Training Future Dentists for an Academic Career: A Three-Tiered Model

Zsuzsa Horvath, PhD; Sarah E. Albani, MA; Christine Wankiiri-Hale, DMD

Abstract: The anticipated shortage of dental faculty presents a challenge for dental education as it will greatly impact the training of the next generation of practicing dentists. One way to alleviate shortages is to identify students who are interested in an academic career at the predoctoral level and provide them with training in teaching, research, and leadership. Based on available evidence, formal programs offer the best way to introduce students to academia as a viable career path. A well-designed program can also equip interested students with the necessary skills and basic knowledge to facilitate starting an academic career. The University of Pittsburgh School of Dental Medicine has developed a three-tiered model for providing its dental students with exposure to and training in academic dentistry. The three tiers reflect differing levels of commitment: 1) a two-year academic career track program, 2) academic career track elective courses, and 3) extracurricular activities. The aim of this study was to provide an initial assessment of the program’s overall effectiveness. Data were collected using student and faculty surveys and student applications for the two-year academic career track program. The data gathered included characteristics of, and feedback from, students taking the elective courses, as well as student and faculty feedback about student teacher effectiveness. The study found overall positive responses to the three-tiered program from faculty, students, and student teachers at this initial stage. Whether these students ultimately become faculty members (the ultimate goal of the program) will be assessed in the future.

Keywords: dental education, dental faculty, faculty recruitment, academic careers, faculty development, mentoring, teaching assistants, peer teaching

Submitted for publication 1/19/15; accepted 10/20/15

Current and projected shortages of academic dentists pose a challenge for the dental profession. The shortfall is expected to impact the future of dental schools and the expertise needed to train the next generation of practicing dentists. The number of vacant budgeted faculty positions at U.S. dental schools increased throughout the 1990s, with a peak of 358 open positions in 2000. Following this peak, the number of vacancies fluctuated, falling to 275 in 2004-05, increasing sharply to 417 in 2005-06, then falling slightly to 406 in 2006-07. While the number of vacant full-time positions slightly declined between 2008 and 2011, filling all positions still presents a challenge to dental schools, and the opening of new academic dental institutions will increase competition for an increasingly scarce pool of faculty.

One way to address this challenge is to identify students who are interested in an academic career at the predoctoral level and provide them with proper training in teaching, research, and leadership. Evidence suggests that formal programs are the best way to expose students to academia as a viable career path and equip them with the necessary skills and basic knowledge that facilitate their return to academia after graduation. John et al. suggested, “it is important that the preparation of dental students for academic careers start early in their dental education.” At the same time, there is an increasing interest among dental students in teaching and education: 28% of graduating students in 2012 “reported that they plan to teach at some point in their careers. However, more than half (56%) were unsure of their plans to teach.” Moreover, the 2013 predoctoral accreditation standards state that “ongoing faculty development is a requirement to improve teaching and learning, to foster curricular change, to enhance retention and job satisfaction of faculty, and to maintain the vitality of academic dentistry as the wellspring of a learned profession.” Effective teach-
ing requires not only content knowledge, but also an understanding of pedagogy, including knowledge of curriculum and course design and development, curriculum and course evaluation, and teaching methodologies, as well as strategies and skills in clinical and didactic/classroom environments.12

While most faculty development efforts focus on current dental faculty or attracting practitioners to dental education,13 in order to support long-term goals of faculty recruitment and retention, efforts must start at the predoctoral level. We argue that our three-tiered program at the University of Pittsburgh School of Dental Medicine (UP-SDM) promotes thinking outside the box by aiming to revise the traditional meaning of faculty development and expanding it to activities that train future faculty at the predoctoral level. Overall, as Rupp et al.’s study demonstrates, dental students are largely uninformed about academic dentistry as a career option.14 Even though a slowly growing number of dental schools offer some opportunities to their students or residents to nurture their interest in an academic career, most of these offerings range from optional extracurricular offerings (e.g., workshop series) to a single course on academic leadership or teaching. Comprehensive offerings are still not widely available to predoctoral students across the country.15-21

In addition to providing a description of the program in this article, we wanted to include an initial assessment of its overall effectiveness. The specific aims of this study were thus to assess students’ motivations and expectations as participants in the Academic Career Track Area of Concentration (ACT ARCO) two-year program, as well as to obtain their response to the courses offered both à la carte and as part of the ACT ARCO program. In addition, feedback from first- and second-year students taught by the practicum students and faculty feedback on the practicum students’ contribution to their courses were used to measure short-term program effectiveness. The third tier of the model—the extracurricular workshop and seminar series—was evaluated using feedback from audience members.

UP-SDM’s Three-Tiered Program

Since the UP-SDM is committed to addressing the projected shortage of academic dentists, our school has created programs to encourage predoctoral students to explore academic dentistry and to promote dental education as a career choice. Designed to accommodate students’ different levels of interest, these programs are constructed as a three-tiered model, allowing for levels of commitment from initial exploration to systematic preparation.

Option 1: Two-Year Academic Career Track

Program description. The ACT ARCO is a two-year program for exceptionally motivated students interested in pursuing a career in academic dentistry. Its design drew inspiration in part from the 2013 iteration of the American Dental Education Association Academic Dental Careers Fellowship Program (ADEA ADCFP).22-24 The ACT ARCO not only informs students about career options, but also prepares them for future roles as dental educators through hands-on training in the areas of teaching, scholarship, and leadership by enrolling them in coursework accompanied by formal advising and mentoring. With this structured program, the UP-SDM addresses the two main “obstacles cited for a lack of interest in an academic career: limited knowledge about opportunities available and lack of formal mentoring programs.”25 In addition, the ACT ARCO program (and the alternate offerings described below) may influence some students to seriously consider an academic career, a prospect they may not have considered when entering dental school.

An area of concentration (ARCO) is one of the ways to offer an academic program at the University of Pittsburgh; similar to a certificate, it allows students to develop a knowledge base and skills in an area related to their primary degree program through a series of elective courses.25-28 Setting up the two-year training program as an ARCO serves two goals: 1) designing the training as elective courses for credit makes the offering a formal program and thus the program itself, including individual courses, officially appears on students’ transcripts; and 2) clustering the courses into a formal academic program allows for curricular planning, so that the courses build on one another and serve as prerequisites for the next level.29,30 As a first step, the UP-SDM needed to determine what skills necessary to function effectively in academia could be taught at the predoctoral level. A needs assessment for the curricular content of such a program was completed when the ADEA ADCFP was established.22-24 This needs assessment has been confirmed by the steady and growing interest among our students in the ACT ARCO program and the
courses that comprise the program, which are also offered as individual electives (Table 1).

