A Qualitative Study on Instructor Experiences with Learning Objectives in the Basic Sciences

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Abstract

While program-level learning objectives are required for medical school accreditation, session-level learning objectives are not, although many institutions use them. Most pre-clerkship basic science medical educators (PCBSMEs) do not have formal pedagogy training, so it is unknown when PCBSMEs learn about learning objectives or how they communicate them to students. A questionnaire was designed to phenomenologically explore these aspects during PCBSMEs' time as a student and as an educator. Qualitative data underwent inductive thematic analysis and generated two descriptive themes. Theme Educator Experiences describes how respondents learned about and used learning objectives as a student and as an educator. Theme Educator Communications describes how PCBMSEs communicate with students about using learning objectives. The relationship between themes suggest learning occurs following Bandura's Social Cognitive Theory. Findings indicate potential obstacles preventing implementation or communication about learning objectives, regardless of training. Strategies to proactively expose PCBSMEs to pedagogical concepts regarding learning objectives are recommended.
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Key words: learning objective, medical education, pedagogy training, thematic analysis

Introduction

The responsibility of pre-clerkship basic science medical educators (PCBSMEs) is to help prepare future physicians for their respective practice(s) by delivering foundational knowledge and promoting the integration of this knowledge across disciplines. Several factors have been identified as obstacles preventing PCBSMEs from carrying out this responsibility, including learning objectives that are poorly designed (DaRosa et al., 2011). Because learning objectives have been identified as an obstacle for PCBSMEs, this study aimed to investigate their knowledge and experiences with the use of learning objectives.

Definitions for learning objectives vary in the literature. One source describes learning objectives as a "statement that describes in specific terms what knowledge, skills, or attitudes learners should be able to demonstrate following instruction" (Webb et al., 2013). Different sources focus on student- or learner-centered statements of intention or goals (Chatterjee & Corral, 2017; Ferguson, 1998; Hartel & Foegeding, 2004) while others emphasize the measurability upon conclusion of the learning process as an indication of proof of learning (Alsheikh, 2020; Prideaux, 2001). Many sources freely interchange other terms with learning objectives including goals, competencies, or standards, but most often "objective" and "outcome" are found to be interchanged (Hager & Gonczi, 1996; Harden, 2002; McMahon & Thakore, 2006). As evidenced by a study investigating constructive alignment, "intended learning outcome" is frequently used with far less use of "objective" but no differentiation between the two terms was included (Wang et al., 2013). At their foundation, an objective is something toward which effort is directed whereas an outcome is the result of this effort and a retrospective concept.

The Liaison Committee on Medical Education (LCME) requires program-level learning objectives for allopathic medical institution accreditation in the United States (Liaison Committee on Medical Education, 2023). The intention behind using program-level learning objectives is to maintain standardization among medical education programs. These accrediting bodies provide generalized learning objectives at the program-level to guide curricular creation while the creation and inclusion of lower-level (i.e., session-level) learning objectives are left to the individual institutions (Association of American Medical Colleges, 2024; Kassebaum, 1992). By leaving this decision to be made by individual institutions, there is potential for session-level learning objectives to be excluded or substituted for other

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concepts like learning outcomes or program-level learning objectives. There may also be an increased variability in lower-level learning objectives since they are not regulated by an accrediting body.

Session-level learning objectives are also used to maintain curricular alignment by acting as a validation tool for assessments (Chatterjee & Corral, 2017; Ferguson 1998; McMahon & Thakore, 2006; Orr et al., 2022; Wang et al., 2013). Implementing high quality learning objectives at the session-level can increase the likelihood that the information provided to the student is what is truly being assessed. Educators that do not properly align learning objectives and assessment measures can create ambiguity, student misinterpretation, curricular misalignment, decreased student satisfaction, and instructor frustration (Alsheikh, 2020; Collier & Morgan, 2008; Leone et al., 2019). Therefore, it is critical for session-level learning objectives to be implemented in medical curricula to maximize curricular alignment. It is currently unknown how PCBSMEs implement session-level learning objectives in their courses, if at all.

Pedagogical training of PCBSMEs

According to the Association of American Medical Colleges' 2022 Faculty Roster, over 76% of PCBSMEs hold a PhD as their terminal degree (Association of American Medical Colleges, 2022). This means that the vast majority of teaching faculty within medical schools have likely received advanced training in their particular field of interest within the basic sciences, but may have had limited formal training in education prior to their faculty appointment. Many basic science doctoral students pursue a career in medical academia, which frequently comes with the responsibility of teaching (Association of American Medical Colleges, 2022). Yet, pedagogical training is often not a requirement for these teaching positions. Most basic science doctoral programs do not require courses in pedagogical practices, learning theory, or curriculum design. Rather, these programs focus on research wherein trainees gain an in-depth knowledge of one particular basic science area or field. Pedagogical training may often be optional or have limited availability to traditionally trained PhD students. For example, there are twenty-one anatomical doctoral programs in the United States but only eight of these programs formally incorporate education courses or training (Wilson et al., 2020).

