Title

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Journal

Academic Medicine, 98(11S)

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Publication Date

2023-11-01

DOI

10.1097/ACM.0000000000005354

Peer reviewed

Professional Identity Formation of Basic Science Medical Educators: A Qualitative Study of Identity Supports and Threats

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Abstract

Purpose: Basic science medical educators (BSME) play a vital role in the training of medical students, yet little is known about the factors that shape their professional identities. This multi-institutional qualitative study investigated factors that support and threaten the professional identity formation (PIF) of these medical educators.

Method: A qualitative descriptive study was conducted with a purposive sample of 58 BSME from seven allopathic medical schools in the U.S.A. In-depth semi-structured interviews of individual BSME were conducted between December 2020 and February 2021 to explore the facilitators and barriers shaping the PIF of BSME. Thematic analysis was conducted.

Results: Factors shaping PIF were grouped into three broad domains: personal, social, and structural. Interrelated themes described a combination of factors that pushed BSME into teaching (early or positive teaching experiences) and kept them there (satisfaction and rewards of teaching, communities of like-minded people), as well as factors that challenged their PIF (misunderstanding from medical students, clinical, and research faculty, lack of formal training programs, and lack of tenure-track educator positions). The structural environment was reported to be crucial for PIF and determined whether BSME felt that they belonged and were valued.

Conclusions: This study shows that although most BSME derive a sense of fulfillment and meaning from their role as medical educators, they face considerable obstacles during their PIF. Structural change and support are needed to increase recognition, value, promotion, and belonging for BSME to improve the satisfaction and retention of this important group of faculty.

Keywords

Since the Flexner Report a century ago, medical schools have been challenged to integrate basic sciences into the medical curriculum.[1] Medical educators with doctoral degrees in biomedical sciences, hereafter referred to as basic science medical educators (BSME), play vital roles in medical education. However, several reports highlight the lack of support for the educator identity of BSME.[2–5] In contrast, a substantive body of literature has emerged on supporting the professional identity formation (PIF) of medical students,[6–16] clinician

educators,[17–22] and clinician scientists.[23–25] As BSME play vital roles in the education and training of medical students, it is important to understand the factors impacting their professional identities to support, engage, and retain this important group of faculty.

Background

In medical education, there is growing recognition of the importance of faculty forming strong professional identities as educators.[18–20,26] Professional identity formation (PIF) is defined as a process of "internaliz[ing] a profession's core values and beliefs."[27] A strong professional identity not only enables medical educators to practice with confidence but also gives others confidence in their abilities to meet the challenges facing medical education.[28,29] A strong professional identity is also key to career choice, motivation, productivity, and the well-being of medical educators.[20,30] Further, because faculty typically have competing identities that are well supported and developed (e.g., as clinicians or researchers), an intentional focus on bolstering the development of an educator identity is merited.[20,31,32]

Although the process of PIF for clinician educators[17–22] and clinician scientists[23–25] has been well described, PIF of basic science medical educators (BSME) is comparatively underexplored. There are a several reasons to suggest that PIF of BSME is distinct. First, BSME likely have developed strong professional identities in other fields prior to entering medical education.[31] For example, for most BSME, an early professional identity as a research scientist is formed in graduate training programs, which are often followed by one or more research intensive post-doctoral fellowships. In addition, basic science faculty who do not have medical degrees are likely to encounter unique challenges to developing an educator identity in a medical school setting, including forming different relationships with medical students compared to clinician educators.[9] While supportive peer relationships with other educators could foster identify formation, such relationships may not develop easily and could be challenged by different professional worldviews and experiences,[33] as well as BSME being siloed in different basic science departments. For these reasons, identifying factors that influence PIF of BSME is a necessary first step to inform faculty development and structural support, and ultimately ensure retention, satisfaction, and other benefits of a strong educator identity for this important group of faculty.

To date, little is known about how BSME conceptualize and manage their complex and evolving identities. Although most faculty development programs focus on knowledge and skillsets, strategies are needed to embed PIF into existing programs to support educator identity. Currently, most strategies support clinician educator identities,[34] and strategies designed to support BSME identities specifically are lacking.[35] One recent study examined the PIF of basic science teachers at four Indonesian medical schools and found that participants were internally driven and "knowingly chose their careers" as basic science teachers.[35] Yet knowledge of the factors that facilitate or inhibit the formation and integration of complex identities of BSME remains largely unstudied and may have important implications for faculty development. The purpose of this study is to answer the following research question: How do BSME view their PIF as educators, and what supports and threats to PIF do they experience?

Method

Study Design

We designed a multi-institutional qualitative descriptive study to explore the PIF of BSME and identify facilitators and barriers to identifying as a medical educator.[36] We adapted a constructivist approach to understand the relatively nascent space around the PIF of BSME.[37,38] Semi-structured individual interviews were conducted to allow for the possibility of unexpected responses. We intentionally did not adopt a specific PIF theory during the initial stages of the project to avoid prematurely restricting our inquiry. Participants were recruited from seven allopathic medical schools in the U.S.A. representing the study team's institutions, which were diverse in location and mission and included both new and legacy medical schools, as well as state and private medical schools. A purposive sampling strategy was used to select full-time faculty members with a doctoral degree in a basic science discipline, who had a minimum of 10% effort in medical education. Individuals with MD/DO degrees were excluded from the study. Eligible participants (n=123) were recruited via email. The study was approved by the IRB at each institution conducting the research.

