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# Development and Preliminary Testing of the Collaboration for Innovation in Mentoring Survey: An Instrument of Nursing PhD Mentorship Quality

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## Abstract

**Background:** High-quality PhD nursing student mentorship facilitates student and program success. Extant literature recommends evaluating and improving mentorship to foster optimal PhD student development. However, a comprehensive measure capturing all aspects of mentorship salient to PhD nursing student wellbeing and success is not available.

**Objectives:** The purpose of this pilot study was to develop a new instrument - the Collaboration for Innovation in Mentoring (CLIM) - for quantifying important components of PhD student mentorship in nursing, and to preliminarily test its psychometric properties (content validity, sensitivity, test-retest reliability).

**Design:** The study employed a cross-sectional design.

**Setting:** The CLIM instrument was administered to nursing PhD students at a public state university in the United States.

**Participants:** Sixteen nursing PhD students at various stages in their progression completed the instrument.

**Methods:** PhD nursing students developed unique items based on qualitative data collected by the University using an Appreciative Inquiry framework. Seven nursing and non-nursing experts with experience in PhD mentorship evaluated content validity. After revisions, the final 44-item instrument was administered at two time points (one month apart) to allow assessment of test-retest reliability. Test-retest reliability was evaluated using Spearman-rank correlations and data from students with ≥1 year of experience with their mentor.

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**Results:** Response rates were 94% for both administrations ($n$=16). The instrument's overall CVI was 0.91 ($p$ = 0.05). Test-retest analyses resulted in high correlations ($r$=0.91, $p$<0.001), further supporting reliability of the CLIM instrument.

**Conclusions:** Preliminary evidence suggests that the CLIM instrument is a reliable instrument of PhD mentorship in nursing. However, additional testing in larger and more diverse graduate student populations is needed to evaluate internal consistency reliability, among other psychometric properties.

### Keywords

Education; Nursing; Mentors; Surveys and Questionnaires; PhD/doctoral; Psychometrics

## Background

PhD mentors are instrumental in facilitating students' transformation into a successful nurse scientist (Armstrong, McCurry, & Dluhy, 2017). Like many other disciplines, development of PhD students in nursing is often dependent on the mentoring relationship (Bagakas et al., 2015; Kay et al., 2009). Mentorship is particularly important for promoting student learning through influential support and scholarly socialization (Andersen & Watkins, 2018). Indeed, quality mentoring improves PhD students' research competency, scholarly writing and presentation skills, career readiness, and general professionalism (Nersesian et al., 2019; Feldman, Greenberg, Jaffe-Ruiz, Kaufman, & Cignarale, 2015; Kim et al., 2015). Additionally, the benefits of quality mentorship often extend beyond academic achievement by fostering an invaluable career-long collaborative relationship between mentors and their mentees (Kay et al., 2009). As a result, a recent integrative thematic review (Lin, Chew, Toh, Radha, & Lalit, 2018), and the American Association of Colleges of Nursing's (AACN) (Rosseter, 2017) strategic priorities have both emphasized the importance of facilitating cultures of high-quality support and mentorship in nursing doctoral education.

Despite the numerous benefits of mentor support and guidance during PhD training, mentorship quality is difficult to measure due to the inherent complexity of the interpersonal interactions that occur between mentors and mentees. These unique relationships vary based on mentorship priorities, mentee needs, and mentor expertise. In addition, previous conceptualization of PhD mentorship has been vague and varied. For example, one review of published management literature found approximately 40 different definitions of mentorship (Haggard, Dougherty, Turban, & Wilbanks, 2011). Consequently, the lack of conceptual consensus of PhD mentorship is a barrier to operationalization, complicating efforts to improve both student and program outcomes.

### Measurement of PhD Student Mentorship

The breadth of definitions and conceptualizations for mentorship also complicates attempts at measurement. Since the current literature recommends focusing efforts to evaluate and improve PhD student mentorship in order to facilitate student academic and professional development, it was important to understand the current state of the science regarding avenues to both assess and foster PhD student mentorship in nursing (Chen et al., 2016).