The lack of formal pedagogical training may mean that few medical educators know how to use or create learning objectives. This could lead to pre-clerkship classroom environments without consistent proper use of learning objectives. Without learning objectives, it is difficult to achieve curricular alignment with assessments or maintain consistent emphasis between course content and clinical importance (DaRosa et al., 2011; Ferguson, 1998). This creates an unpredictable learning environment that influences students' self-efficacy, goals and expectations, self-evaluation, and behavior (Bandura, 1989). This influence may manifest as an increase in the likelihood for students to develop feelings of mistrust, uncertainty, frustration, and a decreased sense of agency (Bandura, 1989). It may also lead to students forming inaccurate expectations for assessments, which directly shapes their approach to learning (Bandura, 1989; Collier & Morgan, 2008; Leone et al., 2019; Ramsden, 1991).

The benefits of proper implementation of learning objectives extend to both students and educators. Considering many medical students will be placed in a teaching role with patients, medical students, residents, or a combination thereof during their careers, the incorporation of foundational pedagogical theory into their pre-clinical education is not unreasonable (Dandavino et al., 2007). While the current perceptions and uses of learning objectives by pre-clerkship medical students are not well known, there is literature to describe this for other student populations (Brooks et al., 2014; Duke, 2002; Kuhn & Rundle-Thiele, 2009). Medical residents who were unfamiliar with how to use learning objectives advocated for pedagogical training during their education, demonstrating a willingness to learn the practice (Martin et al., 2016). Similarly, undergraduate biological sciences students reported learning objectives were useful learning aids and that optional training in how to use learning objectives would be beneficial for their academic progression (Brooks et al., 2014).

To determine the best approach to improve the implementation of session level learning objectives by PCBSMEs there is a need to first identify existing opinions and knowledge of learning objectives by PCBSMEs, specifically regarding how they define and use them. Additionally, the degree of communication between PCBSMEs and their students regarding learning objectives needs to be identified to establish any gaps (Alsheikh, 2020; Collier & Morgan, 2008; DaRosa et al., 2011; Leone et al., 2019). The LCME may require program-learning objectives, but the real value in learning objectives overall may be in how the students best utilize them to help guide their learning. If educators are not adequately communicating learning objectives and the importance of their use, then their utility can be called into question whether the curriculum specifically creates them or not. This study sought to investigate existing views of learning objectives held by a sampled group of PCBSMEs by specifically asking educators for their definitions, uses, and experience in creating learning objectives, as well as if and how learning objectives were communicated to pre-clerkship medical students.

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Methods

Study design

This study utilized a phenomenological framework throughout to explore the experiences and opinions of pre-clerkship basic science medical educators (PCBSMEs) regarding learning objectives (Giorgi & Giorgi, 2003). The researchers created a pilot questionnaire to ask PCBSMEs how they defined and utilized learning objectives in medical education. The questionnaire was widely distributed via social media and message boards to PCBSMEs, although responses were low and lacked sufficient detail. The pilot data helped the researchers construct a targeted questionnaire for PCBSMEs which then focused on their use of learning objectives and factors which influenced that use. The questionnaire incorporated a paradigm founded on Bandura's Social Cognitive Theory of Learning (Figure 1) due to emphasis on concepts of observation, modeling, reflection, and modification of goals or perceptions observed in preliminary data from the pilot study (Bandura, 1986; 1989; Schunk, 2020). Questions were designed to focus on the use of learning objectives as tools for themselves and their students, in addition to how the educators communicated the use of learning objectives to their students. The questionnaire consisted of multiple choice, multiple selection, and free response questions (Appendix 1).