The spirit of the ACT ARCO is guided by the honors program model: students have to meet certain criteria to be accepted and then must take specific courses and maintain their academic and clinical standing to remain in the program. The ACT ARCO is intended to be a prestigious program, for which students are required to declare their interest no later than the end of their second year and submit a formal application. Requirements for admission include the following: good academic standing; essay descri-

Table 1. ACT ARCO curriculum with course descriptions

<table>
<thead>
<tr>
<th>Year</th>
<th>Term</th>
<th>Credits</th>
<th>Course Name and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Fall</td>
<td>1.5</td>
<td>Fundamentals of Teaching: Principles and Methods. This course introduces students to pedagogical principles that can inform effective teaching in dental education and how to apply these principles to teaching didactic courses, small-group sessions, standardized patient sessions, and didactic components of preclinical and clinical courses. The goal is to provide students with basic tools and skills necessary for university-level instruction. Seminar type meetings are scheduled once per week.</td>
</tr>
<tr>
<td>3</td>
<td>Spring</td>
<td>3</td>
<td>A research elective course. A variety of research elective courses are available in the predoctoral curriculum from which students can choose, including clinical, basic science, public health, and educational research.</td>
</tr>
<tr>
<td>3</td>
<td>Summer</td>
<td>2</td>
<td>Introduction to Leadership and Career Development in an Academic Setting. In this course, students examine theories about leadership. The class activities include presentations by guest speakers, discussions, group work, and projects. As a group-based project, students conduct faculty/administrator interviews with several faculty members. These interviews serve as a vehicle to identify role models.</td>
</tr>
<tr>
<td>4</td>
<td>Fall</td>
<td>1-3</td>
<td>Teaching Practicum in Dental Education. The goal of this course is to provide an opportunity for students to practice classroom teaching by assisting in predoctoral didactic activities, such as lectures, small-group discussions, and standardized patient sessions. This course provides support, assistance, and feedback to students related to their presentation and teaching. Students are able to consult during the preparation, are observed while teaching, and receive feedback on the observation. Meetings are scheduled on an as needed basis. Enrollment in or completion of Fundamentals of Teaching: Principles and Methods is required for this course.</td>
</tr>
<tr>
<td>4</td>
<td>Fall</td>
<td>2</td>
<td>Clinical Teaching Practicum. In this course, students revisit course material and skills from the first- and second-year curricula, approach them from the teacher's perspective, and explain or model them to more junior peers. This process helps students to acquire a different set of skills and level of knowledge, beyond simply mastering the material and skills. This experience is designed to promote lifelong learning and simultaneously allows students to promote lifelong learning in others. Eight seminar-type meetings are scheduled once per week; students are scheduled seven times to teach in a first- or second-year preclinical or clinical course.</td>
</tr>
<tr>
<td>4</td>
<td>Fall and spring</td>
<td>1 &amp; 1</td>
<td>Academic Career Track Capstone Course 1 &amp; 2. In this course, students prepare a portfolio that includes the work they have prepared over the two years of the ACT ARCO program (including career reflection essay, teaching philosophy, syllabus sample, sample teaching materials, teaching evaluation, teaching observation, etc.), and present their experience to the school's community.</td>
</tr>
<tr>
<td>4</td>
<td>Spring</td>
<td>2</td>
<td>Clinical Teaching Practicum 2 (optional). This course provides additional teaching opportunities for students who completed the Clinical Teaching Practicum. No seminar-type sessions are included; students are scheduled seven times to teach in a first- or second-year preclinical or clinical course.</td>
</tr>
<tr>
<td>3 or 4</td>
<td>Any</td>
<td>1</td>
<td>Educational Administration (optional). This selective provides an opportunity for students to learn more about the educational background of the topic of the subcommittee or working group on which they serve. In addition, students learn about different types of service and committee work at the departmental, school, and university levels.</td>
</tr>
<tr>
<td>3 or 4</td>
<td>Any</td>
<td>1-3</td>
<td>Educational Research in Dental Medicine (optional). The goal of this course is to provide an opportunity for students to engage in educational research in dental education and an introduction to many of the procedures commonly used in educational research. Conceptualization, procedures, and analysis from a wide variety of areas will be covered, ranging from planning a study, designing survey instruments, IRB review, and searching for and reviewing educational literature, as well as gathering, analyzing, and reporting quantitative and qualitative data.</td>
</tr>
</tbody>
</table>
ing the student’s intent for an academic career and interest in dental education; current resume; letter of recommendation from a UP-SDM faculty member, who must address the student’s intellectual and professional abilities in addition to his or her interest in dental education; and letter of recommendation from a UP-SDM preclinical faculty member, who must address the student’s clinical skills and interest in dental education.

The ACT ARCO requires students to take a minimum of seven courses, totaling 11 to 13 credits (Table 1). These courses, offered through the UP-SDM, have been specifically designed to accommodate the third- and fourth-year students’ schedules and clinical responsibilities. Students must follow the guidelines specified in the UP-SDM Student Handbook to attend elective courses. These courses are scheduled during nonclinical times or at times when students are not assigned to other curricular requirements, mainly during lunch or after clinical hours. The practicum component of the teaching courses often takes place when students may see patients.

Third- and fourth-year students are assigned to treat their patients in one of the General Practice Clinical Modules available for providing comprehensive patient care. Students are responsible for treating or triaging their assigned patients in a timely manner. To allow students the opportunity to pursue competing educational endeavors such as elective courses, a mechanism exists to allow students to receive credit for approved educational experiences. If students want to pursue an alternative educational experience during their scheduled clinic time while still receiving credit, they must complete an absence form to block their schedule and indicate the individual who will respond to their patients’ needs. This mechanism allows students to act as student instructors in the framework of a teaching practicum.