Interview Guide and Data Collection

The interview guide was developed collaboratively by the entire study team and was informed by the literature and personal insights of the study team (see Appendix A). Participants were asked about their pathway into teaching, their professional identity and supports and challenges to their professional identity, their experiences as scientists teaching medical students, and were invited to share suggestions for the future support of BSME. The guide included demographic questions and was refined and finalized by the interviewing team (DB, JVB, KBD, MH, KQ, RLT) through a round of interviewing practice and piloting among the team members, which helped to ensure consistency across interviewers. Interviews were conducted and recorded either via video conferencing software (e.g., Zoom) or audio recording using a handheld recorder. Interview recordings ranged from 15 to 93 minutes and averaged 41 minutes. Whenever possible, interviewees were matched with an interviewer from a different institution. Interviews were transcribed verbatim, verified for accuracy, de-identified, and uploaded into a qualitative data analysis software program (Dedoose, SocioCultural Research Consultants, LLC.). Throughout data collection, interviewers engaged in memo-writing as an approach to reflexivity, and documented interactions between participants and interviewers and captured initial analytic impressions of the data.[38,39] The interviewer team also held regular meetings throughout the interview process to debrief with one another about the interviewing process and what they were hearing during interviews.

Data Analysis

Once data collection was complete, the coding team (JVB, BLD, MH, KQ) analyzed transcripts following the tenets of thematic analysis.[40,41] First, each member of the coding team independently open-coded the same selected five transcripts that were selected for maximum variation and then met to establish a preliminary list of codes and an initial draft of the codebook. Next, the team applied the draft codebook to one interview from the first

round and one new interview, paying close attention to code definitions and boundaries between codes, and met to discuss and draft a refined version of the codebook. Then, each of the 4 members used the refined codebook to code three new transcripts. Each coded transcript was reviewed by another coding team member to ensure agreement and consistency and any discrepancies were discussed by the coding team. Once agreement across the team members was achieved, the codebook was finalized, and the remaining transcripts were divided among the four team members for coding. Throughout this process, the coding team met and discussed questions or disagreements that arose until resolution was achieved. Once all transcripts were coded, the coding team began identifying themes[41] and then sought assistance from the full research team.

Our analysis was sensitized by Cruess, et al. (2015) who identified three domains that influence PIF: individual, relational, and collective.[6,42] Identified themes were shared with the entire study team who participated in drafting code summaries (brief descriptions of the data within codes), identifying themes, and discussing how themes were interrelated. All research team members participated in searching for themes, reviewing themes, and defining and naming themes through a series of written memos and meetings.

Reflexivity

The research team brought different perspectives and training and included 12 BSME with PhDs in various basic sciences disciplines, one PhD in sociology, one MD with a PhD in health professions education, and one MD with a PhD in social anthropology. One BSME with a PhD in a basic science discipline also has a master's degree in health professions education. The research team also included junior and senior faculty members with five research team members serving as associate or senior associate medical school deans. The interviewing and coding teams included overlapping but different study team members. Six research team members not involved in data collection and analysis also completed interviews as participants. The "insider" status of some of the members of the study team was an advantage in informing the purpose of the study, the research questions, and study implications. Insider status for researchers has been utilized and described elsewhere in medical education literature, and it can provide a more nuanced research perspective, but care must be taken to avoid the over-influence of insiders' personal experiences.[43,44] We were comfortable adopting an insider status for some members of our team because of the large size of our study team and because these team members would not be involved in data collection and primary data analysis. Further, the transcripts were anonymized including removing institutional, departmental, and center affiliations, as well as scientific disciplines, before analysis to reduce the potential for privileging experiences of the insider study team members over other participants in the study.

Results

Fifty-eight out of 123 (47.2%) of eligible BSME volunteered to participate in the study between December 2020 and February 2021. Table 1 reports participant characteristics. We identified three domains of key influencers on PIF for BSME: (1) personal factors; (2) social factors, and (3) structural factors. We identified themes related to PIF supports and

threats within each domain. Table 2 includes additional quotes for each domain and theme. Participants were assigned an identifier (two-digit number with institution letter).

Domain 1: Personal Factors

Many BSME described internal factors influencing PIF, such as personality and particular skills. Three themes were identified within this domain: (i) attraction to teaching, (ii) satisfaction with medical education, and (iii) the influence of imposter syndrome.

1.1 Attraction to teaching.—Many participants had early positive experiences during training that confirmed teaching as something they enjoyed or an area of talent.

> I start[ed] as a researcher and that's what I plan[ned] to be when I decided to go to college. Along the way, I decide[d] to become an educator. It's almost like I chose to do research, but education chose me. […] It was natural. I was in the lab. I was mentoring the younger people. I was staying […] to teach instead of doing big research. Yeah. I changed my identity. I was [a] researcher. Now, I'm [an] educator. [96-F]

Many received student and mentor feedback that they were good teachers, which further encouraged their pursuit of educating medical students.