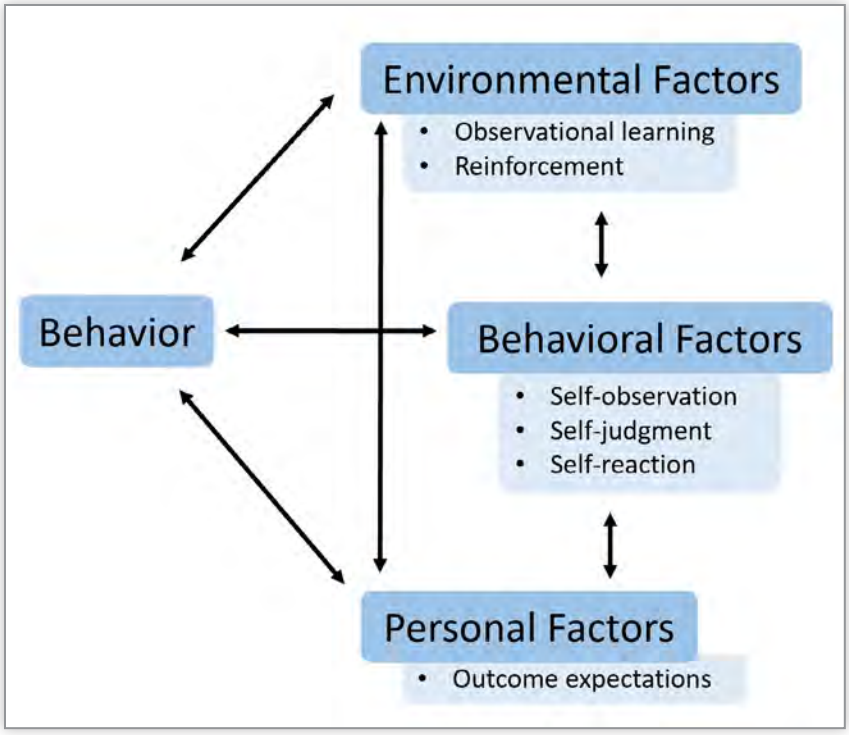

Figure 1. *Visual adaptation of Albert Bandura's Social Cognitive Theory of Learning.*

Setting and participants

Inclusion criteria necessitated the respondents to be currently involved with teaching basic science content to pre-clerkship allopathic medical students. The researchers defined PCBSMEs as individuals who deliver basic science content to pre-clerkship medical students. The basic sciences were defined as those which provide a fundamental understanding of natural phenomena, and which have been further specified by the Association of American Medical Colleges (AAMC; 2024) as "familiar scientific disciplines such as biochemistry, microbiology, physiology, and pharmacology, and their interplay". The questionnaire was distributed to a single allopathic academic medical institution located in the southeastern United States. Completion of the questionnaire was voluntary, self-selected, and participants could withdraw at any point. Participants gave consent by completing the questionnaires.

Data collection

The researchers created a questionnaire based on preliminary results from a pilot study to further investigate PCBSME perceptions of learnings objectives as tools for themselves and their students in addition to communication of learning objectives from PCBSMEs to students. An invitation to complete the questionnaire was disseminated via REDCap (https://projectredcap.org/software/) to all faculty teaching in the basic sciences at the institution of interest (Harris et al., 2009). The questionnaire was sent to institutionally affiliated e-mails in January of 2023. Follow-up reminder e-mails were sent one week and two weeks after the initial invitation.

The questionnaire consisted of multiple choice, multiple selection, and free response questions. Multiple choice and multiple selection questions inquired about demographic information to include level of education and level of medical education at which they were involved with teaching. Free response questions specifically inquired about the respondent's experiences with learning objectives, such as when learning about learning objectives first occurred and through what methods communication about learning objectives takes place.

Data management

The questionnaire was constructed, delivered, and its data stored in REDCap (Harris et al., 2009). No identifiable information was collected from participants. Only the lead researcher (KP) had direct access to the data through a password protected account. Secondary coders (AN and CB) had access to deidentified data through shared permissions from the lead researcher (KP). The lead researcher assigned two-part numeric identifiers to each record wherein the first number

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identified the order of submission of the questionnaire and the second number identified the number of the question for which the response was provided. This study was approved by the Institutional Review Board at the University of Mississippi Medical Center (UMMC-IRB 2022-287).

Data analysis

Free-response questions underwent thematic analysis as described by Kiger and Varpio (2020). Researchers first familiarized themselves with the data before independently generating initial codes. These initial codes were compared between researchers to discuss congruity and differences. Differences in coding were discussed and modified until agreed upon between all researchers before applying the modified codes to the data. Because thematic analysis is a reiterative process, researchers met multiple times to discuss codes until the saturation of data was determined and final codes were agreed upon. Sub-themes and themes were generated independently by the researchers from these final codes and discussed multiple times until agreed upon.

Based on the qualitative nature of this study, the authors acknowledge that each has an inherent bias in the subject matter. Each author has received pedagogical training in the use of learning objectives. The first and second authors were students in an anatomy education doctoral program while the third author has a graduate degree in science education and several years of experience teaching pedagogical theory. However, care was taken to ensure that the data collected from the respondents was analyzed in such a way as to maintain the faithfulness of the given response.

Questionnaire Item	Responses	Response Frequency (%)(n)
1. Did you learn to use learning objectives AS A STUDENT?	Yes	35% (7)
	No	65% (13)
2. Do you utilize learning objectives in your PRE-CLERKSHIP course(s)?	Yes	90% (18)
	No	5% (1)
	Not sure	5% (1)
3. When did you learn to use learning objectives AS A STUDENT?	K-12	0
	Undergraduate College	15% (3)
	Graduate School	15% (3)
	Medical School	5% (1)
	Professional School	0
	Post-Graduate School	0
	Other	0
	Not sure	0
5. Did you learn to use learning objectives AS AN EDUCATOR?	Yes	60% (12)
	No	40% (8)
6. When did you learn to use learning objectives AS AN EDUCATOR?	Undergraduate College	0
	Graduate School	20% (4)
	Medical School	0
	Professional School	0
	Post-Graduate School	5% (1)
	Early Career Faculty (1-5 years)	25% (5)
	Mid-Career Faculty (6-10 years)	10% (2)
	Late-Career Faculty (10 or more years)	0
	Other	0
10. Do you expect your students to know how to use learning objectives prior to being enrolled in your course?	Yes	30% (6)
	No	50% (10)
	Not sure	20% (4)
11. In your experience, how many of your students typically know how to use learning objectives?	All	0
	Most (approximately 75%)	15% (3)
	About Half (approximately 50%)	5% (1)
	Some (approximately 25%)	10% (2)
	A Few (< 25%)	5% (1)
	None	5% (1)
	Not sure	60% (12)