It is important for students enrolled in the ACT ARCO to gain an understanding of the broader field of medical education and to see themselves as members of a professional community. Students are required to attend at least one seminar each term offered through the UP School of Medicine’s Medical Education Conference series, the Academy of Master Educators Seminar Series (monthly) focuses on enhancing teaching skills and mentoring, Medical Education Grand Rounds (twice per semester) present current issues in health professions education and feature national experts, Medical Education Journal Club (monthly) provides an opportunity to review current journal articles in medical education; and Medical Education Research Conference (monthly) and Medical Education Research Methods and Innovative Designs (monthly) offer presentations on ongoing or completed medical education research projects. All of these seminars take place on campus and outside of clinic hours. Participating in these events once a term does not interfere with students’ clinical learning experience. For the third-year students, attending these sessions may conflict with didactic courses, so some presentations are recorded for watching online.

Supporting faculty, recruitment, and launching the program. The UP-SDM has made a commitment to a two-pronged, systematic faculty development effort that assists current faculty and trains future faculty at the predoctoral level. To support this commitment, the school created a faculty-level position to oversee its faculty development efforts and initiatives, serving as director of faculty development. This faculty member (Z.H.) has a doctoral degree with a focus on education, offers courses related to didactic and clinical teaching, and serves as ACT ARCO director. The associate dean for student affairs (C.W.H.) serves as ACT ARCO clinical director and teaches the leadership course in collaboration with the associate dean for faculty affairs (both are alumni of the ADEA/AAL Leadership Institute). Several faculty members offer elective courses in research independently of the program. Given that these faculty members were already present at the launch of the program, the UP-SDM did not encounter any new costs in adopting this area of concentration in its current format. Faculty participation for providing research and teaching experiences in preclinical, clinical, and didactic areas is voluntary. During the planning period, the program directors considered the option of creating a master’s level dual-degree program. The UP-SDM decided not to pursue the dual-degree path at this point due to institutional considerations, feeling instead that creating a training program that takes students’ clinical schedule and time commitment to the provision of patient care into consideration, is offered in-house and has the flexibility for adjustments, and offers a third of the time commitment of a master’s level program is likely to attract and will accommodate a higher number of students with a burgeoning interest in an academic career. Options to expand the current program into a certificate program are currently under consideration.

In the two-year period preceding the launch of the program, the program directors followed the standard approval procedure for new courses and
academic programs. In addition, they prepared a short- and long-term recruitment plan. Communicating directly to students about the benefits of and opportunities in academic dentistry has been one of the best strategies for attracting participants to the program. The UP-SDM uses targeted recruitment, which includes providing short presentations about the program during applicant interviews, during the first year of the predoctoral program, in the “Professionalism in Dental Medicine” course, and during informational sessions to students in their second year; identifying specific students with an interest in teaching and an academic career early on by talking directly with first- and second-year students; reaching out to faculty who teach in the first two years of the predoctoral program; and offering extracurricular workshops to students that provide a taste of the ACT ARCO program with the goal of introducing them to academic dentistry.

Since 2014, the program directors have distributed recruitment materials and provided short presentations to the second-year students, held informational sessions, and met with prospective applicants to answer questions every summer. During this process, it became apparent that the international (advanced standing) students included several potential applicants with a strong interest in developing skills for an academic career. Therefore, the program directors, working with the director of the international (advanced standing) program, determined that these students were eligible for the ACT ARCO program and that their participation was feasible considering their curricular responsibilities and requirements.

Out of the six potential candidates in the Class of 2016, four third-year students were admitted to the program and started coursework in fall 2014: two international (advanced standing) students and two traditional predoctoral students. Moreover, in order to accommodate student interest from the Class of 2015 (who were not eligible at the time of the rollout), two fourth-year students who had been admitted to the UP-SDM’s residency programs were accepted as well and were able to complete the program during their fourth predoctoral and first residency years. Out of the ten potential candidates in the Class of 2017, eight were admitted to the program: three international (advanced standing) students and five traditional predoctoral students. The program directors conduct individual advising sessions every semester to measure student progress, address students’ varying interests, and determine plans for the research requirement. In addition, the program directors consult with the chair of the promotions committee, the associate dean for academic affairs, and the students’ clinical (team/group) leaders to ensure that the ACT ARCO students maintain good academic and clinical standing.

Option 2: Enrolling in Courses à la Carte

Students choosing not to commit to the entire ACT ARCO program but interested in getting some formal training in academic dentistry can participate by taking the associated courses in an à la carte manner. Several elective courses are offered at the UP-SDM to third- and fourth-year students interested in developing skills in didactic and clinical teaching and leadership: Clinical Teaching Practicum, Fundamentals of Teaching: Principles and Methods, Teaching Practicum in Dental Education, Introduction to Leadership and Career Development in an Academic Setting, and Educational Research in Dental Medicine. While these courses serve as the core curriculum of the ACT ARCO, they are also open to all students and residents (see website for student testimonials13).

Importantly, even students who choose not to pursue an academic career can benefit greatly from these courses. In a private, group, or alternative practice environment, they will likely be involved in training more junior dental providers and will be educating patients and joining dental study clubs. They may also assume leadership roles as the CEO of their practice, as community leaders, or in professional organizations. As graduating students are often not prepared for leadership roles or in training and mentoring staff in a practice, they may be interested in some of these elective courses.

Option 3: Extracurricular Activities

At the UP-SDM, there are also learning experiences available for predoctoral students who are curious about academic dentistry but not prepared to commit to a formal course of study. To foster a community for students interested in an academic career and engage students as early as their first year, the UP-SDM offers an informal lunch hour discussion series several times a year. Topics include starting an academic career, higher administration, part-time clinical career, combining military and academic career, passion for teaching, etc. A panel of guest speakers (faculty and students) provides
informal presentations based on personal insights and experiences, which is followed by questions to the panelists. For many students, these workshops and seminars serve as a gateway into academic dentistry; ACT ARCO applicants have attended these events. Based on informal feedback, offering such programs with a low commitment is an excellent way to get students to start thinking about a career in academic dentistry as early as possible. These seminars and workshops also provide additional professional development opportunities for the students in the ACT ARCO program or enrolled in the courses à la carte.

