

Dissecting Through Barriers: A Mixed-Methods Study on the Effect of Interprofessional Education in a Dissection Course With Healthcare Professional Students

Alisha Rebecca Fernandes,¹ Andrew Palombella,² Jenn Salfi,³ Bruce Wainman^{2,4*}

¹Faculty of Health Sciences, Department of General Surgery, McMaster University, Hamilton, Ontario, Canada

²Faculty of Health Sciences, Education Program in Anatomy, McMaster University, Hamilton, Ontario, Canada

³Faculty of Applied Health Sciences, Department of Nursing, Brock University, St. Catharines, Ontario, Canada

⁴Faculty of Health Sciences, Department of Pathology and Molecular Medicine, McMaster University, Hamilton, Ontario, Canada

Healthcare delivery is reliant on a team-based approach, and interprofessional education (IPE) provides a means by which such collaboration skills can be fostered prior to entering the workplace. IPE within healthcare programs has been associated with improved collaborative behavior, patient care and satisfaction, reduced clinical error, and diminished negative professional stereotypes. An intensive interprofessional gross anatomy dissection course was created in 2009 to facilitate IPE at McMaster University. Data were collected from five cohorts over five years to determine the influence of this IPE format on the attitudes and perceptions of students towards other health professions. Each year, 28 students from the medicine, midwifery, nursing, physician's assistant, physiotherapy, and occupational therapy programs were randomly assigned into interprofessional teams for 10 weeks. Sessions involved an anatomy and scope-of-practice presentation, a small-group case-based session, and a dissection. A before/after design measured changes in attitudes and perceptions, while focus group data elaborated on the student experience with the course. Pre- and post-matched data revealed significant improvements in positive professional identity, competency and autonomy, role clarity and attitudes toward other health professions. Qualitative analysis of intraprofessional focus group interviews revealed meaningful improvements in a number of areas including learning anatomy, role clarity, and attitudes towards other health professions. *Anat Sci Educ* 8: 305–316. © 2015 American Association of Anatomists.

Key words: gross anatomy education; medical education; interprofessional education; midwifery education; occupational therapy education; physician's assistant education; physiotherapy education; nursing education; mixed methods; assessments; outcomes

INTRODUCTION

Effective healthcare delivery requires a team-based approach. In 1988, the Report of a World Health Organization Study Group on Multiprofessional Education for Health Personnel entitled *Learning together to work together for health* (WHO,

1988) called for the creation of interprofessional education (IPE) programs for health professional students and practitioners, with a view toward using IPE to optimize patient care (Hopkins, 2010). It emphasized that effective interprofessional collaboration and communication require intentional interaction among the health disciplines and a mutual understanding of their scope of practice (Hopkins, 2010). These themes were later reiterated and elaborated on by the World Health Organization (WHO, 2006; Yan et al., 2007; Gilbert et al., 2010; WHO, 2010). In recent years, similar reports calling for the creation of effective IPE initiatives have been published by the Canadian Health Services Research Foundation and the Enhancing Interdisciplinary Collaboration in Primary Health Care Initiative (Nolte, 2005; CIHC, 2010).

According to the United Kingdom Centre for Advancement of IPE (Barr, 2000), IPE comprises “occasions when

*Correspondence to: Dr. Bruce Wainman, 1R1 Health Sciences Centre, 1280 Main Street West Hamilton, Ontario L8S 4L8, Canada. E-mail: wainmanb@mcmaster.ca

Received 10 October 2014; Revised 12 December 2014; Accepted 22 December 2014.

Published online 16 January 2015 in Wiley Online Library (wileyonlinelibrary.com). DOI 10.1002/ase.1517

two or more professions learn with, from and about each other to improve collaboration and quality of care.” This definition implies IPE is not merely parallel learning but an interaction that encourages thoughtful and active participation in shared tasks, and allows participants to understand one another’s scope of practice and professional roles (Thistlethwaite et al., 2010).

Historically, healthcare professionals have learned to collaborate with other disciplines while on the job. Such workplace encounters are integral to the process of gaining proficiency in interprofessional collaboration, and to the delivery of quality care (Barnsteiner et al., 2007; Thistlethwaite and Dallest, 2014). However, much benefit can be acquired from early interaction among health professional students in the form of IPE initiatives (Hammick et al., 2007; Reeves, 2009; Hood et al., 2014; Shields et al., 2015). These directed initiatives teach participants to communicate, mobilize one another’s skills, contribute to common goals, and learn about one another’s scope of practice prior to entering the workplace and before professional bias has developed (Lerner et al., 2009; Mellor et al., 2013). As Thistlethwaite phrased it, “the rationale for IPE is that learning together enhances future working together” (Thistlethwaite, 2012).

IPE is not yet a standard component of most curricula for health professional students (Ho et al., 2008; Aston et al., 2012). An overview of IPE by Reeves stressed that there is no single effective method of IPE delivery, emphasizing that today is a creative time for educators to continue to trial variants of IPE (Reeves, 2009). Despite the diversity of IPE offerings available to date, few have assessed the use of anatomy dissection—a basic curricular component of several health professions’ curricula—as a means of IPE.