Table 1. *Fixed-item questionnaire items and response frequencies.*

Results

The questionnaire received 28 responses, with 20 retained for analysis. Records were excluded for the following reasons: seven respondents did not complete the questionnaire and one respondent indicated they only taught at the clerkship level. There were seven fixed-item questions which gathered information specific to experience with learning objectives. Some questions were not answered by all participants due to the branching logic of the questionnaire. Most respondents (65%, n = 13) reported they did not learn to use learning objectives as a student with one-third (30%, n = 6) reporting they expected their students to know how to use learning objectives prior to being enrolled in their course. Similarly, 40% (n = 8) of respondents reported they did not learn to use learning objectives as an educator, but the majority reported using learning objectives in their pre-clerkship course(s) (90%, n = 18). Response frequencies to fixed-item questions are reported as percentages in Table 1.

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Free response questions underwent inductive thematic analysis wherein two themes were generated: 1) Educator Experiences and 2) Educator Communications (Figure 2).

Theme 1: Educator experiences

The theme "Educator Experiences" was generated in the context of the respondents reflecting on two different time periods and their experiences with learning objectives during each. This theme was generated from two sub-themes based on the two different time periods: 1) Use as Student and 2) Methods of Learning to Use Learning Objectives Once in an Educator Role.

Sub-theme 1A: Use as a student

Sub-theme "Use as Student" was generated to organize responses describing the time or environment in which first encounters with learning objectives occurred. An example is illustrated by Record ID 17-08 stating, "when given syllabus in undergraduate courses."

This sub-theme also included responses which described ways these respondents were taught to utilize learning objectives while they were a student. Responses were varied but largely included descriptions of learning to use learning objectives as a tool to aid their own learning. Several responses which illustrated the specific actions they took with learning objectives are listed below:

- "As a guide to studying for exams." (Record ID 24-08)
- "Learning objectives served as a guide as to what concepts were important in lectures and also focused my preparation for exams" (Record ID 1-08)
- "I learned to use objectives as a way to provide a checklist of what are the most important aspects of a lecture. I learned that this should help form a non-exclusive outline for understanding the material. Non-exclusive meaning just because a topic may not be on the objectives list, it does not mean it might not be important." (Record ID 5-08)

Sub-theme 1B: Methods of learning to use learning objectives in an educator role

This sub-theme was generated to describe various ways by which the skills of utilizing learning objectives as an educator were learned. Responses ranged from describing formal training to self-teaching as indicated by Record ID 21-11 stating, "reading professional journal articles, attending annual conference meetings, teaching course [sic] with other faculty members and understanding what students need to learn." Several respondents also indicated learning from their colleagues as described below:

- "I learned to use learning objectives from my colleagues" (Record ID 1-11)
- "By example from established teachers." (Record ID 4-11)
- "Experienced faculty was also very helpful and previous lectures to determine flow of the lectures." (Record ID 12-11)

Respondents also described how they were taught to use learning objectives as tools to aid in the practice of backwards design (Bowen, 2017) when creating curricular content. One respondent expressed this by stating:

- "I took coursework in teaching and in doing so was introduced to the use of objectives to guide a class session as well as a course. Among the ways we were taught was in using backwards design to ensure that the objectives for the course were measured through assessment as well as covered in a class session." (Record ID 7-11)

Theme 2: Educatory Communications

The theme "Educator Communications" described how PCBSMEs communicate to their students about learning objectives. This theme was generated from two sub-themes: 1) General Communications and 2) Use-Specific Communications.

Sub-theme 2A: General Communications

This sub-theme described how actively these PCBSMEs communicate to their students about learning objectives. Responses ranged from describing no communication, inconsistent communication, or consistent communication. No communication includes responses where the communication specific to learning objectives was described as absent or minimal such as acknowledging the existence or location of their learning objectives but nothing more. Two examples are provided below:

- "I don't, [students] are just given the word document with the objectives." (Record ID 17-12)
- "I just put them on the lab instructions and email." (Record ID 3-12)

Some responses describing no communication identified specific obstacles which prevented communication regarding learning objectives.

- "... insufficient time is allotted to cover course material, so there is definitely insufficient time to go over the objectives themselves in any detail." (Record ID 2-12)

Inconsistent communication includes responses wherein communication regarding learning objectives differed depending on subject or learning environment.

- "I include the learning objectives as the first slide of each PowerPoint presentation for each lecture…I also include a written description for small group sessions and verbally emphasize the main objectives." (Record ID 13-12)

Consistent communication includes responses describing a routine communication about learning objectives and an active practice of directing students toward using them.

