Teaching load and goals

As per my candidate's statement, I devote approximately 20% of my time towards teaching endeavors. The courses I have instructed begin on page 6 of my CV. My primary teaching responsibilities are as course-coordinator and lead instructor for *Musculoskeletal Practice Patterns I (P541)* and *II (P622)*. These 4 credit hour graduate courses involve 6 contact hours per week (2 lecture & 4 laboratory hours) with a class of 34-38 Doctor of Physical Therapy students and are provided each Spring and Fall, respectively. I personally present 16-out-of-18 lectures for P541 and 12-out-of-14 lectures for P622. For both courses I write and grade all written exams and am present during all laboratory classes providing one-third of laboratory demonstrations and exams. The remaining class portions are given by a faculty colleague or adjunct faculty member; however, I am present during all class hours.

In addition to the above courses, I frequently contribute to other graduate courses as a guest instructor. The courses I have contributed to as a guest instructor begin on page 8 of my CV. The courses include:

1. Basic Bone Biology (G819)
2. Functional Anatomy and Clinical Biomechanics (P513)
3. Evidenced-Based Critical Inquiry II (P645)
4. Introduction to Therapeutic Interventions (P646)
5. Special Topics in Health and Rehabilitation Sciences (W710)

My teaching philosophy is to encourage the future clinicians in my class to be life-long critical thinkers who use the available evidence to guide their clinical decision making. This is consistent with 'Vision 2020' of the American Physical Therapy Association and the general direction of healthcare, and contrasts with the rote, recipe-like learning of historical physical therapy training. My teaching philosophy stems from clinical experience working with internationally recognized therapists who demonstrated to me that clinical success is determined not by an ability to memorize material, but by how well one understands basic concepts and can problem-solve to apply these concepts to individual patients. This is important to instill in students as they matriculate in my courses as musculoskeletal practice patterns represent one of the four major practice patterns in physical therapy and students proceed to clinical rotations and ultimately practice following completion of my courses.

Peer review of teaching

My teaching was peer-evaluated by Dr. Amy Bayliss (Associate Clinical Professor, Department of Physical Therapy and 'Knowledge Broker for Teaching' within the school's mentoring program). See 'Appendix: Peer evaluations' for a complete copy of her classroom observation report. Dr. Bayliss' specific feedback included:

> *"…created a very friendly, open, respectful learning climate…"*
>
> *"…PowerPoint slides had great visuals that really enhanced student learning and you did an excellent job of explaining the content."*
>
> *"You…enhanced learning by utilizing the camera which projects up on the screens during lab demonstrations."*
>
> *"During lab break-out sessions you utilized your two lab instructors well so all sections of the classroom were managed by one of the three instructors."*
>
> *"You did a wonderful job of motivating students by allowing them to regularly participate, validating their comments (through feedback or expansion of their comments), and relating the content to real-world situations.*
>
> *"You…have great communication skills and are enthusiastic allowing you to connect with your students, making the learning environment one that is naturally motivating."*

A couple areas that Dr. Bayliss suggested I could work on moving forward were:

> *"For content that is challenging, you may consider utilizing classroom assessment techniques such as 'muddiest point' or a 'one minute paper' to check in on student learning"*
>
> *"Adding some reflection activities or classroom assessment techniques would be a good addition for assessment of learning"*

QUANTITATIVE STUDENT EVALUATION OF TEACHING

Quantitative student evaluations of teaching were obtained while in rank during each semester of the *Musculoskeletal Practice Patterns I (P541)* and *II (P622)* courses using multi-op survey forms. These forms were administered by an independent party with the instructor absent from the room. The aggregate score sheets for the courses can be viewed in 'Appendix: Student evaluation of teaching'.

The figure below shows the semester averages for all Department of Physical Therapy courses and my musculoskeletal practice pattern courses for global items 1 (overall, I would rate the quality of this course as outstanding [**Figure 1A**]) and 2 (overall, I would rate the quality of this instructor as outstanding [**Figure 1B**]). Average scores for the musculoskeletal practice pattern courses all range between 4 (=agree) and 5 (=strongly agree), indicating that students agree-to-strongly agree with both global items (**NOTE**: scores for Fall 2010 to Spring 2012 were scored on a 4-point score and have been converted here to the more recently introduced 5-point scale). When the average multi-op scores for global items 1 and 2 are averaged across all departmental courses and the musculoskeletal practice pattern courses, the scores for my courses are significantly higher than those for all other departmental courses (**Table**).