Gross anatomy dissection has long been recognized as a means of teaching clinically-relevant anatomy for health professional students (Snelling et al.; 2003; Azer and Eizenberg, 2007; Hamilton et al., 2008; Krause et al., 2014; Shields et al., 2015). It also serves as a venue for interaction—fostering teamwork, communication skills, professionalism, and respect (Escobar-Poni and Poni, 2006; Thomas et al., 2011). The studies that have been done have yielded positive results. In 2015, Shields and colleagues surveyed pre-clinical physical therapy (PT) and medical students (MD) participating in a standard gross anatomy course together. Qualitative findings included a reduction in the perceived division between PT and MD students, and improvements in teamwork, communication and respect (Shields et al., 2015). A similar study in 2004 by Mitchell et al. presented a questionnaire to multidisciplinary teams of students in a dissection course. Largely, students’ attitudes toward shared anatomy learning and toward IPE, improved (Mitchell et al., 2004).

Unfortunately, these longitudinal IPE offerings did not include an intentional component allowing students to understand one another’s scope of practice or professional roles. Furthermore, they employed small sample sizes, and did not use standardized measurement tools to assess for change in attitudes and perceptions. These issues represent a recurring theme in the literature. A comprehensive review of IPE initiatives called for more valid and reliable outcome measures to inform the practice of IPE (Hammick et al., 2007).

Recognizing the need for competency in interprofessional collaboration, and the suitability of gross anatomy dissection as a venue for fostering interaction among health professional students, a novel interprofessional problem-based learning (PBL) and gross anatomy dissection course was designed and implemented. This annual 10-week-long course invites stu-

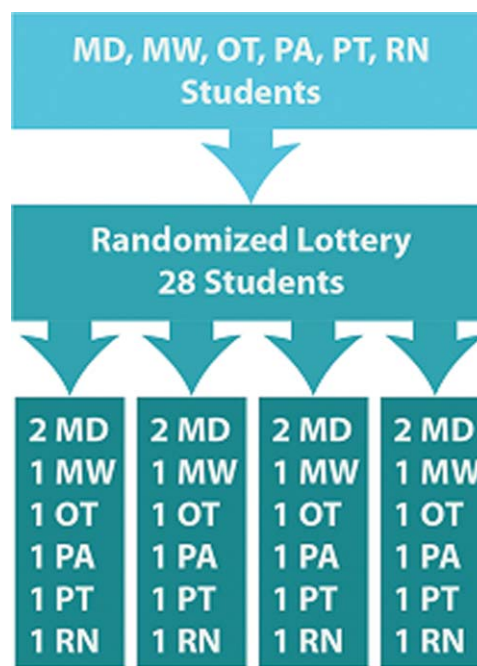


Figure 1.

Structure of the 2014 McMaster gross anatomy interprofessional dissection course. MD, medicine; MW, midwifery; OT, occupational therapy; PA, physician’s assistant; PT, physiotherapy; RN, nursing.

dents from several health professions to collaborate during PBL and case-relevant gross anatomy dissection, and to intentionally learn about one another’s scope of practice. In 2010, qualitative and quantitative data were collected using validated measures to determine how learning in this setting influenced students’ perceptions of other health professional students, as well as their perceptions of IPE (Chan et al., 2011). This article will share the findings from a mixed methods evaluation of the interprofessional PBL and gross anatomy dissection course at McMaster University in Hamilton, Ontario, Canada.

METHODS

Course Format

Annually, approximately 28 students are randomly selected and allocated into four interprofessional groups, each with members from five to six different programs (Fig. 1). The undergraduate medical program (MD) is allocated two students per group reflecting their larger class size. In total, approximately 150 students from the MD, midwifery (MW), occupational therapy (OT), physician’s assistant (PA), physiotherapy (PT), and nursing (RN) programs completed the course by 2014.

The weekly three-hour course is divided into segments, illustrated in Figure 2. Prior to each session, students use their course guide to review case studies and anatomy. To open each session, anatomy relevant to the week’s dissection and case studies is presented. Next, a student coordinator from one of the six represented professions outlines the scope of practice of their discipline. Students then complete PBL-style case studies in their interprofessional groups. This provides the

Weekly Course Breakdown:

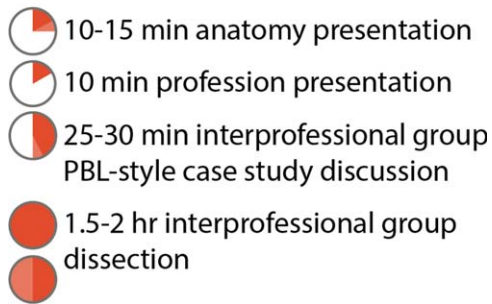


Figure 2.