- "I introduce objectives on the first day of class as the best source of information, and the answer to 'what do we need to know'. I make sure to point them out and review them every class session, and I encourage students to base their study around these objectives." (Record ID 7-12)

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Sub-theme 2B: Use-specific communications

Sub-theme "Use-Specific Communications" described communications from these PCBSMEs to students about specific ways to use learning objectives. Responses indicating this specific communication does occur described suggestions for students to use learning objectives as tools. More specifically, these recommendations described using learning objectives to prepare for assessments by focusing content and practicing metacognitive habits. Various recommendations are described by the following statements:

- "I suggest they look at them before class and after class when they review the material." (Record ID 13-13)
- "I encourage them to start their study with an open ended [sic] recall of the objectives." (Record ID 7-13)
- "I tell them that the best way that I know how to use the topic lists is to study until they are able to explain, verbally or in writing, any item on the topic list WITHOUT [sic] needing to consult notes, slides or textbooks. Once the student has that capability, they have mastered that topic item, at least in the time frame of the next exam!" (Record ID 25-13)

Responses also included how this specific communication does not occur. The following quotes represent this lack of communication:

- "Little or no time is spent by me discussing ways to use learning objectives." (Record ID 2-13)
- "I do not specifically tell the students how to use the learning objectives." (Record ID 19-13)

