approach to ILP integration could help ensure their role in fostering SDL while maintaining flexibility to meet residents' individual needs. Personalized coaching may enhance the utility of ILPs by increasing residents' ownership and investment in their learning.

Residents also reported using a variety of strategies that emphasized retrieval practice, such as question banks, mock examinations, and peer teaching, which were supplemented by reading, podcasts, and videos. These methods were selected strategically to balance intrinsic, extraneous, and germane cognitive load, enhancing retention while minimizing unnecessary cognitive strain.<sup>10,11</sup> This finding is consistent with previous research that shows residents access a wide range of learning resources and that retrieval-based learning is associated with significantly better performance.<sup>25,26</sup> Structured resources, such as Council on Resident Education in Obstetrics and Gynecology–aligned question banks and mock IM-ITEs, have been shown to improve

examination outcomes in obstetrics and gynecology residency programs.<sup>27</sup> Additionally, teaching others reinforces learning by increasing the interactivity of elements, which strengthens long-term memory integration.<sup>11</sup> In this study, coaching helped residents align these strategies with their ILPs, reinforcing goal-directed learning and facilitating reflection on effective strategies.

Deliberate repetition and spaced learning strategies were commonly used to reinforce knowledge and address areas of weakness. These techniques introduce desirable difficulty, promoting germane cognitive load, and long-term retention.<sup>10,11</sup> Karpicke and Roediger's experiments demonstrated that repeated retrieval significantly improves memory consolidation,<sup>28</sup> while eliminating items from review diminishes performance.<sup>29</sup> Additionally, a study on Anki, a widely used spaced repetition tool, demonstrated a significant improvement in licensing examination pass rates among users, despite the Anki cohort having a significantly lower grade point average than the non-Anki cohort.<sup>30</sup> Within the coaching framework, residents were able to incorporate these strategies into ILPs with structured timelines, enabling consistent application and alignment with their learning and performance goals.

We conducted this study at a single institution within a formal academic coaching program, which

may limit its transferability across different specialties and institutions in different contexts. We also lacked data on participant demographics (eg, race, ethnicity, gender, and age), which may impact the ability to assess the influence of coaching across diverse populations. Transferability of findings to other programs in which all trainees must participate in coaching programs might also be limited by the fact that only a subset of our trainees was required to participate, with others self-selecting into the program. Lastly, the program faces a resource constraint due to its reliance on faculty volunteers and the administrative burden of creating and maintaining ILPs, which demands a significant amount of time.

Future research should explore how formal academic coaching programs impact SDL across participant subgroups, institutions, and specialties. Future studies using different methodologies, such as surveys across a broad sample of programs, could compare strategies used by residents who participate in coaching programs to a control group of residents who do not participate in coaching. A mixed-methods approach would be ideal, incorporating quantitative assessments to evaluate the resources and strategies utilized by trainees alongside qualitative insights to provide a deeper understanding of their experiences.

## Conclusions

IM residents in an academic coaching program employed structured, cognitively informed SDL strategies. These strategies centered on (1) personalized and structured learning approaches; (2) the use of diverse methods with emphasis on retrieval practice; and (3) deliberate repetition and spaced learning for retention.

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