Methods

The use of collected data for this study was approved by the University of Pittsburgh Institutional Review Board (PRO15050268). Our literature review showed that comprehensive programs to train future academic dentists are rare in dental education.\textsuperscript{15-21,36} To conduct an initial program assessment and measure the effectiveness of the UP-SDM’s three-tiered program, data were used from educational activities and feedback mechanisms that occur in the program on a regular basis as a part of ongoing program evaluation. This study utilized student surveys, faculty surveys, and ACT ARCO student applications to gather data about the ACT ARCO program, elective courses, and extracurricular activities from fall 2012 through summer 2015, with fall 2014 being the first year of implementation of the full ACT ARCO program.

In the elective courses that also serve as ACT ARCO required courses (Clinical Teaching Practicum, Fundamentals of Teaching: Principles and Methods, and Introduction to Leadership and Career Development in an Academic Setting), anonymous pre and post surveys have been conducted on an ongoing basis. The questions on the pre-course surveys were used to gain information about student background and experience relevant to the course. The post-course surveys, which also acted as a course evaluation and assessment tool, were used to gather feedback about the course, the course director’s teaching, and what the students learned throughout the semester.

Student applications to the ACT ARCO program from the Classes of 2016 and 2017 were used to gain an understanding of the underlying characteristics and motivations of students choosing to participate in the program. Responses to the following questions provided data: How did you develop an interest in dental education?; Which area interests you the most: teaching, research, leadership? Explain why; How do you plan to use the skills learned in this program?; Do you intend to pursue a career in dental education?; and Please describe your immediate after-graduation and long-term plans.

First- and second-year students, who were taught by third- and fourth-year students taking the Clinical Teaching Practicum and Teaching Practicum in Dental Education, were given an anonymous survey. The surveys were administered on paper in class on a regular basis. They consisted of one or two rating scale questions and two short answer questions. The purpose of these surveys was to gather student feedback about the strengths, weaknesses, and overall effectiveness of the practicum student teachers, as well as to solicit feedback about improvements that could be made for the preparation of practicum students.

Faculty members involved with the third- and fourth-year students in the Clinical Teaching Practicum and/or Teaching Practicum in Dental Education courses were also asked to complete a brief survey. The faculty surveys were administered using Qualtrics software. In an attempt to increase participation, faculty members were given the option to complete the survey in Qualtrics, in person, or on a Word document version by hand or typing. There were two versions of the survey: one for faculty involved with Clinical Teaching Practicum students and one for those involved with Teaching Practicum in Dental Education students. Each survey consisted of a question asking for the faculty member’s name (to allow for follow-up questions), the course in which he or she interacted with students, a rating scale and short answer questions regarding value and benefit of the practicum students’ contributions, and two final short answer questions asking for ways to improve the program/share concerns.

All audience members who attended the extracurricular informal lunch hour discussion series were also asked to complete an anonymous survey. These surveys were administered on paper at the end of each session and consisted of a combination of rating scale, short answer, and open-ended comment questions. The purpose of this survey was to gain insight into how informative and useful the panelists and topics were to the audience and to gather information about what panelists and topics the audience would be interested in for future planning.

The surveys, ACT ARCO applications, and course assignments were de-identified by replacing names with an alphanumeric code. Responses to
multiple choice, yes or no, and rating scale survey questions were quantified and percentages calculated by dividing the number of a given response by total number of responses for that question. Responses to short answer and open-ended questions on the surveys and ACT ARCO student applications were categorized, and the number of responses in each category was quantified.

## Results

The surveys and application materials used as sources for data had different response rates (Table 2). Individual response rates are reported for each question. Percentages for open-ended questions represent the number of responses in a given category divided by the total number of categorized responses for the entire question.

### Motivation to Participate in Two-Year Training

Responses from 15 ACT ARCO applications from 2014 and 2015 were used to gather information about how students developed an interest in dental education and their motivation to make a commitment to the two-year program. Ten of the 15 students (66.7%) reported positive experiences teaching others as a source of their interest in pursuing dental education, while 46.7% (7/15) reported role models and positive interactions with educators, which was the second most cited source. Three of the 15 (20%) also reported having a desire to positively impact future generations of dentists, and 13.3% (2/15) reflected the recognition that a program like this also helps them reinforce and stay up-to-date on current knowledge.

All 15 applicants responded to the question whether teaching, research, or leadership interested them the most. Some students listed more than one area of interest. Nearly all (93.3%, 14/15) chose teaching as their main area of interest. Research and leadership were also mentioned by an equal number of students (26.7%, 4/15 each). All 15 applicants also responded to the question on how they planned to use the skills learned in the program, whether they intended to pursue a career in dental education, and what their immediate after-graduation and long-term plans were. Nearly all the students (93.3%, 14/15) listed gaining experience in the field of dentistry as a post-graduation plan. Almost two-thirds (60%, 9/15) also reported their intention to complete a residency program, typically for a dental specialty, after graduation. Two-thirds (66.7%, 10/15) cited long-term goals to pursue dental education as a primary career, while a third (33.3%, 5/15) indicated a desire to pursue a part-time teaching career.

### Table 2. Sources of data used in this study and survey response rates

<table>
<thead>
<tr>
<th>Source</th>
<th>Number of Participants Eligible to Complete Surveys</th>
<th>Survey Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Teaching Practicum pre assessment*</td>
<td>38 (out of 38)</td>
<td>100%</td>
</tr>
<tr>
<td>Clinical Teaching Practicum 1 and 2 post assessment*</td>
<td>46 (out of 46)</td>
<td>100%</td>
</tr>
<tr>
<td>Fundamentals of Teaching: Principles and Methods pre assessment*</td>
<td>7 (out of 7)</td>
<td>100%</td>
</tr>
<tr>
<td>Fundamentals of Teaching: Principles and Methods post assessment*</td>
<td>7 (out of 7)</td>
<td>100%</td>
</tr>
<tr>
<td>Introduction to Leadership and Career Development in an Academic Setting pre assessment*</td>
<td>6 (out of 6)</td>
<td>100%</td>
</tr>
<tr>
<td>Introduction to Leadership and Career Development in an Academic Setting post assessment*</td>
<td>6 (out of 6)</td>
<td>100%</td>
</tr>
<tr>
<td>Student applications to ACT ARCO program*</td>
<td>15 (out of 15)</td>
<td>100%</td>
</tr>
<tr>
<td>Feedback from first- and second-year students on Clinical Teaching Practicum students*</td>
<td>305</td>
<td>100%</td>
</tr>
<tr>
<td>Feedback on lecture from first- and second-year students taught by Teaching Practicum in Dental Education students*</td>
<td>288</td>
<td>100%</td>
</tr>
<tr>
<td>Feedback on small-group discussion from first-year students taught by students in the Teaching Practicum in Dental Education*</td>
<td>59</td>
<td>100%</td>
</tr>
<tr>
<td>Feedback from faculty on Clinical Teaching Practicum students</td>
<td>11 (out of 18)</td>
<td>61%</td>
</tr>
<tr>
<td>Feedback from faculty on Teaching Practicum in Dental Education students*</td>
<td>7 (out of 7)</td>
<td>100%</td>
</tr>
<tr>
<td>Surveys on lunch hour discussion series</td>
<td>129 (out of 147)</td>
<td>88%</td>
</tr>
</tbody>
</table>