Figure 1. Semester averages for the department of physical therapy and musculoskeletal practice pattern courses for the global item: **A**) overall, I would rate the quality of this course as outstanding, and; **B**) overall, I would rate the quality of this instructor as outstanding.

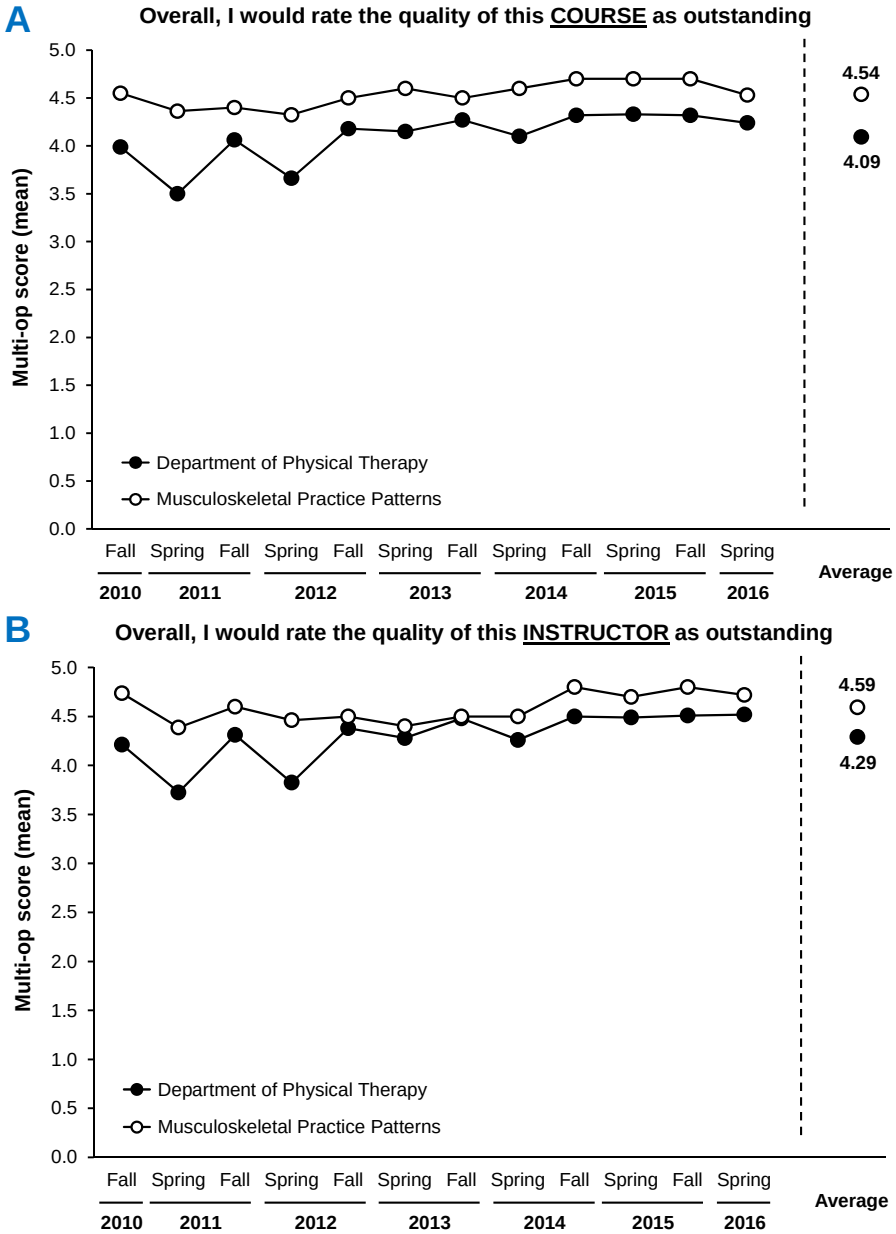

Table. Average multi-op scores for global items 1 and 2 averaged across all semesters while in rank

Multi-op item	Musculoskeletal Practice Pattern courses	All other Departmental courses	P value
Global item 1	4.54 ± 0.13	4.09 ± 0.26	<0.01*
Global item 2	4.59 ± 0.15	4.29 ± 0.27	0.01*

*Significant differences between groups, as determined by unpaired t-test analyses

QUALITATIVE STUDENT EVALUATION OF TEACHING

Students provided blinded qualitative evaluations of teaching for each semester with the instructor absent from the room. Representative comments are listed below and confirm the high quantitative student evaluations. The full transcripts of qualitative comments provided by students can be viewed in 'Appendix: Student evaluation of teaching'.