We conducted a literature review to evaluate available mentorship instruments. Several have been designed to assess general graduate student mentorship, but not PhD student mentorship specifically (Poloi et al., 2016; Flemming et al., 2013). A recent systematic review of mentorship measurement tools identified twenty-two instruments for assessing mentorship functions, roles, behaviors, or activities (Chen et al., 2016). Of these, most were developed in business ($n$=11) or education ($n$=7) sectors. Only two instruments assessed PhD student mentorship: Wilde and Schau's (1991) *Mentoring Instrument: Mentees Perception* and Rose's (2003, 2005) *Ideal Mentor Scale.* Sparse evidence regarding psychometrics has been published on Wilde and Schau's (1991) *Mentoring Instrument: Mentees Perception*; and, although Rose's (2003, 2005) *Ideal Mentor Scale* was tested in nursing PhD students and demonstrates strong theoretical basis and psychometric performance, the purpose of Rose's instrument was to identify mentoring preferences rather than to measure mentorship quality.

We also surveyed a range of additional manuscripts and instruments outside of those identified by Chen et al. (2016), but similarly found that instruments were often designed for and tested among non-PhD student samples (Poloi et al., 2016; Flemming et al., 2013). One identified instrument of mentorship in nursing programs, the *Berk's Mentorship Effectiveness Scale*, assessed a mentor's accessibility, content expertise, approachability, and degree of support (Nersesian et al., 2019; Berk et al., 2005). However, the instrument's psychometric properties have not been evaluated (Berk et al., 2005, p. 68). Another identified instrument was Schlosser and Gelso's (2001) *Advisor Working Alliance Inventory (AWAI)*, which was designed to assess the relationships between psychology PhD students and their advisors and conceptualizes the student-mentor relationship as a working alliance. Empirical evidence gathered for this instrument supported a strong internal consistency reliability (alpha = 0.95) and test-retest reliability ($r$ = 0.92) (Schlosser & Gelso, 2001). However, the instrument failed to capture several components of PhD mentorship, including multi-mentor teams—which is common and expected in PhD student training (e.g., from a dissertation committee)—and formal use of Individual Development Plans (IDPs) by PhD students and their mentors. Such agreements are useful tools for documenting and planning mentored activities and are required from recipients of federally funded training grants (Vanderford et al., 2018).

Based on the sparsity of available empirical evidence that identifies conceptually aligned and psychometrically validated measurements, we concluded that no gold-standard instruments exist for assessing mentorship quality in nursing PhD programs. Ultimately, a comprehensive, pragmatic, valid, and reliable instrument evaluating mentorship of PhD students in nursing is needed to both improve mentorship quality and cultivate a culture of PhD student mentorship which supports students' wellbeing and success. As such, the purpose of this pilot study was to develop and preliminarily test an instrument of mentorship quality as perceived by PhD students in the nursing discipline—the Collaboration for Innovation in Mentoring (CLIM) instrument.

# Methods

## Item Generation

The initial item pool was informed by qualitative interview data obtained from 63 stakeholders (i.e., PhD students, faculty, deans, clinical leaders/employers, and alumni). Using an Appreciative Inquiry framework (Whitney & Trosten-Bloom, 2010), stakeholders were asked to describe the characteristics of an excellent nursing PhD program. Thematic analysis of the raw interview data resulted in four themes relevant to high-quality mentor-mentee relationships: mentor-mentee fit, multi-mentor teams, mutual benefit, and mentor-mentee contracts.

Informed by these four generated themes, the current literature, individual student experience, and a review of available mentorship instruments, nursing PhD students at a Midwestern public university developed the 41 original items assessing mentor-mentee fit (e.g., personality, expertise), embeddedness within a multi-mentor team, symbiotic benefit of the mentor-mentee relationship, and their shared mentor-mentee commitment towards individual student goals. The questions were designed to be equally applicable to candidates (those who had passed their preliminary exams) and pre-candidates (those who had not yet taken their preliminary exams). Negatively phrased items were placed throughout the instrument to reduce response and agreement bias. A temporal reference was added to the instructions before each question informing students to rate the quality of their mentorship over the current semester.

## Content Validity and Reliability

Content validity (i.e., the extent to which an instrument captures the intended construct) was calculated using the methods described by Lynn (1986). The preliminary instrument consisting of 41 items was administered to seven nursing and non-nursing student, alumni, and faculty experts with experience in PhD mentorship from four large public universities. A sample of five experts is considered the minimum requirement for content validity testing, but additional experts were contacted in this study to capture multiple perspectives of both nursing and non-nursing PhD mentorship (Lynn, 1986). For example, non-nurse faculty feedback was included to explore generalizability to other PhD student populations. Experts were asked to rate each item on a scale of 1 to 4, with higher scores indicating better relevancy. If the expert provided a low relevancy score, they were asked to propose item revisions. Per the methodology described by Lynn (1986), content validity index (CVI) coefficients were created for both the individual items and the total instrument by calculating the percentage of answers that scored a 3 (relevant but needs minor alteration) or 4 (very relevant and succinct). Items that scored below 0.86 were reviewed ($n$=4); four questions were revised, and three items were added, resulting in the final 44-item CLIM instrument.