*Course surveys were administered as pass-fail assignments, and all students were required to complete them. However, not all open-ended questions were answered by every student.

*The students who had an opportunity to work with practicum students, were in attendance when the survey was administered, and opted to take the survey comprised these study samples.
Students’ Expectations and Feedback

Students taking the Clinical Teaching Practicum, the Teaching Practicum in Dental Education, and Introduction to Leadership and Career Development in an Academic Setting courses took part in pre and post assessment surveys. Those surveys asked about students’ previous experience teaching in clinical, classroom, or leadership settings, their perceived preparedness in these areas, what skills they expected to develop in the course, and what skills they gained during the term.

Prior experience. In the Clinical Teaching Practicum, 38 students from eight terms (fall 2012 to summer 2015) responded to the questions concerning teaching experience. Students entered the course with varying levels of teaching experience. Many students reported having no prior teaching experience in the following areas: recreational setting (31.6%, 12/38), clinical setting (65.8%, 25/38), students under 18 in classroom (63.2%, 24/38), students over 18 in classroom (57.9%, 22/38), and academic tutoring (36.8%, 14/38). The second most frequent response was one to sixth months of experience in most areas: recreational setting (28.9%, 11/38), clinical setting (23.7%, 9/38), students under 18 in classroom (18.4%, 7/38), students over 18 in classroom (26.3%, 10/38)—with the exception of academic tutoring, where the most frequent response (21.1%, 8/38) after no experience was one to two years of experience.

In Fundamentals of Teaching: Principles and Methods (classroom teaching), seven students from one term (fall 2014) responded to the questions concerning teaching experience. With the exception of academic tutoring, for each type of teaching listed, the largest percentage of students reported having no experience: recreational setting (57.1%, 4/7), clinical setting in health sciences (57.1%, 4/7), students under 18 in classroom (57.1%, 4/7), students over 18 in classroom (42.9%, 3/7), and academic tutoring (42.9%, 2/7). An equal number (28.6%, 2/7) in each category (one to six months, one to two years, and over five years) had experience in academic tutoring.

In the Introduction to Leadership and Career Development in an Academic Setting course, six students from one term (summer 2015) responded to the questions concerning leadership experience. The majority reported having two to five years of leadership experience in a recreational setting (33.3%), no leadership experience in health sciences (50%, 3/6), no leadership experience in an academic setting (33.3%, 2/6), no and six months to one year of leadership experience in an academic setting (33.3%, 2/6), no leadership experience in mentoring others (66.7%, 4/6), and no leadership experience in coaching others (50%, 3/6).

Preparedness. In the Clinical Teaching Practicum, 38 students from eight terms (fall 2012 to summer 2015) responded to the question regarding preparedness for clinical teaching. The majority (63.2%, 24/38) reported feeling somewhat prepared to teach in the clinical setting. Only one (2.6%) reported feeling very prepared to teach, while nine (23.7%) reported being not sure and four being underprepared (10.5%). At the end of the term, 46 students from eight terms (fall 2012 to summer 2015) responded to the same question regarding teaching preparedness (Clinical Teaching Practicum 1 and 2 post assessment). All students reported feeling either very prepared (41.3%, 19/46) or somewhat prepared (58.7%, 27/46) to teach in the clinical setting after taking this course. None of the students reported feeling not sure, slightly underprepared, or substantially underprepared (Table 3). There was a notable shift toward a perception of greater preparedness after completing the course. In particular, only one (2.6%) indicated feeling very prepared prior to taking the course, while this number rose to 19 (41.3%) after completing it.

In Fundamentals of Teaching: Principles and Methods (classroom teaching), seven students from one term (fall 2014) responded to the question regarding teaching preparedness for didactic teaching. None of the students at this stage reported feeling very prepared. Three (42.9%) reported feeling somewhat prepared to teach in the classroom setting, while the remaining students reported being not sure (14.3%, 1/7), slightly underprepared (28.6%, 2/7), or substantially underprepared (14.3%, 1/7). Following the course, the same seven had the following responses regarding teaching preparedness: very prepared (14.3%, 1/7), somewhat prepared (57.1%, 4/7), and not sure (28.6%, 2/7). None of the students reported feeling slightly underprepared or substantially underprepared at that point.

In the Introduction to Leadership and Career Development in an Academic Setting course, six students from one term (summer 2015) responded to the question concerning leadership preparedness. Two of the six (33.3%) reported feeling somewhat prepared to assume a leadership role, while the remaining responses were divided evenly (16.7%, 2/12).
skill, 10.6% (5/47) reported that they learned effective communication skills in clinical or preclinical teaching, and the same number were able to consider different learning styles, levels, personality types, and perspectives of students while teaching. Finally, 6.4% (3/47) appreciated the opportunity to observe peers teaching and gain feedback, while 4.3% (2/47) recognized the importance of preparation and the time and effort required for clinical teaching.