Sample positive comments

"I liked the class design of presenting the material, and then allowing us to practice the skills. Every course topic was presented in a clear manner, and this course stimulated my thinking." (Spring 2011)

"This class is awesome. I really have no suggestions to better the class the structure & powerpoints are above and beyond…so is the teaching." (Fall 2011)

"Dr. Warden does a great job presenting the material in a fun and interactive way. Lessons are very interesting and engaging, and I feel very comfortable asking questions in class." (Spring 2012)

"I thought the sequence of lecture, evaluation, and intervention allowed me to put the whole picture together." (Fall 2012)

"Dr. Warden is a great teacher and cares about if you know/understand the material" (Fall 2012)

"Dr. Warden is always willing to take time to explain any areas of misunderstanding. I deeply enjoy his style of teaching and he always makes class interesting." (Spring 2013)

"The quizzes and labs really helped enforce what was important to the lectures. Studying for quizzes helped me stay current on material." (Spring 2013)

"Backing up education with research is key to pushing our profession forward. Rock on, Dr. Warden, Rock on!" (Fall 2013)

"Dr. Warden is awesome…he's so knowledgeable and also keeps the class light and fun. I learned so much about how to be a PT, a good one, because of his teaching and course." (Spring 2014)

"Dr. Warden did an amazing job teaching this course. I felt he really wanted us all to succeed." (Spring 2014)

"Dr. Warden is an amazing professor…" (Fall 2014)

"Dr. Warden made challenging material fun to learn" (Spring 2015)

"I really like how Dr. Warden teaches and presents things clearly. His questions can get tricky but he gives you the basics to build on" (Spring 2016)

Sample constructive criticisms

"The only aspect missing is to see patients with significant deficits, but that is what clinicals are for…." (Spring 2011)

"Demonstrate more exercises" (Fall 2012)

"Spend just a little more time with demonstrations – sometimes it was hard to see what was going on or it went too quickly." (Spring 2013)

"Get the projector/camera fixed at front of class. It's nearly impossible to see what is going on when demonstrating manual techniques." (Spring 2013)

"It would be nice to spend more time on therapeutic exercise and critical thinking questions…real patients would be nice…" (Fall 2013)

"Some type of practice, quizzes before the 1st class test…" (Spring 2014)

"I would love if some of the lab pictures were slightly clearer however I know they are really hard to find." (Spring 2015)

"Sometimes the lab handouts were slightly confusing due to their organization." (Spring 2015)

Disseminated scholarship on teaching and learning

While in rank, I co-authored a publication related to teaching (CV publication #1 [CV page 35]). The full-text version of the manuscript is available in 'Appendix: Teaching publications'. The paper was published in the *Journal of Physical Therapy Education* (*JOPTE*). *JOPTE* is the journal of the Education Section of the American Physical Therapy Association and aims to be the premier forum for disseminating scholarly works in physical therapy educational theory and practice. The study investigated how two different methods of cardiopulmonary physical therapy instruction influenced student test performance in higher cognitive domains. My contribution to the study included roles in study conception and design, data analysis, and manuscript preparation and revision. The paper was primarily authored by Dr. Amy Bayliss (Associate Professor of Physical Therapy) and I was the sole co-author.

Impact of instruction on student learning outcomes

My teaching agenda significantly contributes to the overall student learning outcomes within the department. The musculoskeletal practice pattern is one of the four practice patterns in physical therapy. It is an integral component of the professional degree as it forms a major portion of the National Physical Therapy Examination (NPTE), a certification all of our students are required to pass in order to be licensed and practice in physical therapy. All students (100%) I have educated have gone on to pass the musculoskeletal portion of the NPTE.