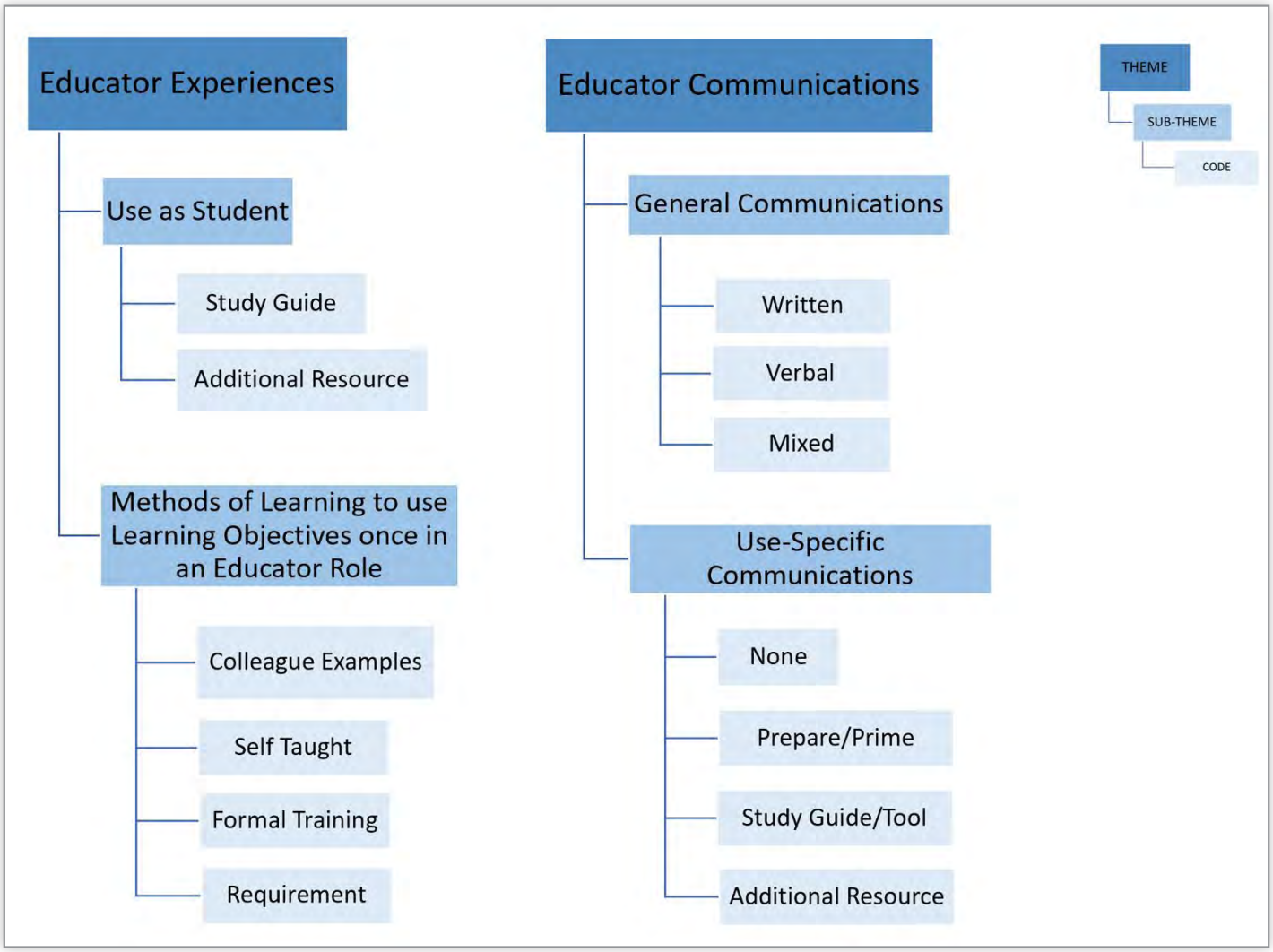

Figure 2. *Inductive thematic analysis results of qualitative data.*

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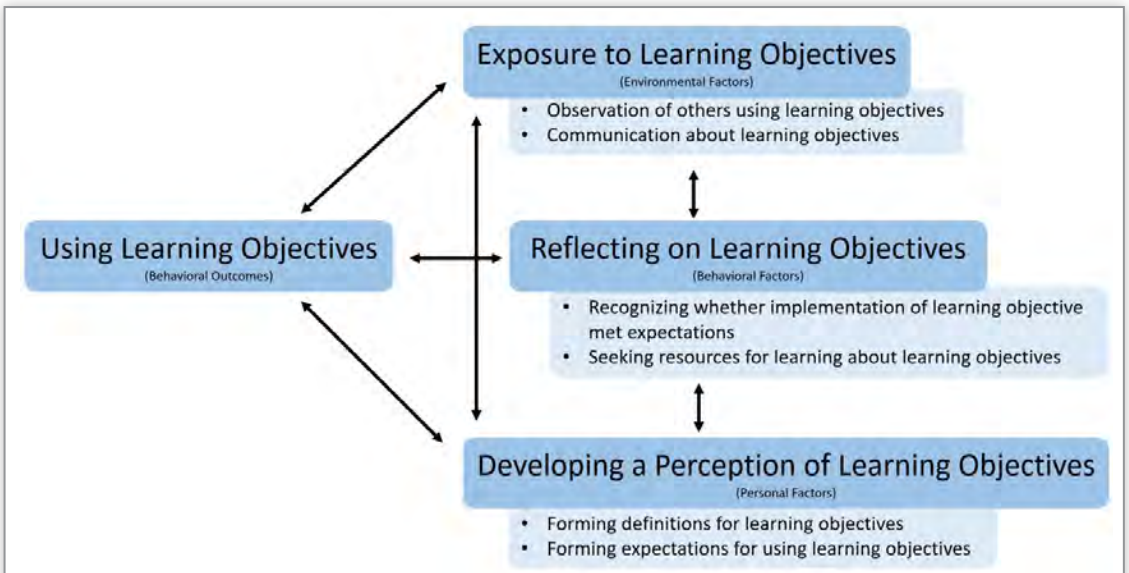
Discussion

This study was designed to investigate how PCBSMEs learned about learning objectives and subsequently how they currently utilize them. This study also investigated communications regarding learning objectives from PCBSMEs to their students. The two themes were generated from codes which reflect the different factors of Bandura's Social Cognitive Theory of Learning (Figure 2). This can be appreciated in that these PCBSMEs stated they learned about learning objectives by observing and receiving communication from others, forming expectations, and reflecting and modifying their framework regarding learning objectives as they gained more experience in their faculty role (Bandura, 1989; Ramsden, 1991). Based on the presented results, Figure 3 was developed to hypothesize the interrelationship between the different experiences educators may have regarding learning objectives and their use of said learning objectives. After modifying the framework to fit the context of learning objectives, each factor (environmental, behavioral, and personal) can be appreciated by the resulting themes and corresponding exemplar quotes from the data.



SCT Model Element	Theme (Code)	Quote
Environmental Factor	Educator Experiences (Colleague Examples)	**"By example** from established teachers." (ID 4)
Environmental Factor	Educator Experiences (Tool)	**"Among the ways we were taught was in using backwards design** to ensure that the objectives for the course were measured through assessment as well as covered in a class session." (ID 7)
Environmental Factor	Educator Experiences (Formal Training)	**"I took coursework in teaching** and in doing so was introduced to the use of objectives..." (ID 7)
Behavioral Factor	Educator Experiences (Tool)	"Early in my **career I found myself still trying to stay ahead** of the students with regard to content knowledge. Using learning objectives that others had prepared **helped me focus my own learning** to prepare for class. **Writing my own learning objectives was also a helpful activity,** as I had to really refresh content and think about what the students needed to know. **It helped to focus my own efforts as an educator** as I prepared for class." (ID 12)
Behavioral Outcome	Educator Communications (Active)	**"I inform the students that I utilize the topic lists as I write my exam questions**. Every question must be directly related to one or more items on the topic lists. There are no exceptions." (ID 25)
Personal Factor	Educator Communications (Additional Resource)	"We tell them that the **learning objectives do not include all information required** to do well in the course." (ID 4)

Figure 3. *Schematic for Albert Bandura's Social Cognitive Theory of Learning (top) and as it hypothetically applies to learning and using learning objectives for participants of this study (bottom).*

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The first theme, Educator Experiences, describes how these PCBSMEs became familiar with learning objectives during their time as a student and as an educator and can serve as the environmental factor within the proposed model. The experiences of Theme 1 provide material for the individual to reflect upon and form expectations, which serve as behavioral and personal factors, respectively, within the model. For these educators, there is likely a relationship between these two time periods in that if the respondent indicated exposure to learning objectives as a student, then they probably formed a perceived value of learning objectives at this time. This perceived value may be reflected in a behavioral outcome of whether, and specifically how, the respondent utilizes learning objectives as an educator. Further investigation is necessary to quantify the strength of this relationship.