In Fundamentals of Teaching: Principles and Methods, seven students from one term (fall 2014) responded to the question regarding skills they expected to develop in the course. From the responses provided, 11 categorized responses were identified. Responses included topics such as preparing effective teaching materials (27.3%, 3/11). The desire to learn different teaching techniques, receive feedback from the course director, and develop effective presentation skills had response percentages of 18.2% (2/11) each. Six students from one term (fall 2014) responded to the open-ended question regarding valuable skills learned in this course. From the responses provided, 12 categorized responses were identified. How to teach to a variety of learning styles and how to teach in varied, engaging ways were both reported as the most important skill that students learned (25%, 3/12 each). The importance of preparation was also mentioned as an essential element of information learned (16.7%, 2/12).

In the Clinical Teaching Practicum, 37 students from eight terms (fall 2012 to summer 2015) responded to the open-ended question regarding skills they expect to develop in the course. From the responses provided, 51 categorized responses were identified. Whereas responses to this question varied, the highest percentage (45.1%, 23/51) was about students’ desire to be an effective teacher and to learn teaching techniques. Other responses included teacher-student interactions in clinical setting (9.8%, 5/51), teaching to different learning styles, levels, personality types (7.8%, 4/51), giving feedback (7.8%, 4/51), and preparing for clinical teaching (3.9%, 2/51). A very small number of students welcomed the opportunity to reinforce knowledge through teaching (3.9%, 2/51) and sought feedback on their own teaching skills (1.96%, 1/51).

At the end of the term, 41 students (89%) from eight terms (fall 2012 to summer 2015) responded to the open-ended question regarding valuable skills they learned in the Clinical Teaching Practicum 1 and 2. From the responses provided, 47 categorized responses were identified. The most frequent response (21.3%, 10/47) was general teaching methods and skills. Learning how to question and engage students was the next most frequently listed skill that the students learned (17%, 8/47). In addition, 12.8% (6/47) listed providing feedback as a valuable skill, 10.6% (5/47) reported that they learned effective communication skills in clinical or preclinical teaching, and the same number were able to consider different learning styles, levels, personality types, and perspectives of students while teaching. Finally, 6.4% (3/47) appreciated the opportunity to observe peers teaching and gain feedback, while 4.3% (2/47) recognized the importance of preparation and the time and effort required for clinical teaching.

In Fundamentals of Teaching: Principles and Methods, seven students from one term (fall 2014) responded to the question regarding skills they expected to develop in the course. From the responses provided, 11 categorized responses were identified. Responses included topics such as preparing effective teaching materials (27.3%, 3/11). The desire to learn different teaching techniques, receive feedback from the course director, and develop effective presentation skills had response percentages of 18.2% (2/11) each. Six students from one term (fall 2014) responded to the open-ended question regarding valuable skills learned in this course. From the responses provided, 12 categorized responses were identified. How to teach to a variety of learning styles and how to teach in varied, engaging ways were both reported as the most important skill that students learned (25%, 3/12 each). The importance of preparation was also mentioned as an essential element of information learned (16.7%, 2/12).

In the Introduction to Leadership and Career Development in an Academic Setting course, five out of six students from one term (summer 2015) responded to the open-ended question about skills they expected to develop in the course. From the responses provided, nine categorized responses were identified. The highest percentage (33.3%, 3/9 each)
pertained to gaining leadership skills, learning about leadership styles, and developing ways to interact effectively with others in various situations. The same number responded to the open-ended question regarding valuable skills they learned in the course. From the responses provided, eight categorized responses were identified. Interviewing skills was most frequently named the most important skill students learned (50%, 4/8). The importance of feedback and communication was the next most frequent response (25%, 2/8), followed by dealing with difficult employees (12.5%, 1/8).

Concerns. In the Clinical Teaching Practicum, 42 students from eight class terms (fall 2012 to summer 2015) responded to the open-ended question regarding lingering teaching concerns at the end of the course. From the responses provided, 49 categorized responses were identified. The most frequently reported concern related to the recognition of not having sufficient knowledge and experience (18.4%, 9/49). The second most frequently reported concern was being able to teach effectively and clearly (16.3%, 8/49). Other concerns included being informative/helpful in a way that empowers students (8.16%, 4/49), getting students engaged and interested in the subject (10.2%, 5/49), preparation (8.2%, 4/49), and not being able to give enough individual attention to students (4.1%, 2/49).

In Fundamentals of Teaching: Principles and Methods, six students from one term (fall 2014) responded to a similar open-ended question regarding post-course teaching concerns. From the responses provided, seven categorized responses were identified. Being nervous about giving lectures and teaching in general was the most frequent response (42.9%, 3/7). In addition, the following concerns were mentioned by one student each (14.3%): designing the semester layout for a course, not having enough time to teach material, and having enough knowledge.

In Introduction to Leadership and Career Development in an Academic Setting, five students from one term (summer 2015) responded to the open-ended question regarding lingering concerns related to leadership. From the responses provided, six categorized responses were identified. Responses to this question were varied. Concerns listed were maintaining a work-life balance, making decisions that impact others, inspiring others, networking, and overcoming natural personality traits such as being introverted (16.7%, 1/6 each).

Feedback from Students Taught by Practicum Students

Teaching skills and effectiveness. A total of 305 first- and second-year students from four terms (spring 2014 to spring 2015) responded to the question regarding teaching effectiveness of the practicum students with whom they interacted in clinical or preclinical settings. Because some first- and second-year students interacted with and thus evaluated more than one practicum student, there were a total of 837 responses. The majority (71.2%, 596/837) rated the teaching effectiveness of practicum students as 5 out of 5 (highest possible), while 22.7% (190/837) rated the effectiveness as 4 out of 5 (Figure 1).

Students participating in the Teaching Practicum in Dental Education had the opportunity to give a didactic lecture and facilitate a small-group discussion, after which they received feedback on their teaching skills. A total of 248 responses out of 288 completed surveys from second- and third-year students during the 2015 term were recorded in response to the question about presentation effectiveness in a lecture taught by the practicum students (not all surveys included this question). The majority (53.2%, 132/248) strongly agreed that the presentation contributed to their learning, while 44.4% (110/248) agreed and 2% were undecided. A total of 40 out of 59 surveys completed by first-year students taught in a small-group setting by the practicum students during two terms (spring 2015 and summer 2015) were recorded for the question about the value of the discussion facilitated by practicum students. The majority (60%, 24/40) strongly agreed and the remaining students (40%, 16/40) agreed that the discussion contributed to their learning.