## Survey Administration

After content validity testing, the CLIM instrument was administered to a cohort of PhD nursing students ($N$=18) at a Midwestern public university and then re-administered one month later to assess test-retest reliability (i.e., the agreement of the results between

successive administrations). At both time points, the instrument was administered using Qualtrics Survey Software (Qualtrics, Provo, UT).

### Analysis

Demographic characteristics as well as individual item and total score ranges, means, and standard deviations were tabulated using descriptive statistics. We collected preliminary evidence of internal consistency reliability (ICR) (i.e., the relatedness of the individual items) using Cronbach's alpha, while recognizing that our small sample precludes robust analysis of internal consistency, which typically requires samples over 100 participants at minimum, though a sample as small as 30 can be used in a preliminary analysis of ICR (Yurdugül, 2008). Test-retest reliability (i.e., the agreement of the results between successive administration of a measurement) was calculated using Spearman-rank correlation. Test-retest reliability is typically conducted with a small sample size (Bujang et al., 2017). Test-retest reliability was examined using CLIM scores from students with ≥1 year of experience with their mentor. This was done because students with <1 year are more likely to experience fluctuations in mentorship quality as they begin to work together with their mentor. All analyses were conducted using SPSS version 26.

## Results

### Demographics

Table 1 shows the demographics of the sample. Of the 18 nursing PhD students invited to participate, 16 completed the baseline instrument only and 14 completed both the baseline and follow-up (one month) administrations; thus, our sample included 14 students (78% response rate). The average time to complete the instrument was 18 minutes. Sample demographic characteristics were assessed at the one-month follow-up and are presented in Table 1. Participants' mean age was 26.5 ($SD$ = 2.35) years. Most participants were female (79%), Caucasian (79%), and PhD candidates (57.1%). First (28.6%) and second year (14.3%) pre-candidate students were also represented within the sample. At the time of the initial administration, first-year students had worked with their primary mentors for approximately four months.

### Content Validity

A full list of questions with CVI indices and revisions from content validity experts is detailed in Table 2. The CVI coefficients for the 41 items ranged from 0.57 – 1.0 (Table 2). Two items had low CVI coefficients (0.57 [# 22], 0.71 [#34]) which were not statistically significant. These two items were subsequently revised based on suggestions provided by content validity experts. The remaining CVI coefficients were 0.86 and 1.0 for 17 and 20 items, respectively ($p \leq 0.05$). An item was considered "content valid" if ≥ 86% of responses from the seven reviewers indicated that the item was relevant to mentorship quality (Lynn, 1986). As a result, none of the items with a CVI of 0.86 or 1.00 were revised. Three new items were also added based on experts' recommendations: 'my mentor has been uncivil towards me' (#34; reverse coded); 'I feel comfortable disagreeing with my mentor' (#35); 'my primary mentor encourages me to persevere' (#36). The instrument's overall CVI was 0.91 ($p = 0.05$), thereby demonstrating excellent content validity.

### Item Analysis

Table 3 illustrates the results of the descriptive item analysis. Mean scores for 61% of the items reflected high-quality mentorship (i.e., means ≥ 5 for positively phrased items, means ≤ 2 for negatively phrased items). Of the positively phrased items, #44 (*primary mentor encourages me to persevere*) had the lowest (worst) mean score ($\overline{X}$ = 4.00, *SD* = 0.82, *range* 2–5), while the highest (best) mean score was for item #15 (*mentor is an expert in scientific methods*) ($\overline{X}$ = 5.56, *SD* = 0.63, *range* 4–6). Of the negatively phrased items, #19 (*mentor does NOT act ethically*) had the lowest (best) mean score ($\overline{X}$ = 1.33, *SD* = 0.49, *range* 1–2) and item #11 (*primary mentor and I are NOT a good fit*) had the highest (worst) mean score ($\overline{X}$ = 2.25, *SD* = 1.29, *range* 1–4).