> I got a job in a science lab as an undergraduate […] then I started teaching other people, like new people that had joined the lab. And I kept getting feedback that I was a really good teacher. [23-B]

Finally, participants also described situations in which an unexpected teaching opportunity exposed them to the rewards of teaching early on:

> Somebody left very suddenly, and the next year, I was asked to take over his lectures […] that was a daunting task for me but it was very enjoyable, once I got into it. [82-D]

Whether intentional or happenstance, many participants identified enjoyable teaching experiences. They also discovered their talent through these experiences, which laid the groundwork for an evolving role in medical education.

1.2 Satisfaction with medical education.—BSME described the act of teaching as a strong support of their identities as medical science educators because teaching was fun and because medical students were motivating, bright, and appreciative.

> The students are so appreciative. And those interactions with the students are what kind of fuel me. They give me energy. I get tired and then I get refueled by my interactions with the students and then I can go again. [44-E]

Teaching medical students also supported PIF by providing participants with a sense of fulfillment, and they described how they experienced immediate rewards with learners that they did not experience as basic science researchers.

> I felt like research itself is not very rewarding in terms of getting immediate reward […] It can take years before you can publish a paper or get a result that is exciting

> […] You know you teach, you either get the feedback that the person understood, or the class was happy or not […]. And I was attracted to that, the fact that I could gain that kind of reward that science doesn't give you. [79-C]

1.3 Influence of imposter syndrome.—Participants reported feelings of inadequacy and doubt about their role educating medical students that threatened their identities as BSME.

> There is sort of an imposter syndrome that was very difficult to overcome. I remember going into my first job thinking these are like the smartest kids in the world, and I'm supposed to teach them […]they probably know more than I know right now before we even walk in the classroom. [81-B]

Others felt that their lack of training in clinical medicine and education challenged their identity formation:

> I suppose one other small component is if you're a basic researcher and you find yourself in a medical educator position and you never actually did a medical degree, there is a slight concern that you might be trying to teach people things that you haven't actually been taught yourself. [66-C]

Domain 2: Social Factors

At the social level, participants discussed the ways in which interactions with other individuals as well as involvement with local, national, and international organizations influenced their professional identity as BSME. Within this domain, three themes were identified: (i) mentor modeling provides encouragement, (ii) communities of practice are critical, and (iii) feeling devalued hinders belonging.

2.1 Mentor modeling provides encouragement.—Mentors were reported to be a positive support of PIF for BSME. Mentors provided a range of both tangible and intangible supports: they sponsored participants, opened doors to teaching opportunities, and provided feedback and encouragement.

> As I tiptoed into deciding whether or not I wanted to be an educator I had some really good mentors here that really kind of guided and shaped my path forward. [16-C]

For a trajectory that was unknown to most faculty, mentors also provided powerful evidence that a career path as a basic science medical educator existed and could be fulfilling.

> [Mentors] just kind of gave me hope and mentorship and could see other opportunities. […] teaching in med school and helping me kind of get these positions and […] succeed in those positions. [85-B]

Participants consistently conveyed a belief that having good mentors was not to be taken for granted, using language like "I was super fortunate" [29-C] and "I've been incredibly lucky" [89-D] to describe their experiences.

2.2   Communities of practice are critical.—For participants in our study, finding like-minded people with similar training and education roles typically was not easy. However, when they did find "their people," it provided an incredibly powerful force for identity development. For some BSME, their "people" were found through informal local groups:

> So for me it was really beginning to interact with colleagues who were educators, not [just] colleagues who were bench researchers who might happen to teach. [69-B]

Teaching academies at individual institutions also provided an opportunity to be surrounded by like-minded people.

> So as far as becoming a medical educator, and sort of my professional identity, when I was looking for my peeps, so becoming a member of the [medical education teaching academy] was huge for me, because then I kind of found my peeps. [67-G]

Finally, other participants described finding community in national and international professional associations or societies for educators.

> My colleagues at [a national medical science educator organization] were critical, and [Name] as a society was critical to really create a community of practice and to enable the opportunities that like-minded individuals, that is individuals that were scientists, but also interested in optimizing education and learning could meet. [59-D]

2.3   Feeling devalued hinders belonging.—While mentors and communities of like-minded individuals were a positive force when identified, many BSME described interactions and comments that threatened their PIF. Participants reported feeling misunderstood, disrespected, or devalued by members of several groups, including other basic scientists, clinician educators, or medical students.

> Amongst PhD science, PIs, I think there still is somewhat of a either you're a PI and you've got R01 grants and that equals you've succeeded, or you do stuff like teaching, which means you couldn't do the former, so you reverted to the latter. And so, that's a little bit of a challenge. Because, I didn't really see myself as having failed. [29-C]

Finally, some participants felt their expertise was not valued by the medical school community, and described a series of changes that contributed to this feeling:

> The changes in medical education, a huge increase in the disregard for basic science and faculty from basic science backgrounds and that revised curriculum and emphasized clinical training at the reduction of basic science education, and that students feel that anything that doesn't directly help them pass step one of the boards is irrelevant, a waste of time and should not be taught. [38-D]

Domain 3: Structural Factors

In the structural domain, we identified four themes: (i) paucity of formal training programs, (ii) unclear career trajectories and variable departmental alignment, (iii) administrative leaders set the tone for valuing BSME, and (iv) misalignment between institutional mission and faculty incentives.