Similarly, these experiences may influence a different behavioral outcome which Theme 2, Educator Communications, describes. If the respondent did not learn about the value of using learning objectives, then it is possible they are less likely to actively communicate about learning objectives to their students. In contrast, if the respondent learned about the value of learning objectives, it may be more likely they will actively communicate about learning objectives to their students. To help illustrate this hypothesis, two respondents who self-reported different environmental factors also described different personal factors and behavioral outcomes (Table 2). Record ID 2 responded "No" to learning to use learning objectives as an educator whereas Record ID 7 responded "Yes". Record ID 2 then described passive communication to their students about learning objectives and no communication to their students regarding specific ways to use them. In contrast, Record ID 7 described active communication to their students regarding learning objectives and use-specific communication in the form of a recommended way to use them to support their learning. While this is one example, it provides evidence to support future analyses which could quantify the relationship between these factors.

Questionnaire item	Record ID 2	Record ID 7
Did you learn to use learning objectives AS A STUDENT?	No	No
Did you learn to use learning objectives AS AN EDUCATOR?	No	Yes
When did you learn to use learning objectives AS AN EDUCATOR?	*No response due to branching logic of questionnaire*	Graduate School
How did you learn to use learning objectives AS AN EDUCATOR?	*No response due to branching logic of questionnaire*	"I took coursework in teaching and in doing so was introduced to the use of objectives to guide a class session as well as a course. Among the ways we were taught was in using backwards design to ensure that the objectives for the course were measured through assessment as well as covered in a class session."
How do you COMMUNICATE to your students about your learning objectives?	"Learning objectives are included in the syllabus, in online materials (e.g. course canvas site), and are listed at the beginning of lectures (and included in the powerpoint which is also provided to students)."	"I introduce objectives on the first day of class as the best source of information, and the answer to "what do we need to know". I make sure to point them out and review them every class session, and I encourage students to base their study around these objectives. On the other side, I also make sure that my exam questions are grounded in the objectives that were selected for the class as a whole and the sessions from that block or unit to ensure that I am testing what was deemed most important for the course."
How do you tell your students to USE your learning objectives?	"Little or no time is spent by me discussing ways to use learning objectives. First, they should be largely self-explanatory. Second, insufficient time is allotted to cover course material, so there is definitely insufficient time to go over the objectives themselves in any detail."	"I encourage them to start their study with an open ended recall of the objectives. I also remind them, daily if necessary, that they don't need to ask what is important because it is outlined in the objectives."
Do you expect your students to know how to use learning objectives prior to being enrolled in your course?	Yes	No

Table 2. *Questionnaire data from selected records (Record ID 2 and 7) which illustrate a difference in behavioral outcomes.*

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Theme 2 - Educator Communications also revealed there may be obstacles in place which prevent proper implementation and communication regarding learning objectives for these educators. One obstacle may be a lack of training as indicated by some respondents. Several stated they did not learn to use learning objectives as an educator until they were in a faculty position. This is likely because most PCBSMEs do not have formal training in pedagogy, as it is not a requirement to secure a faculty position within medical academia (Association of American Medical Colleges, 2022). This lack of training may exacerbate an already inherent amount of variation with approaches to pre-clerkship teaching in addition to problems that arise when learning objectives are not used or used improperly (Alsheikh, 2020; Bandura, 1989; Collier & Morgan, 2008; Leone et al., 2019).

Another obstacle may be the challenge of limited time provided to cover a large volume of information. Some of these PCBSMEs indicated that it is more important to use class time to expose students to all the session content and leave navigation of the learning objectives for them to do on their own. Further investigation is necessary to identify the breadth of these obstacles and whether action can be taken to mitigate them.

Because of this, providing early exposure to pedagogical concepts, including learning objectives, may be beneficial to several stakeholders within medical education. This exposure could be presented in several ways. One option is a mandatory course or workshop in basic science doctoral programs which focuses on foundational pedagogical concepts and practices. Another option is to include a training session which covers similar concepts as part of new faculty onboarding for positions with teaching responsibilities. Both suggestions use a proactive approach to address the lack of pedagogical training for potential PCBSMEs, rather than a reactive approach once the individual is teaching.