Strengths of teaching practicum students. In the 305 completed surveys, 1,292 categorized responses were identified. Percentages represent the number of responses in a given category divided by the total number of categorized responses for the open-ended question regarding strength of the clinical teaching practicum students. Various teaching personality traits were most frequently mentioned as being a strength of the practicum students (31.4%, 405/1292). Knowledge and expertise in the content area was the second most frequent response regarding practicum student strengths (21.1%). Overall personality (17.4%, 225/1292) and use of teaching skills and techniques including effective communication (16.6%, 215/1292) were also mentioned as strengths.
Out of 288 completed surveys, 366 categorized responses were identified to the open-ended question regarding strengths of the practicum students presenting in a didactic course. Good public speaking skills and personality were most frequently mentioned as a strength (34.2%, 125/366). Practicum student preparedness and organization was the second most frequently mentioned category (18.3%, 66/366), followed by the ability to connect and interact with the class (14.2%, 52/366). A total of 59 first-year students from two terms (spring and summer 2015) responded to the open-ended question regarding areas of strength of the practicum students with whom they interacted. From the responses provided, 161 categorized responses were identified. Ability to facilitate group discussion and participation was most frequently mentioned as a strength (39.8%, 64/161). Helpful insight provided by the practicum students was the second most common strength given by first-year students (18.7%, 30/161). In addition, the following strengths were listed: friendly, relatable, engaging personality (11.9%), ability to make connections to real-life examples (6.2%), and ability to create a good learning environment (5%).

Faculty Feedback

Value of teaching practicum students. Of the 18 faculty members asked, 11 completed the survey asking for feedback on their experience with the teaching practicum students. Six of ten faculty members (60%) interacted with practicum students in first and second clinics; all respondents interacted with practicum students in pre-clinic (some interacted with the students in both learning environments). Nine of 11 faculty members responded to the survey question regarding the value of having practicum students helping in class, with 55% (5/9) strongly agreeing and 33% (3/9) agreeing that the practicum students were valuable to the learning experience. All seven faculty members completed the survey asking for feedback on their experience with students in the Teaching Practicum in Dental Education: 57% (4/7) interacted with the practicum students in their lecture courses, 57% (4/7) in a small-group discussion, and 29% (2/7) in a standardized patient session clinic (some faculty interacted with the students in all learning environments). Seven faculty members responded to the survey question regarding the value of having practicum students helping in class: 71% (5/7) strongly agreed and 14% (1/7) agreed that these students were valuable to the learning experience.

Benefits of teaching practicum students. There were ten responses out of 11 to the open-ended question asking faculty about benefits of having practicum students in their clinical or preclinical courses. The following benefits were reported with about equal frequency: practicum students help offset the high student-faculty ratio (90%, 9/10),
first- and second-year students are more comfortable interacting with practicum students (60%, 6/10), and practicum students can relate better to students (60%, 6/10). There were seven responses out of seven to the open-ended question asking about benefits of having practicum students in the didactic courses. Benefits included the following: practicum students can relate better to students (57.2%, 4/7), students are more comfortable interacting with practicum students (42.9%, 3/7), practicum student receives valuable, real-world experience and useful feedback about performance (42.9%, 3/7), valuable insight from practicum student related to students’ interest (28.6%, 2/7), and practicum students helped faculty with using different forms of technology (14.3%, 1/7).

Suggestions for improvement. Seven of the 11 faculty participants responded to the open-ended question asking for suggestions for better preparing practicum students for clinical or preclinical teaching in the future. There were equal percentages of responses for each suggestion (14.3%, 1/7). Suggestions were as follows: encourage practicum students to be more proactive about helping students; be more selective about selecting students; encourage practicum students to prepare themselves better for their clinical teaching experience; inform faculty of practicum student course requirements; provide practicum students with practice teaching opportunities before actually teaching in the clinic environment; and better communication regarding practicum student’s schedule. There were five responses out of seven to the open-ended question asking for suggestions for better preparing practicum students for didactic teaching in the future: 60% (3/5) stated that the practicum student was well prepared, 20% said there were no improvements to be made, and 20% (1/5) stated that more time was needed to prepare practicum students for their teaching experience.

Concerns. There were seven responses out of 11 to the open-ended question asking faculty to share concerns or challenges regarding practicum students teaching in clinical or preclinical courses that they would like to see addressed. Three (50%) responses pointed to the need for more time to prepare practicum students, while one each (16.7%) stated that there were no concerns or challenges and said that some students were dissatisfied with being taught by practicum students.

Student Feedback from Extracurricular Series

In the extracurricular lunch hour discussion series, participants were asked to indicate whether the session in general addressed their interest. The topics included clinical teaching experience as a student, junior faculty members’ experience, part-time clinical instructor’s experience, role models in higher administration, and passion for teaching. A total of 128 audience members (summer 2013, fall 2014, spring 2015, summer 2015) responded. The majority (51.6%, 66/128) strongly agreed that the discussion session addressed their interest. The remaining audience members agreed (41.7%, 53/128) or were neutral (7.1%, 9/128).

Discussion

The purpose of this article was to provide an overview of a new three-tiered program designed to help nurture interest in academic careers among predoctoral dental students. We also presented baseline survey data on the program, focusing on students’ motivations, preparedness, and expectations. Short-term program effectiveness was measured by evaluating feedback from third- and fourth-year students of the ACT ARCO program and elective courses, first- and second-year students on the students who taught them, and faculty on the participating students’ contribution to their courses. The effectiveness of the lunch hour discussion series was evaluated using feedback from participants. Furthermore, we explored the assumptions that students will take advantage of training opportunities for an academic career at varying commitment levels and that teaching opportunities for students are valued by faculty and students.

At this point, enrollment in all courses and in the ACT ARCO program has exceeded our initial expectations. Enrollment in the Clinical Teaching Practicum, which has been offered nine times since 2012, is steadily growing; subsequent courses were needed to meet student demand for more teaching
opportunities. Initial enrollment in the more recent courses (Fundamentals of Teaching: Principles and Methods and Introduction to Leadership and Career Development in an Academic Setting) is comparable to current enrollment in the Clinical Teaching Practica. Rupp et al. recommended the presence of academic training programs at the predoctoral level to raise awareness about academic careers. Enrollment in our ACT ARCO program shows similar trends and promise as the current enrollment equals 10% of the class. The enrollment data at the UP-SDM demonstrate that there is not only awareness of teaching as a possible career option but a strong interest in such training among students that was previously not addressed.