3.1 Paucity of formal training programs.—A minority of participants indicated that they received formal training in education during their graduate (PhD) program. In some disciplines, such as Clinical Anatomy, there was a heavy focus on teaching. For a few, obtaining a certificate in teaching was helpful, however for most the lack of training opportunities for teaching undermined their PIF as a BSME.

> To become a medical educator, getting a PhD […] I understand why you want to have your professors to have that really in-depth knowledge. But I felt that I also would have benefited from this same amount of knowledge on how to teach and effectively and how people learn […] I think that the system isn't necessarily set up for people to become educators, the system is set up for people to become PIs. [23-B]

3.2 Unclear career trajectories and variable departmental alignment.—The feeling that the "system is set up" for research and not education arose frequently as an institutional threat to PIF. First, many did not even know that a career as a medical science educator existed.

> One of my co-postdocs was about to apply for an educator job, and so I followed her along and was sort of, "Whoa, that sounds interesting." I didn't really know that path existed. [57-G]

Even when individuals were aware of this career path, institutional threats to PIF resulted from uncertainty around expectations for promotion.

> When it comes to the promotion and tenure, it's a constant discussion of I don't have the same publications that a researcher will. So when it stacks up side by side in the same promotion and tenure committee, this one is fantastic. And this one has no publications or very few, so clearly not the same […] it's been an issue mentally. I think about it. [51-C]

Finally, shorter contracts associated with educator positions at some institutions threatened a sense of value and security.

> There have been moments of like, "Gosh, my department could just decide to not renew my contract next year." And that's a weird position to be in […] where I'm doing a really important job and I don't have tenure. I actually try to just not think about it a lot. I've accepted it. […] Something that would make a big difference to other people where […] there is a position where you're focusing on professional education is for it to be a tenure track position […] with the respect and benefits that other faculty experience. [9-G]

The departmental home for BSME differed across institutions with varying influences on PIF. Some felt isolated in departments without other educators: "I'm on an island" [51-C]. However, other faculty described being in a department of educational faculty, which supported their PIF.

> I tell people when we're recruiting, I'm in this really special bubble that I hope never pops, because we've got a decent sized department here where we're all 100% supported by the institution to be educators and to teach and innovate and do scholarship and publish. […] I've landed in a very special place…[69-B]

3.3 Administrative leaders set the tone for valuing BSME.—Some participants described leaders in administration who set a clear tone of valuing education:

> I think that really the support for the role really comes from the top. […] the dean is very keen to keep medical educators involved in all aspects of the medical school. And of course, the administration is as well. In fact, they just named a director for faculty development. So, that's been a very positive sign. [21-A]

3.4 Misalignment between institutional mission, faculty incentives, and structural support.—Some BSME described an environmental milieu that was less supportive of education and a misalignment of the institutional teaching mission with the actual incentives and recognition provided to faculty:

> I think there should be clear paths to promotion that are teaching educator tracks that we don't get penalized for not having clinical care […] if you're a basic scientist, they feel like, "So where's your research lab?" It's like, "You gave me no startup money and no space. How come you now want a grant? […] truly putting the actions to supporting them throughout their work and promotion that you truly value the teaching, not something like, "Oh, well we say we value teaching, but we actually want you to do all this other stuff to get promoted." [4-B]

For some, movement toward integrated curricula also shone a light on the divergence between the stated and actual value of BSME.

> All of a sudden, you come sweep in and have a new curriculum revision and put MDs in charge of everything. Things like that really hurt the identity. I think […] you need to have the respect from your institution for the role of foundational sciences and the foundational scientists. [27-C]

Furthermore, mismatch between words and financial support undercut a sense of value as an educator:

> I have changed and continue to change my focus on my work. And I'm not sure the institutional structure is keeping up with that. Meaning I still have concerns about funding my salary […] I can give you an example. When I was offered [to] take on an administrative role, the Dean […] asked what I wanted in terms of financial support. And I just basically said, "You don't have to give me a raise. I just don't want to have to worry about funding my salary anymore." [28-E]

Whereas participants often spoke in relatively balanced ways about supports and threats in personal and social domains, discussion of structural aspects of identity formation were often focused on threats. In addition, participants often articulated structural factors as the most important. Finally, many participants called for structural support when talking about future priorities for supporting PIF of BSME.

> It's not something to just hire somebody and call them a med educator, and think that they're going to go out, and just teach med students, or maybe some grad students techniques and that can go on for 30 years[…] as we go down that road, we have to make sure that the people who are doing the education are well compensated for it, because it requires a lot of education, and a lot of talent. And that they're nurtured, appreciated, and developed, and that they have some job stability. [68-D]

Discussion

This study identified key supports and threats to PIF of BSME in three interrelated domains: personal, social, and structural. Interrelated themes within these domains describe a combination of factors that pushed BSME into teaching (positive teaching experiences) and kept them there (satisfaction and rewards of teaching, communities of like-minded people), as well as factors that challenged their PIF (misunderstanding from medical students, clinical and research faculty, lack of formal training programs, and lack of tenure-track educator positions). The structural environment was reported to be crucial for PIF and determined whether BSME felt that they belonged and were valued.