In addition to teaching the musculoskeletal practice pattern program, I have contributed to overall student learning outcomes by founding a novel student mentoring program within the department. I started this program as an assistant professor and it continues to run today, although I have since handed over the reins to a faculty colleague. The program recruits high-achieving senior physical therapy students to mentor junior students in anatomy, physiology and neuroscience. I initiated the program to: 1) assist junior students in the foundational sciences; 2) provide senior students an opportunity to develop teaching skills, and; 3) develop collegial connections across physical therapy classes.

Undergraduate and/or graduate research mentoring and outcomes

I have actively mentored a variety of faculty and students while in rank (n=29) and throughout my career (n=56) (see **Table** and CV p.10). Many of the mentees have been awarded research funding and awards, co-authored papers, and gone onto successful initial careers.

Table. Faculty and student mentees

Mentee type	In rank	Total career
Faculty	6	6
Post-doctoral fellows	3	4
Graduate research students	5	8
Graduate professional students	14	33
Undergraduate students	1	4

FACULTY MENTORING

Of the 6 faculty mentees I am directly involved in mentoring, 4 have been recipients of prestigious Career Development (K) Awards from the National Institutes of Health totaling $2.7M. Two of the awardees are from my home department (Drs. Fuchs and Avin) and two are from the School of Medicine (Drs. Imel and Moorthi). Two of the faculty have completed their mentoring with me (Drs. Fuchs and Imel) and have successfully been promoted to associate professor and awarded tenure.

In addition to the direct mentoring of faculty, I advise faculty on research activities in my role as Associate Dean for Research. In particular, I am currently the knowledge broker for research within the school's mentoring program. This role is still currently being defined, but essentially involves helping faculty find appropriate research mentors and assist them with their research needs (see 'Appendix: additional evidence').

POST-DOCTORAL FELLOWS AND GRADUATE RESEARCH STUDENT MENTORING

While in rank, I was the principal supervisor of 3 post-doctoral fellows (Drs. Avin, Lee and Roosa), committee chair and primary supervisor of 2 PhD students (Drs. Dirks and Weatherholt), minor advisor and committee member of 1 PhD student (Ms. Shay), committee member of 1 PhD student (Dr. Cardinal) and on the advisory panel of 1 international MS in Sports Medicine student (Mr. Leitch).

The post-doctoral fellows have completed their training with me and have embarked on successful early careers in either academia (Drs. Avin and Lee) or industry (Dr. Roosa). For instance, Dr. Avin joined our faculty as assistant professor and has since been awarded a NIH Mentored Clinical Scientist Research Career Development Award (K08), while Dr. Roosa has moved up the ranks to the position of Principal Clinical Scientist at Stryker.

During her time in my lab, Dr. Roosa was the recipient of numerous research awards (CV p.5), including an American Society of Bone and Mineral Research Young Investigator Award, a Federation of American Societies for Experimental Biology Travel Award, and the Charles H. Turner Young Investigator Bone Research Award.

In addition to the post-doctoral fellows who I mentored while in rank, I previously mentored a post-doctoral fellow (Dr. David Komatsu) who has since gone onto a position as Research Assistant Professor at Stony Brook University and received his first NIH R01 award (NICHD R01HD070888).

All of the post-doctoral fellows have co-authored papers with me, including publications in *Proceedings of National Academy of Sciences*, *Osteoporosis International*, *Bone*, *Journal of Clinical Densitometry*, and *Current Osteoporosis Reports*.

I supervised 4 PhD students while in rank, including 2 enrolled in my school (Drs. Cardinal and Weatherholt), and 1 enrolled in each of the School of Medicine (Dr. Dirks) and School of Nursing (Ms. Shay). I was committee chair and primary supervisor for 2 of the PhD students (Drs. Dirks and Weatherholt). Both students have completed their studies and begun their careers. Dr. Dirks has taken a position as Clinical Research Specialist in California, while Dr. Weatherholt recently accepted a tenure-

track position as Assistant Professor at Indiana State University. The other 2 PhD students are continuing their studies (Dr. Cardinal and Ms. Shay).

Beyond serving as a mentor on the above faculty and PhD students, I also currently serve as a faculty member on a NIH research training grant (T32) within the IU School of Medicine and am listed as a faculty member on a NIH T32 within the IU School of Nursing that recently received a fundable score. These awards provide stipends for both post-doctoral fellows and graduate research students.