Limitations

The authors acknowledge several limitations to this study. First, the nature of the questionnaire made thorough collection of the thoughts and opinions about learning objectives limited. Respondents most likely would expand on these given additional data collection methods such as structured interviews. Also, this study was conducted at a single institution, and different institutions place different levels of emphasis on using current pedagogical methods. Additionally, a variety of educators responded, and it is unknown what level of involvement each of these educators had in program or course level curricular development. Lastly, while the study aimed to explore perceptions regarding session-level learning objectives the questionnaire did not explicitly state this. Therefore, respondents may have completed the questionnaire with regard to other level learning objectives in mind. Future studies should evaluate involvement to assist in providing more context to the responses. The sample size was not large enough to investigate correlations between non-qualitative data, but additional data collection could reveal such relationships exist.

Future directions

Based on this study, the researchers suggest further investigation into how PCBSMEs acquire knowledge regarding learning objectives. This may include surveying resource availability or obstacles preventing access, redirecting current resources, or the development of novel resources. Additionally, gathering the perspectives of other stakeholders, such as medical students or department chairs, regarding value of learning objectives and perceptions on PCBSME communication would improve understanding of how effective learning objectives are for students and identify potential areas of improvement. Capturing the perspectives of stakeholders at higher levels, such as the LCME, may more easily facilitate appropriate changes with a top-down approach. Finally, the framework presented could lead to quantitative research that explores the strength of different factors into the use and the effectiveness of learning objectives in medical education. Creating a standardized assessment of learning objective use could provide necessary relationships and align best practices for all involved in medical education.

Conclusion

This study broadly suggests the learning experiences of a student may influence their approach to teaching. More specifically, a limited experience and understanding of learning objectives may limit how effectively a PCBSME implements and communicates learning objectives to their students. Further investigation is necessary to acquire more generalizable results describing PCBSME understanding and implementation of learning objectives. This data can be used to develop strategies for improved implementation of learning objectives and encourage practice of empirically supported pedagogy within basic science courses of medical education. Additionally, gathering perspectives of learning objectives from other stakeholders within medical education such as curriculum designers, students, and administrators would provide a more complete understanding of how best to train educators in implementation and communication.

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About the Authors

Kayla Pavlick is a graduate student in an anatomical sciences education track program at the University of Mississippi Medical Center and, as primary researcher, was responsible for the conceptualization, methodology, data collection and analysis, and writing of the manuscript in partial fulfillment of their dissertation. Casey Boothe is an Assistant Professor at the University of Mississippi Medical Center but was a graduate student in an anatomical sciences education track program at the University of Mississippi Medical Center at the time of analysis for this study. She was involved with the methodology, data analysis, and manuscript editing. Andrew Notebaert is an Associate Professor and Program Director at Northern Illinois University and participated in the conceptualization, methodology, data analysis, and manuscript editing.

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Appendix 1. Questionnaire distributed to pre-clerkship basic science medical educators in January of 2023

Demographics

1. Please indicate your age range:
    a. 20 – 30
    b. 31 – 40
    c. 41 – 50
    d. 51 – 60
    e. 60 or older

2. Please indicate your race:
    a. African American
    b. Asian
    c. Caucasian
    d. Hispanic
    e. Other
    f. Prefer not to say

3. Please indicate at what level(s) you teach medical students:
    a. Pre-clerkship ONLY
    b. Clerkship ONLY
    c. Both pre-clerkship and clerkship
    d. I do not teach medical students

4. Please indicate your highest level of education achieved:
    a. Bachelor's Degree
    b. Master's Degree
    c. PhD
    d. MD or DO
    e. Other
        i. Please specify: _____

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Learning Objectives

1. Did you learn to use learning objectives AS A STUDENT?
   a. Yes
   b. No

2. Do you utilize learning objectives in your PRE-CLERKSHIP course(s)?
   a. Yes
   b. No
   c. Not sure

3. When did you learn to use learning objectives AS A STUDENT?
   a. K-12
   b. Undergraduate College
   c. Graduate School
   d. Medical School
   e. Professional School
   f. Post-Graduate School
   g. Other
   h. Not sure
      i. Please specify: _____

4. How did you learn to use learning objectives AS A STUDENT? Please include as many details as possible.

_____
_____

5. Did you learn to use learning objectives AS AN EDUCATOR?
   a. Yes
   b. No

6. When did you learn to use learning objectives AS AN EDUCATOR?
   a. Undergraduate College
   b. Graduate School
   c. Medical School
   d. Professional School
   e. Post-Graduate School
   f. Early Career Faculty (1-5 years)
   g. Mid-Career Faculty (6-10 years)
   h. Late-Career Faculty (10 or more years)
   i. Other
      i. Please specify: _____

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7. How did you learn to use learning objectives AS AN EDUCATOR? Please include as many details as possible.

_____
_____

8. How do you COMMUNICATE to your students about your learning objectives? Please include as many details as possible.

_____
_____

9. How do you tell students to USE your learning objectives? Please include as many details as possible.

_____
_____

10. Do you expect your students to know how to use learning objectives prior to being enrolled in your course?

a. Yes
b. No
c. Not sure

11. In your experiences, how many of your students typically know how to use learning objectives?

a. All
b. Most (approximately 75%)
c. About Half (approximately 50%)
d. Some (approximately 25%)
e. A Few (< 25%)
f. None
g. Not sure

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