Our findings contribute to the small number of studies on the PIF of BSME. In one recent study of PIF of basic science teachers at four Indonesian medical schools, internal motivation for teaching and institutional support were important, which resonated with our findings.[35] However, because all of the participants in that study were medical doctors with some holding a master's degree or PhD,[31] it is unlikely that these MD basic science educators experienced the same set of supports or threats as described by the PhD participants in our study (e.g., the self-doubt stemming from lack of familiarity with the clinical environment). While Soemantri et al. (2022) found that individuals "purposively and knowingly chose their careers as teachers" and "did not perceive conflicts between their roles as teachers and their roles as doctors,"[35] our participants described a less linear and more coincidental pathway into teaching and experienced tensions between their identities as educators and researchers.

Our findings introduce several PIF themes that are unique for BSME. First, the preexisting professional identity as a researcher can be powerful and better supported with more social capital than the educator role, creating challenges to PIF.[26] Participants in our study navigated an uncertain career trajectory as they explored opportunities to teach (as opposed to research) and also encountered feeling untrained to teach, because their training was predominantly in the basic sciences. In addition, the lack of clinical knowledge created feelings of being an imposter for many participants in our study who were teaching medical

students. Finally, many participants described trying to form professional identities as educators in institutional structures that were created to support research, not education.

We applied Kehoe et al.'s (2016)[45] of domains as "cogs" to illustrate the interrelation of our themes (Figure 1). PIF as a process is most effective "if all levels are operating effectively."[45] That is, if all levels (personal, social, structural) are rotating in a positive direction, participants felt the most supported in their professional identity as educators. If some of the cogs were not rotating in a positive direction, participants felt less supported. When cogs were rotating in different directions, positive momentum had to be very strong at another cog level to keep the overall direction positive. For example, in institutions where BSME are siloed in research departments and not provided clear opportunities to advance, they also often reported feeling misunderstood by their research faculty colleagues.

We depict the structural domain as the largest domain (and cog) because participants spoke *at length* about various structural components that either did or did not support their identity and success as medical science educators. The salience and frequency of structural level factors in our data was unexpected and diverged from the "collective identity"[6] domain of Cruess et al.'s (2015) model that emphasizes social group belonging. Although individual experiences and interactions with others mattered for PIF, the structural environment either made participants feel welcomed and at home, or that they did not belong. Many factors constituted whether the structural environment felt hospitable, and schools with traditional basic science departments faced more challenges to creating a career pathway for BSME when compared with schools in which educators worked together in the same department with the mission to educate medical students. Of note, even when participants discussed structural factors that were supportive of PIF for BSME, it was often described as special and rare.

Our findings corroborate findings in the literature calling for more attention to structural aspects of PIF.[1,8,24] Scholars have classified theories of PIF into two types: one focused on what is within a person and the other focused on the social and structural.[24] A recent critical review of interventions on PIF in medical education also indicates that there is a gap in the literature about PIF interventions in medical education addressing institutional factors.[8] Our study not only identified structural factors as key threats to BSME PIF but also proposes a model to frame how the personal, social, and structural factors interact with each other.

Overall, the notion that education is a legitimate and desirable career path for faculty with PhDs in basic science disciplines was made clear in this study. Institutional investment in educators was seen as critical, as educators need to be nurtured, developed, compensated fairly, and provided with job stability to maximize performance and growth in their roles. The results of this study inform the academic medical community about the identity of this important group of faculty, and ultimately, highlights the need for structural change and support to institutionalize recognition, value, promotion, and belonging for BSME. These findings suggest that academic medicine leaders aiming to recruit, develop and retain BSME faculty should consider ways to support this group of faculty. Developing a local teaching academy, with specific attention to areas of divergent faculty development support for its members, is one possible approach. Ensuring that BSME have adequate resources to

attend and present at educational conferences in person, as many of our respondents found "their people" at national and international meetings, is another viable approach to support BSME and foster inter-institutional relationships and collaborations. Finally, institutions should examine and revise and/or clarify their promotion and tenure criteria for basic science faculty who have primary roles as educators to ensure that these faculty are rewarded, promoted, recognized, and valued.

A limitation of the study is that the research team members recruited participants from their own institutions, which may have biased the enrollment. However, faculty from all basic science disciplines and years of services were sampled and code saturation was reached.[46] In addition, including participants from seven different institutions increased the generalizability of the study findings. Although we had a large sample size of 58 participants, we are not able to ensure that the experiences of BSME who chose to participate in this voluntary study are the same as those who did not choose to participate. Study participants averaged 18 years on the faculty, so the data may be slanted towards the experiences of faculty who are more senior in medical education, but study participants had a broad range of time as faculty (0.5–46 years). Information about the distribution of identity characteristics within the general population of BSME's is currently unknown, thus we cannot ascertain to what extent the data reflects the diversity of BSME in general. Some participants declined to provide this data, while other IRB protocols prevented inclusion questions related to self-identified race and ethnicity. Because the majority of our sample self-reported as having a white racial identity, we are limited in our ability to report aspects of PIF more specific to BSME who identify as Black, Indigenous, or Persons of Color. Future studies are needed to explore perspectives of diverse BSME on PIF.

Conclusion

Our study demonstrates that the process of developing a professional identity as a BSME is complex and replete with both supports and threats to PIF. At a time when much of the current PIF research focuses on other groups and on individual level processes and interventions, it is particularly important to understand and consider the structural domain that our participants identified as key in creating an environment in which they can thrive as BSME. Through an improved understanding of key factors impacting the PIF of BSME, this group's engagement, development, and retention in medical education can be better supported to enhance their vital contributions to educating future physicians.