Figure 1 illustrates the item response ranges. Seven of the 44 items (#8, 12, 17, 26, 28, 29, and 43) spanned the full item response range. These items reflected variability in mentorship quality relevant to (1) mentee comfort sharing personal problems, (2) personality compatibility, (3) mentor availability, (4) mentor encouraging mentee to step out of comfort zone, (5) mentee contribution to mentor's productivity, (6) mentee assistance with mentor's research, and (7) comfort disagreeing with mentor. For most items, there was limited variability in individual item score ranges (ranges = 4 or 5 to 6 for positively phrased items; ranges = 1 to 2 or 3 for negatively phrased items). For four items (#2–5) that referenced involvement of a team of mentors or dissertation committee members, up to 20% of responses were scored as "not applicable".

### Internal Consistency and Test-Retest Reliability

While this analysis lacked an adequate sample size to fully calculate internal consistency reliability, the Cronbach's alpha coefficient, using responses from for second time point in our sample, was 0.95. This provides preliminary evidence suggesting internal consistency reliability, but additional testing with a larger sample is needed to confirm this finding. Regarding test-retest reliability, total scores from the first and second administration ($n$=12 students with ≥1 year of mentee experience) were strongly correlated ($r$=0.91, $p$<0.001). Test-retest reliability among the entire cohort was 0.63.

## Discussion

Our preliminary pilot study is one of the first to develop a comprehensive instrument to measure the quality of PhD student mentorship in nursing programs. Informed by an Appreciative Inquiry framework and qualitative data from diverse stakeholders, all items were retained following expert content validity checking, and three new items were added. Overall, the CLIM instrument demonstrated excellent content validity and provides some promising evidence of internal consistency reliability, though this should be confirmed with data from a larger sample. The 44-item CLIM instrument is comprehensive, yet also pragmatic, taking a reasonable amount of time to finish (<20 minutes). To our knowledge, there is no instrument that adequately assesses PhD mentorship quality through a multidimensional lens. As such, we believe that the comprehensiveness of our instrument increases the likelihood of capturing the components of mentorship most integral to nursing PhD student success.

The positively phrased items on the CLIM instrument tended to produce a positive response, where the opposite phenomenon was observed with the negatively phrased items. This occurred for 16 items of the questionnaire (36.4%) which suggest possible ceiling/floor effects. It is possible that these scores simply reflected high-quality mentorship at the school of nursing used for recruitment, but it could also stem from a lack of sensitivity to detect the full range of mentorship quality. Therefore, future research could aim to administer the instrument in a larger variety of schools of nursing reporting different mentorship environments. In addition, we observed some “not applicable” responses for questions involving a team of mentors or a dissertation committee, which may reflect a lack of applicability for first year students who likely had not formed a committee, or for those who had limited mentorship experiences with faculty outside their dissertation chair. Future revisions to this instrument may remove these items to increase the overall applicability. The lower test-retest reliability observed among first year PhD students may reflect the normal evolution of relationship development as mentor/mentee pairs get to know each other. Thus, to capture variation in mentorship quality across the trajectory of PhD training, mentorship quality assessments should be conducted at multiple time points.

Broadly, mentorship in PhD programs is fundamental to student program progression, socialization into the scientific community, and successful establishment of a program of research and professional network (Bagakas et al., 2015; Kilcullen, 2007; Kay et al., 2009). Following additional psychometric testing, the CLIM instrument could be utilized by PhD program directors in schools of nursing to evaluate student-perceived quality of mentorship received, capture the variation in mentorship quality across students, and identify areas of strength and weakness. Directors and mentors can then target weak areas for improvement, and so this instrument has the potential to not only improve individual mentor-mentee relationships, but also program-level cultures surrounding mentorship.

The American Association of Colleges of Nursing recognizes the importance of mentorship to recruit, enroll, and retain nursing PhD students. Simply stated, nursing schools that assess and prioritize high-quality mentorship may observe better PhD student recruitment and retention. When considering projected faculty vacancies due to retirement (Feng & Kesten, 2017), the recent decline of enrollment in research-focused doctoral programs (AACN, 2019), and the call for increasing the number of doctoral-prepared nurses by the Institute of Medicine (IOM, 2011), mentorship quality should be seen as exceptionally relevant to the sustainability of nursing science. The study findings provide preliminary evidence that the CLIM instrument is a reliable tool—based on excellent test-retest reliability results and promising preliminary evidence of internal validity—that could inform future mentoring strategies, and in turn, help to maintain the pipeline of PhD-prepared nurse faculty.