When surveyed about which of the three arms of an academic career most interested prospective ACT ARCO applicants, university teaching was ranked the highest. These results combined with the high enrollment in the teaching practica confirm the need for and interest in training specifically in teaching. These results showed that a comprehensive model, such as the UPSDM’s three-tiered program, successfully attracts a high number of students and accommodates their needs to engage in training in teaching or leadership at varying levels of commitment. Attracting students to an academic career exclusively through research programs or through a highly selective process may ultimately exclude interested and capable students from considering an academic career path early on. Of course, we need to confirm via further assessment that this level of interest and engagement at the UPSDM can be sustained.

Students reported that their teaching and leadership preparedness increased after completing the courses. In the Clinical Teaching Practicum, the number of students who reported feeling very prepared for clinical teaching increased from 2.6% (at the outset of the course) to 41.3%. While the other courses (Fundamentals of Teaching and Leadership and Career Development in an Academic Setting) have a smaller number of participating students, pre- and post-course surveys also showed major increases in self-reported preparedness. In addition, students were able to list skills they learned ranging from general teaching skills to specific strategies such as asking open-ended questions, recognizing and teaching to different learning types, and interviewing skills. The skills students learned in a particular course are high-level and transferable skills, which they will be able to apply in all aspects of their academic and clinical careers.

Findings from the various surveys showed that the practicum students’ involvement in instructional activities is being appreciated by both faculty and the students being taught. Anonymous feedback from first- and second-year students recognized teaching practicum students as effective teachers in both clinical and didactic settings. The ability to relate to the learner was highly praised by students and faculty. This is presumably due to the fact that practicum students are less removed from the learning experience than are the faculty; recognition of this advantage can benefit teaching programs at dental schools and provide a basis for buy-in from various constituencies.

This report has limitations that must be taken into account. While the data and sample sizes are robust for surveys in courses that have been taught for several years, we were limited in our ability to assess those aspects of the evolving program introduced more recently due to small sample sizes. Thus, the results cannot reliably be generalized to other dental schools in North America. Although overall response rates were high for most of the surveys, there were several reasons why students may not have completed a given survey: they were not in attendance on the day when the survey was administered, they did not work with practicum students, or they chose not to fill out the survey. In addition, first- and second-year students may have worked with more than one practicum student and thus completed more than one survey. The surveys that were not part of a class assignment did not have a design that forced a response to every question; thus, response rates sometimes varied from question to question.

Middle- and long-term measures of program effectiveness have been planned to follow-up on this initial study. Using the existing pre and post surveys, the program directors will continue to measure gained knowledge and skills, as well as students’ perceptions of the effectiveness of individual courses and the ACT ARCO program in developing specific skills and preparing students for an academic career and their perceived relevance of courses and program content. In addition, at the end of the two years, the program directors will conduct an exit interview with each graduating ACT ARCO student to assess perceived program effectiveness and future plans. The long-term effects of this program will be measured by tracking graduates’ placement in academic positions. The ACT ARCO program directors will use direct communication and social media to track students after graduation and follow the development of their careers and will collect graduates’ curriculum vitae to
determine academic rank, leadership positions, and/or teaching roles. The same communication methods will be used to connect with graduates who did not enter academia to explore their reasons. We intend to report the middle- and long-term outcomes of the program to the dental education community.

**Conclusion**

This report represents an initial step in the process of assessing the UP-SDM’s three-tiered program designed to prepare students for an academic career. We have established baseline information about the program, which will provide a basis for future studies. The three-tiered program demonstrates the UP-SDM’s long-term commitment to addressing the challenge of faculty shortages in academic dentistry. The overarching goal of the three-tiered program is to attract students to academia as a viable career path and equip them with the necessary skills and basic knowledge to return to academia. Because we offer three programs, students can choose the level of commitment that matches their readiness. With this, the UP-SDM aims to address barriers to students’ interest in academic dentistry: each tier of the program exposes students to the opportunities, rewards, and challenges that an academic career can offer, and the formal experiences of the elective courses and the ACT ARCO program provide structured learning experiences and mentoring for participants. By fostering a community and nurturing students’ interest during the predoctoral years, the UP-SDM expects to increase the likelihood that these students will maintain their interest in a career in academic dentistry; however, it is too early to tell. It is important to equip motivated predoctoral students with the necessary basic skills to successfully transition to an academic career at a later point in their lives. At this initial stage, the overall positive feedback on the three-tiered program from three groups—faculty, participating students, and students being taught—confirms the value of the UP-SDM’s approach to training students for academic careers.

**Acknowledgments**

The authors would like to express their gratitude to Dean Thomas W. Braun for his continuous support of the creation and maintenance of the program and to the 2015 Dean’s Summer Research Scholars Program for funding Sarah Albani’s involvement in the project. We thank the students providing feedback on the courses in which they participated, on the practicum students’ teaching, and on the extracurricular lunch discussion series. We also thank the faculty members who gave feedback on the practicum students’ involvement in their courses. In addition, we thank the members of the Advisory Committee for providing feedback and encouragement during the planning phase and for volunteering their time to advise the ACT ARCO program directors in monitoring progress; Seth M. Weinberg and Heiko Spallek for their continued support and provision of advice during planning, implementing, and maintaining the program; Jean O’Donnell for her support of curricular planning of the ACT ARCO; Michael Dobos and Marnie Oakley for their support of students engaging in teaching as part of their educational experience; Anitha Potluri for support of the international (advanced standing) students to participate in the ACT ARCO; and Hsing-Chi von Bergmann, University of British Columbia, for sharing the evaluation instrument used for the Teaching & Learning Module for Graduate Student Instructors. These initiatives would have not been possible without the dedication to teaching and enthusiasm of the students who are participating in the ACT ARCO program and taking the elective courses as well as the support of the clinical and preclinical faculty members who welcome students completing the Clinical Teaching Practicum and/or Teaching Practicum in Dental Education.

**Disclosure**

None of the authors declared any conflicts of interest.

**REFERENCES**