APPENDIX

Introduction

Thank you for participating in the study. This study explores how faculty with PhDs in sciences who teach medical students view their professional roles. Results from this study may help us identify strategies for supporting faculty in these roles. We would like to hear about your experiences and perceptions. I will audio record our conversation to ensure accuracy, however, everything that you say here is confidential. The audio recording will be destroyed after all the information has been transcribed. Your comments will be combined with those of other participants and reported in a deidentified format.

I am going to begin recording now. [Start recording in zoom]

Do you have any questions for me before we begin?

Can you please confirm that you are a full-time faculty member with at least 10% effort in the field of medical education or administration?

Because a signed informed consent document would be the only thing linking you to participation in the study, we will be collecting a verbal consent.

Do you consent to participate in this study? [confirm **<u>YES</u>**]

Demographic Questions

Before we start, please answer some short demographic questions: I want to remind you that you don't need to respond to any question that you don't want to.

- What is/are your terminal degree(s)? In which discipline(s)?

- In what year did you obtain your terminal degree?

- Do you direct a research lab?

- In which department and school is your appointment?

- How long have you worked as a faculty member in a medical school?

- Since you became a faculty in a medical school, how many years have you taught medical students or engaged in medical education administration?

- What other students (if any) do you educate?

    – Probe: undergraduate, graduate, nursing, pharmacy, dentistry, physical therapy

- What gender do you self-identify with?

- (added later) What are your racial and ethnic self-identities?

Pathway to Teaching in Medical School

- First, please tell me about your career pathway. What led you to educate medical students?

    – Probe: Were there **specific events or people** who influenced your career path?

    – Probe: Have you received **any training, formal or informal**—that prepared you for your role as a medical educator, both generally as a teacher and more specifically to educate medical students? (Formal: structured training, course work or certificate program; Informal: unstructured mentoring, etc.).

- What helped you to become a medical educator?

    – Probe: Were there personal, interpersonal, institutional, social factors that helped you to become a medical educator, (such as mentors, graduate /post-graduate training programs, access/support for teaching opportunities during grad school)

- What was challenging for you to become a medical educator?

    – Probe: Were there personal, interpersonal, institutional, social factors that was challenging in your pathway to become a medical educator (e.g. lack of graduate/post-graduate training programs, access/support for teaching opportunities during grad school)

Professional Identity

- What are your roles within your department and the medical school?

    – Probe: How is your time split to account for those varying roles?

- **How would you describe your professional identity given your multiple roles?** (Professional identity is about your conceptualization of who you are professionally.)

    – **Do you identify most as a scientist/researcher or an educator, or something else?** Why? (Time spent vs where feel passionate, accepted, etc.)

    – Probe: Has your identification as a basic scientist or medical educator **changed over time?**

- Do you ever feel conflicted in your multiple roles or identities?

    – Probe: How does your medical educator role/identity impact your roles within your own department?

- What supports your identity as a medical educator?

> – Probe: people, experiences, institution support, status/respect issues, faculty development opportunities, **communities of practice/societies**, etc.

- What challenges your identity as a medical educator?

  > – Probe: people, experiences, institution support, status/respect issues, faculty development opportunities, communities of practice/societies, etc.

- Is there a time when you feel like you don't belong to the medical school community?

  > – Probe for specific examples by asking "Tell me more".

Basic Scientists vs Clinicians

- When you teach medical students, you are teaching people who will become clinicians (and not scientists in your home discipline, for the most part). How have you navigated that?

  > – Probe: Do you see yourself differently as an educator when teaching medical students vs graduate students?

- What specific benefits do medical students receive from being educated by you as a basic scientist?

- Do you think your experiences are different from clinicians who educate medical students?

Suggestions for Support

- How can basic scientists be better supported in their identities as medical educators?

  > – Probe: What are one or two priorities for supporting basic scientists in their role as medical educators?

That is all of my questions. **Is there anything else about basic scientists as medical educators you would like to share**? Or anything that I should have asked but you didn't?

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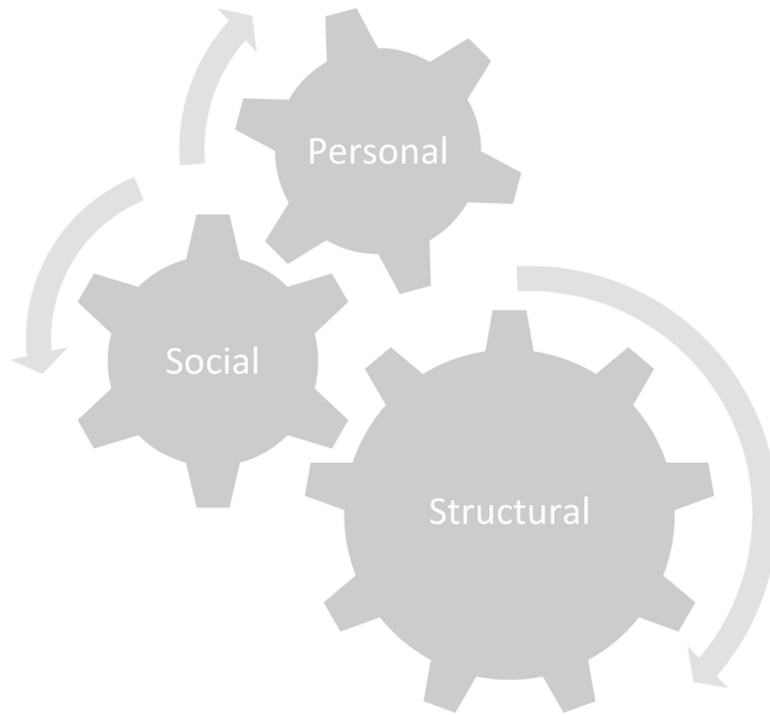
Figure 1:

BSME PIF Domain Cogs

Personal, social, and structural levels are depicted as "cogs" (see Kehoe et al. 2016). When all levels (personal, social, structural) are rotating in a positive direction, BSME participants feel the most supported in their professional identity as educators.

Table 1:

Participant Demographics

	Frequency	(%)
Gender *		
Male	34	59%
Female	24	41%
Race **		
White	40	69%
African American	1	2%
Asian American	1	2%
Asian Indian	1	2%
Other	1	2%
Preferred not to answer/data unavailable	14	24%
Ethnicity **		
Hispanic	4	7%
Non-Hispanic	18	31%
Preferred not to answer/data unavailable	36	62%
PhD Discipline		
Pharmacology & Toxicology	12	21%
Biochemistry and Cell Biology	12	21%
Physiology & Biophysics	10	17%
Microbiology & Immunology	5	9%
Neuroscience	6	10%
Anatomy	5	9%
Genetics	2	3%
Anthropology	2	3%
Psychology	2	3%
Other	2	3%
Research lab		
Yes	24	41%
No	34	59%
	Average	*Range*
Years as full-time faculty in a medical school	18.8	0.5–46

*
What gender do you self-identify with?

**
What are your racial and ethnic self-identities?

Table 2.

Additional Quotes by Domain and Theme

Domains and Themes	Exemplar quotes
Personal factors	
• attraction to teaching	I always knew that I wanted a career where I would teach, just from the time I was really, really young. It was always something I loved doing." [9-G]
	In graduate school, my plan was to be a research scientist, but what I found while in graduate school was that I loved teaching. It was part of my requirements for my tuition and stipend. I had to teach some…courses, and I loved it. So as I moved through graduate school, I realized more and more that I actually wanted to be an educator and not a research scientist [81-B]
	I took over from someone who needed a replacement for an undergrad course, and I really thought that was just going to be a complete waste of my time because it's a lot of work and it's a full semester directing a course. But actually that's when it really cemented that I loved it. [45-D]
	It was so happenstance that it came along. And this is what I'm qualified to do. And this is what I'm good at, I would say.[…] Is it what I sought out to do? Certainly, not. But it is what I'm doing. […] It was just the [teaching postdoc] opportunity […]It was that postdoc. And I've just followed that path ever since. If it weren't for that opportunity, I would never have sought it out. Wouldn't even had known it existed. And then from then on out, it's been easy because, like I said, there's a need, a supply and demand for gross anatomy instructors. [51-C]
• Satisfaction with medical education	It's not really big things, [it's] occasional thank you note from a learner or from a student that you worked with, it's all those little things. Journals don't write you thank you notes when you send them a great paper, right? But if you really help a student then sometimes you get something back from that. [69-B]
	I guess the only thing I want to share is that it's fun. That it's not perfect for everybody, but I think there's a real group of colleagues who like it are passionate about it and do a good job. […] And one of the reasons I like my job so much is because I get to keep learning all the time and learning the new stuff. And I learned the stuff that has a clear medical role and so that's much more exciting to me than the ultra arcane, very deep, basic science ideas. I like that the stuff I'm learning now for my job has medical application. [92-B]
	I just really enjoy the work. [19-F]
• Influence of imposter syndrome	I suppose in like an imposter syndrome kind of way […] there was one time where a student asked me a question, and I didn't even know what the word meant. And it was my first lecture in front of all the students and I was just like, "Oh, God, what am I even doing here?" […] So there have been a couple of moments that I have like, had doubts about my abilities. [23-B]
	I think one thing that can be challenging for new people just in watching my younger colleagues is students can be great and very supportive, but students can also be really hyper critical and can really challenge your ego and your identity. [69-B]
	I think I'm an educator wannabe. You know what I mean? I just think a lot about it. I love to think about it, and I wish I had more formal training that I could say, "Yes, I am an educator." [79-C]
	What challenges [my identity]? What challenges it is all my training being in the sciences and not being in education, essentially at all. That challenges my identity. [92-B]
Social factors	
• Mentor modeling provides encouragement	I told [mentor] I would like to do more medical education like she was doing. And so, she basically went to one of the other block directors and said, "You should have this guy teach for you. He's great." And so, that's how I got my start lecturing. [29-C]
	She felt very fulfilled. Part of what attracted me to [mentor] was I wanted to do education. I knew someone who was excellent at it, and was a PhD, and really enjoyed it. That started me off towards her, talking to her about it. [29-C]
	I also had the luxury of having excellent academic mentors and so excellent educational mentors. I would have a very different perception if I had moved my first academic position and everybody just said, "Forget about teaching, do the bare minimum and focus on your research lab." I would be in a very different place for better or worse, but I didn't. I had really strong educational mentors. They were very progressive. [48-F]
• Communities of practice are critical	Over the course of the year I met people who had similar roles that I did. And I could see how dedicated people were and how professional and how excited and enthusiastic and how important it was. And that helped me kind of regain my confidence that this was an important effort to put my time and energy into. [44-E]
	There are regular opportunities for seminars and engaging with our [teaching program]. There's just a steady reminder of ways in which we can be better teachers. So, that's supported me quite a bit. [60-F]
	Staying involved and getting even more involved with associations is really important to me in terms of seeing new teaching methods that are out there, seeing new research methods, educational practices. […] through like, IAMSE, for example, what are other basic scientists doing in their teaching practice? […] Those sorts of professional development activities always kind of put a pep in my step. [62-G
	[national medical science educator organization] really has been critical in my confidence and self satisfaction as a medical educator… [30-F]
• Feeling devalued hinders belonging	So when I transitioned into this new medical education role, I did feel like it was a step down. I felt like it was not as highly valued by other people. And I had a little bit of a complex about that [44-E]
	I guess the only thing would be that I am not a physician […] occasionally from students, some faculty will say, well why are you even involved so to speak? [28-E]
	The changes in medical education, there's definitely, from my perspective anyway, a huge increase in the disregard for