The strong CVI scores among an array of nursing and non-nursing PhD experts provide a promising foundation for further testing and validation in other doctoral programs. While quality of mentoring experiences likely varies somewhat across doctoral programs and schools, they share many basic components. Like nursing, general mentorship quality is influenced by the compatibility of the match, student characteristics (e.g., age; previous education), or mentor characteristics (e.g., track record of successful mentoring experiences; emotional intelligence; academic rank). As such, future research could attempt to validate

this instrument in other PhD programs. However, there are some student and program outcomes that were not captured in this instrument, (e.g., time to degree; deliverables; recruitment and retention), which could be explored further.

Although this pilot study is the first to provide a comprehensive psychometrically validated instrument to measure PhD mentorship quality in nursing doctoral programs, we do recognize several limitations. The sample size for the current study was small and confined to one Midwestern state public university. While this did not preclude our ability to examine test-retest reliability and content validity, a larger sample is needed for an accurate evaluation of internal consistency reliability, and additional validity testing (e.g., structural validity). Despite our small sample, our response rate (78%) is considered good for a multi-phase study, and many subgroups were represented, including male sex, Asian race, and different levels of candidacy status. Future studies should test the CLIM instrument's validity and reliability with larger, more heterogenous samples. Our goal was to develop a comprehensive, yet pragmatic, instrument of nursing PhD mentorship quality; however, this study may not have captured all salient domains. This may be due to the current lack of conceptual clarity within the current literature. We attempted to address this limitation by leveraging both interview and CVI data from a diverse sample of stakeholders and mentorship experts during item generation. Finally, our study was not adequately powered to identify and evaluate dimensionality. Future studies with larger samples are encouraged for conducting exploratory and confirmatory factor analyses.

## Conclusion

Preliminary results suggest that the CLIM instrument is reliable and valid, but high total scores may indicate a ceiling effect, and our small sample size prevented adequate evaluation of internal consistency reliability. Further psychometric testing is needed to evaluate internal consistency reliability, determine structural validity based on hypothesized mentorship constructs, and to scale up testing in larger and more diverse graduate student populations. Despite this, the developed measurement captures a robust constellation of components integral to quality mentorship.

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## Highlights

- The 44-item CLIM instrument was developed to measure mentorship quality in nursing.
- Preliminary results indicate content validity and reliability of the CLIM instrument.
- The CLIM instrument may be applicable to other disciplines with further testing.


**Figure 1.**
CLIM Item Response Distributions *(N=16)*

**Table 1.**

Demographic Characteristics (*N*=14)

| ***Variable*** | | |
|---|---|---|
| | ***Mean (SD)*** | |
| Age in years | 26.5 (2.35) | |
| | | ***N*** (%) |
| Sex | | |
| Male | | 3 (21.4) |
| Female | | 11 (78.5) |
| Race | | |
| Caucasian/White | | 11 (78.5) |
| Asian | | 3 (21.4) |
| Candidacy Status | | |
| Pre-candidate | | 6 (42.9) |
| Less than 1 year in the PhD program | | 4 (28.6) |
| Candidate | | 8 (57.1) |