GRADUATE PROFESSIONAL STUDENT MENTORING

In addition to formal mentoring of faculty and graduate research students, I have informally mentored graduate professional students in research activities. I involved 28 Doctor of Physical Therapy and 5 Doctor of Medicine graduate professional students in research activities during my career. These students do not have a formal requirement to participate in research activities in their degree programs, yet I find they enjoy the challenge of extra-curricular research and learn valuable skills translatable to their future clinical careers. Thus far, 25-out-of-the-33 graduate professional students have co-authored a peer-reviewed publication from the work they contributed to and 2 have gone on to commence or complete their PhD training (Drs. Avin and Cardinal).

Participation in research activities contributed to 3 of the Doctor of Physical Therapy students being awarded a prestigious Mary McMillan Scholarship from the American Physical Therapy Association (Drs. Avin, Bogenschutz and George). This scholarship is awarded annually to up to 10 Doctor of Physical Therapy students nationwide, with each of the 200+ degree programs around the country allowed to nominate one student per year. During their time as Doctor of Physical Therapy students, Drs. Avin, Bogenschutz and George co-authored 3 (CV publications #45, 49 and 68), 4 (CV publications #24, 25, 29 and 34) and 3 (CV publications #12, 17 and 20) publications, respectively. This is an impressive number of publications considering the extra-curricular nature of the students' research involvement. The publications were also in high impact venues, including *Physical Therapy*, *Bone*, *American Journal of Sports Medicine*, *Journal of Bone and Mineral Research* and *Medicine and Science in Sport and Exercise*.

Course, curricular and professional development

NOTE: The appendices below are located under the 'Appendix: Sample of course materials' link.

I inherited the 2 musculoskeletal practice pattern courses (P541 and P622) from predecessors when I started as an assistant professor. Both courses had only been taught for one semester within the doctor of physical therapy curriculum prior to my arrival and I have now taught the courses since 2006. When I first took over the courses both required considerable restructuring. I have made a number of major changes to the courses over the years based on my personal teaching philosophy, the above constructive criticisms from students, and continual self-assessment. Some of the changes implemented include:

- New course syllabi
- Reconstruction of all classes
- Introduction of multiple-choice class tests
- Provision of evidenced-based readings
- Development of applied laboratory activities that require problem-solving
- Development of handouts to improve laboratory organization
- Immediate student feedback regarding class performance
- Flipping the content of the two courses so that training regarding spinal/central conditions precedes training on extremity/peripheral conditions
- Changing the courses from two 3 hour classes per week to three 2 hour classes

New course syllabi were constructed for both classes as the syllabi I inherited were at too low a level for professional doctoral students. The inherited syllabi were predominantly at or below the analysis level on Bloom's taxonomy. The modified syllabi now incorporate the higher taxonomy levels of synthesis and evaluation. This is reflected in the course objectives which require students to integrate, evaluate, explain and develop (Appendix T1). Students are tested at these levels via both practical (Appendix T2) and written (Appendix T3) examinations.

To bring the class content in line with the syllabi, classes were reconstructed, new assessment methods developed, and evidence-based readings distributed. Classes now incorporate a multimodal approach to teaching to facilitate the learning of concepts and their application, as opposed to the learning of raw material with limited application. This has involved the use of PowerPoint presentations, interactive internet resources, and applied laboratory-based activities. Multiple-choice class tests were introduced throughout each class to encourage progressive learning of laboratory and theory material, respectively, and aid in proactively identifying struggling students. Students are given rapid feedback regarding their performances, including areas where they are strong and where additional work is indicated. In addition, comprehensive handouts have been developed to improve laboratory organization and provide more detail on laboratory procedures (Appendix T4).

Teaching recognition – grants, awards, honors, fellowships

As a result of my teaching endeavors, I was the recipient of 3 teaching awards while in rank (CV p.3). In 2011, I was awarded the Early Career Excellence in Teaching Award from the American Society of Bone and Mineral Research. This national-level teaching award is given once yearly to an individual in the early stage of their career who displays a strong commitment to teaching and learning. In 2012 and 2016, I was awarded the Trustees Teaching Award within the school—an award principally given to recognize faculty excellence in teaching. In addition to personal teaching awards, my students have been frequent recipients of national level awards (CV p.5), including Young Investigator Awards from the American Society of Bone and Mineral Research and Mary McMillan Scholarships from the American Physical Therapy Association.