Domains and Themes	Exemplar quotes
	basic science and faculty from basic science backgrounds and that revised curriculum and emphasized clinical training at the reduction of basic science education, and that students feel that anything that doesn't directly help them pass step one of the boards is irrelevant, a waste of time and should not be taught. And I think despite lip service, the administration reinforces that. [38-D]

Structural factors

• Paucity of formal training programs	I feel like there doesn't exist at least at [current institution] much training in how to [teach] well. And like I was saying some of what I've been trained in, I searched out a lot of it, I searched out. […] So there is nothing particular about basic training and basic science how to be a researcher, there is nothing in that that makes you a good teacher, and certainly nothing that makes you a good teacher of medical students. [87-D]
• Unclear career trajectories and variable departmental alignment	And then when the job that I have came up that was full-time medical education, I didn't even know those existed. That's why I wasn't looking for it and jumped at the chance to take that because that fit with my interests much more than a research job did. [92-B] I think the other people that are coming along in this track that I'm entering or working with, just like me, they had no idea that this was a thing. So I think the variability that I've seen is whether department chairs are knowledgeable enough or value that track enough to tell their people, and if that's the right track for them or not. [33-C] I think from the administrative standpoint, at least from where I sit, I think that it's still a conversation that, are we tenurable? Is this a tenure-worthy act? What is the contribution? It's not a dollar league contribution. What is the contribution? What is the value added? How do we quantify that? Is it the same as tenure track? […] So I think we're not quite there on how do we place a value on it. [48-F] One of the things that could be done […] is […] to have more than one year contracts of the faculty and these medical educators. […] There's no reason when you know that that is a really valued member of the community why you can't give them a three or a five-year contract. I think that would be one of the things that would go the farthest in supporting the faculty… [91-D] Where we are, basic science educators are spread across all over the place, all over different departments. And so we do have some touch points where we can get together, but oftentimes for some of the faculty, they are strangers in a strange land within their even own departments, […] it gets challenging to identify with the folks in your own department. [80-D] The […] chairs, they don't even know why I'm here. They understand that the School of Medicine people asked if they could put me in my department financially. And that's what they know about me. Other than that, it's just a different group of people. [51-C]
• Administrative leaders set the tone for valuing BSME	On the med ed side, it is culturally, there is gravitas to it. There's something there. It's respected. It is a career. It is a career path. It's not just something you do on the side […] I think the dean of the medical school [dean's name] has really built a culture of helping people establish that identity. There is a comradery. [29-C] In addition to having those moments in time and those people that help, the institution really has helped my-- they have supported my identity, they have given me praise for what I do, and so I've never had to fight them on that. [27-C] I think being at an institution that values the education stream. So at my current institution that, the education component is just so much larger than the research side. So I think there is just a large, they place a lot of value on that. […] So for me I'm fortunate. I think I found a home that kind of I do have, I do have that support. [85-B] I think the culture at our institution, [..] there is a position that is funded where you can be an educator without having a lab. So, the very nature of it being there, there's opportunities to learn, grow support for the role, appreciation. And then we also have an [academy of medical educators] that is meant to lobby on behalf of educators and show appreciation. But I would say that just the fact that there is a job, that this is something that is doable and people value it, that it is a respectable thing to do, I think is the most supportive. [57-G]
• Misalignment between institutional mission and faculty incentives.	So I would say in the last couple years I really somewhat became disheartened with the whole experience. […] with some of my [junior] colleagues that are in the process I say you are a great educator, you're putting all your energy, but you have to step back and go this is not going to help you. […] that breaks my heart to have to give that advice to say you really need to look at these other areas and get your publishing and get these things up, which might take away from creating the best materials, really investing 110% into your teaching. [85-B] And I would say that the other challenge is that there's very few opportunities in an academic institution to be fully supported as an educator, because there's not that many grants that fund you as an educator. They might fund projects, but they don't fund you. And so, I think they struggle with that concern. Where are the opportunities? How do they support? Is my chair going to be onboard with this? [33-C]