**Table 2:**

Content Validity

| CVI | Suggested Modification (if applicable) | First Prototype | Modifications |
|---|---|---|---|
| 0.86 | | 1. I engage regularly with my mentors. | Unchanged |
| 1.00 | | 2. My dissertation chair is aware of the roles and involvement of my other mentoring team members. | Unchanged |
| 1.00 | | 3. My dissertation chair facilitates consensus among my committee members. | Unchanged |
| 1.00 | | 4. The members of my mentorship team do NOT contribute diverse viewpoints to my learning. | Unchanged |
| 1.00 | | 5. Members of my mentorship team work together to help me achieve my goals. | Unchanged |
| 1.00 | | 6. My primary mentor connects me to other experts. | Unchanged |
| 0.86 | | 7. My primary mentor validates me for my successes. | Unchanged |
| 0.86 | | 8. I share personal problems with my primary mentor if they interfere with my work as a student. | Unchanged |
| 0.86 | | 9. My primary mentor and I see things so differently that it is difficult to work together. | Unchanged |
| 1.00 | | 10. My primary mentor and I don’t work well together. | Unchanged |
| 1.00 | | 11. My primary mentor and I are NOT a good fit. | Unchanged |
| 0.86 | | 12. My primary mentor and I have compatible personalities. | Unchanged |
| 1.00 | | 13. I feel comfortable approaching my primary mentor with my questions and concerns. | Unchanged |
| 0.86 | | 14. My primary mentor is NOT an expert in content relevant to my research area. | Unchanged |
| 0.86 | | 15. My primary mentor is an expert in scientific methods relevant to my research area. | Unchanged |
| 0.86 | | 16. My primary mentor and I have similar enough research interests. | Unchanged |
| 1.00 | | 17. My primary mentor is available. | Unchanged |
| 1.00 | | 18. My primary mentor spends enough time with me. | Unchanged |
| 0.86 | | 19. My primary mentor does NOT act ethically regarding research conduct and authorship. | Unchanged |
| 0.86 | | 20. My primary mentor’s conduct is professional. | Unchanged |
| 1.00 | | 21. My primary mentor provides constructive feedback. | Unchanged |
| 0.57 | Changed “enhance” to “improve” | 22. My primary mentor encourages me to enhance my work. | 22. My primary mentor encourages me to improve my work. |
| 1.00 | | 23. My primary mentor does NOT provide guidance when I need direction. | Unchanged |
| 0.86 | | 24. My primary mentor provides thorough responses to my questions. | Unchanged |
| 1.00 | | 25. My primary mentor provides timely responses to my questions. | Unchanged |
| 1.00 | | 26. My primary mentor encourages me to step out of my comfort zone. | Unchanged |
| 0.86 | | 27. My primary mentor does NOT foster my professional development. | Unchanged |
| 0.86 | | 28. I contribute to my primary mentor’s academic productivity. | Unchanged |
| 0.86 | | 29. I help my primary mentor conduct their research. | Unchanged |
| 1.00 | | 30. My primary mentor does NOT further my research/academic scholarship. | Unchanged |
| 1.00 | | 31. My primary mentor learns from me | Unchanged |

| CVI | Suggested Modification (if applicable) | First Prototype | Modifications |
|---|---|---|---|
| 1.00 | | 32. My primary mentor and I discuss my development. | Unchanged |
| 1.00 | | 33. My primary mentor and I define expectations. | Unchanged |
| 0.71 | added “in writing” | 34. My primary mentor and I formalize our expectations. | 34. My mentor and I formalize our expectations in writing. |
| 1.00 | | 35. My primary mentor and I do NOT set shortterm goals for my development. | |
| 1.00 | | 36. My primary mentor and I set long-term goals for my development. | |
| 1.00 | | 37. My primary mentor’s and my expectations are aligned. | |
| 1.00 | | 38. I am committed to my primary mentor. | |
| 0.86 | | 39. My primary mentor is NOT committed to me. | |
| 1.00 | | 40. I can have confidential discussions with my primary mentor. | |
| 0.86 | | 41. I know what my primary mentor expects me to do. | |
| | New Item | | 42. My primary mentor has been uncivil towards me. |
| | New Item | | 43. I feel comfortable disagreeing with my primary mentor. |
| | New Item | | 44. My primary mentor encourages me to persevere. |

**Table 3.**

CLIM Instrument Descriptive Statistics (*N*=16)

| Question | N | Mean | SD | Range |
|---|---|---|---|---|
| 1. I engage regularly with my mentors. | 16 | 5.13 | 0.89 | 3–6 |
| 2. My dissertation chair is aware of the roles and involvement of my other mentoring team members. | 13 | 4.69 | 0.95 | 3–6 |
| 3. My dissertation chair facilitates consensus among my committee members. | 12 | 5.17 | 0.72 | 4–6 |
| 4. The members of my mentorship team do NOT contribute diverse viewpoints to my learning. | 14 | 1.79 | 0.58 | 1–3 |
| 5. Members of my mentorship team work together to help me achieve my goals. | 14 | 4.79 | 0.58 | 4–6 |
| 6. My primary mentor connects me to other experts. | 16 | 5.19 | 0.75 | 4–6 |
| 7. My primary mentor validates me for my successes. | 16 | 5.12 | 1.03 | 2–6 |
| 8. I share personal problems with my primary mentor if they interfere with my work as a student. | 16 | 4.63 | 1.20 | 1–6 |
| 9. My primary mentor and I see things so differently that it is difficult to work together. | 16 | 1.81 | 0.98 | 1–4 |
| 10. My primary mentor and I don’t work well together. | 16 | 1.87 | 0.96 | 1–4 |
| 11. My primary mentor and I are NOT a good fit. | 16 | 2.25 | 1.29 | 1–4 |
| 12. My primary mentor and I have compatible personalities. | 16 | 4.56 | 1.32 | 1–6 |
| 13. I feel comfortable approaching my primary mentor with my questions and concerns. | 16 | 5.13 | 0.81 | 3–6 |
| 14. My primary mentor is NOT an expert in content relevant to my research area. | 16 | 2.00 | 0.97 | 1–4 |
| 15. My primary mentor is an expert in scientific methods relevant to my research area. | 16 | 5.56 | 0.63 | 4–6 |
| 16. My primary mentor and I have similar enough research interests. | 16 | 5.13 | 0.62 | 4–6 |
| 17. My primary mentor is available. | 16 | 4.94 | 1.23 | 1–6 |
| 18. My primary mentor spends enough time with me. | 16 | 5.13 | 0.62 | 4–6 |
| 19. My primary mentor does NOT act ethically regarding research conduct and authorship. | 15 | 1.33 | 0.49 | 1–2 |
| 20. My primary mentor’s conduct is professional. | 16 | 5.44 | 0.63 | 4–6 |
| 21. My primary mentor provides constructive feedback. | 16 | 5.19 | 0.83 | 3–6 |
| 22. My primary mentor encourages me to improve my work. | 16 | 5.31 | 0.60 | 4–6 |
| 23. My primary mentor does NOT provide guidance when I need direction. | 15 | 1.73 | 0.96 | 1–4 |
| 24. My primary mentor provides thorough responses to my questions. | 16 | 5.13 | 0.89 | 3–6 |
| 25. My primary mentor provides timely responses to my questions. | 16 | 5.37 | 0.72 | 4–6 |
| 26. My primary mentor encourages me to step out of my comfort zone. | 16 | 4.75 | 1.24 | 1–6 |
| 27. My primary mentor does NOT foster my professional development. | 16 | 1.62 | 0.62 | 1–3 |
| 28. I contribute to my primary mentor’s academic productivity. | 16 | 4.44 | 1.21 | 1–6 |
| 29. I help my primary mentor conduct their research. | 16 | 4.69 | 1.20 | 1–6 |
| 30. My primary mentor does NOT further my research/academic scholarship. | 16 | 1.56 | 0.63 | 1–3 |
| 31. My primary mentor learns from me. | 15 | 4.27 | 1.10 | 1–5 |
| 32. My primary mentor and I discuss my development. | 16 | 5.13 | 0.50 | 4–6 |
| 33. My primary mentor and I define expectations. | 16 | 4.50 | 1.03 | 2–6 |
| 34. My mentor and I formalize our expectations in writing. | 16 | 4.25 | 1.07 | 2–6 |
| 35. My primary mentor and I do NOT set short-term goals for my development. | 16 | 2.19 | 0.75 | 1–4 |
| 36. My primary mentor and I set long-term goals for my development. | 16 | 5.00 | 0.82 | 4–6 |
| 37. My primary mentor’s and my expectations are aligned. | 16 | 4.63 | 0.89 | 3–6 |
| 38. I am committed to my primary mentor. | 16 | 5.13 | 0.72 | 3–6 |
| 39. My primary mentor is NOT committed to me. | 16 | 1.69 | 0.70 | 1–3 |

| Question | N | Mean | SD | Range |
|---|---|---|---|---|
| 40. I can have confidential discussions with my primary mentor. | 16 | 5.19 | 0.83 | 3–6 |
| 41. I know what my primary mentor expects me to do. | 16 | 4.69 | 0.70 | 3–6 |
| 42. My primary mentor has been uncivil towards me. | 16 | 1.75 | 1.00 | 1–4 |
| 43. I feel comfortable disagreeing with my primary mentor. | 16 | 4.13 | 1.20 | 1–5 |
| 44. My primary mentor encourages me to persevere. | 16 | 4.00 | 0.82 | 2–5 |

Note: *SD = standard deviation. 1: Strongly Disagree; 2: Disagree; 3; Somewhat Disagree; 4; Somewhat Agree; 5: Agree; 6: Strongly Agree*