Weekly course itinerary. PBL, problem-based learning.

opportunity to discuss the role of their profession in managing the case, and learning about the roles of others. Finally, students dissect in interprofessional groups. Weekly topics, objectives, and a case study breakdown are illustrated in Appendix A. Students who had participated in the prior year's interprofessional dissection were chosen as class coordinators in charge of recruitment, PBL problem setting and data collection.

Data Collection

A sequential explanatory mixed-methods study design was conducted to assess what students learned about interprofessional collaboration, teamwork, and anatomy in an interprofessional dissection course in anatomy. The quantitative component of this design assessed changes in attitudes and perceptions regarding interprofessional collaborative practice, and monitored students' readiness for interprofessional learning. Through the collection of both quantitative and qualitative data, one can develop a more complete picture of the phenomenon under study (Creswell, 2008), thus a qualitative component was added to this study with the hopes that qualitative data could assist in interpreting the quantitative findings. As is typical with a sequential explanatory design, quantitative, and qualitative data were collected and analyzed separately, as the two data sets reflected different questions (Creswell, 2008).

Ethics approval was initially granted in 2008 by the Research Ethics Board (REB) for Hamilton Health Sciences/Faculty of Health Sciences at McMaster University. The approval has been renewed annually, in line with the REB's research protocol.

Quantitative Component

Quantitative data were collected using a before-and-after study design, with two established measurement scales. These consisted of the revised Interdisciplinary Education Perception Scale (IEPS) (McFayden et al., 2007) and Readiness for Interprofessional Learning Scale (RIPLS) (McFayden et al., 2005), illustrated in Appendices B and C, respectively. The scales enable quantitative measurement of changes in attitudes and perceptions towards IPE, as well as assess students' readiness for interprofessional collaboration. Data collection occurred from 2011 to 2014 and included 97 students from the Faculty of Health Sciences at McMaster University (Table 1).

Table 1.

Breakdown of Students by Program That Have Completed the Pre- and Post-surveys.

Health sciences program	Number of students
Medicine	27
Midwifery	11
Occupational Therapy	14
Physician's Assistant	15
Physiotherapy	13
Nursing	17
Total	97

Luecht et al. (1990) originally designed the IEPS as a tool to measure changes in students' attitudes following an interprofessional experience. It is comprised of four subscales: competence and autonomy, perceived need for cooperation, perception of actual cooperation, and understanding of other's value (Luecht et al., 1990). The IEPS subscale breakdown is illustrated in Appendix B. Parsell and Bligh (1999) originally developed the RIPLS to assess perceptions and attitudes of healthcare students towards interprofessional learning, with subscales including teamwork and collaboration, positive and negative professional identity, and professional roles and responsibilities. The RIPLS subscale breakdown is illustrated in Appendix C.

McFadyen et al. (2005) revised the RIPLS, dividing the original three subscales into four, while increasing stability and improving psychometrics. The revised RIPLS has high internal consistency and has been validated in undergraduate and postgraduate students (McFayden et al., 2005). Similarly, McFadyen et al. (2007) revised the IEPS to improve psychometric stability, demonstrating good test-retest reliability and internal consistency for three of the four subscales, and validating it for use in undergraduate populations (McFadyen et al., 2007). The comparison between revised IEPS and revised RIPLS subscale breakdowns is illustrated in Appendix D. The revised IEPS and revised RIPLS instruments utilize a six- and five-point Likert scale, respectively.

Qualitative Component

Qualitative data were collected from multiple sources: participant feedback from written weekly evaluation forms and postcourse intraprofessional focus groups. After completion of the interprofessional dissection course in anatomy, 15 focus group sessions were conducted, with four participants in each focus group. Convenience and purposeful sampling procedures were used to recruit student participants on a volunteer basis, with representation from all of the health professional programs within the Faculty of Health Sciences. Members of the research team conducted the focus group sessions, which consisted of four open-ended questions, illustrated in Appendix E. Two investigators were present at each session, one to facilitate the interview and one to take notes. Each session was audio recorded and transcribed. Thematic content analysis was completed by three groups of

Table 2.

Descriptive Statistics for Interdisciplinary Education Perception Scale (IEPS) Subscale Scores for All Professions Combined

Subscale	Precourse mean (\pm SD)	Postcourse mean (\pm SD)
Perception of actual cooperation ^a	5.15 (\pm 0.52)	5.30 (\pm 0.53)
Perceived need for cooperation	5.74 (\pm 0.46)	5.76 (\pm 0.41)
Competency and autonomy ^a	4.97 (\pm 0.80)	5.28 (\pm 0.66)

^aIndicates a significant difference between pre- and postcourse subscale score means ($P < 0.05$); data are means \pm standard deviation; $n = 97$.

investigators independently, and a number of common themes were identified. All qualitative analyses were compared, and themes were collapsed into a final list of four broader categories (Burnard, 1991).

Triangulation of evidence from different individuals (student participants and facilitators), different types of data (investigator observations and notes, and transcribed verbatim), and different forms of data collection (weekly written evaluations and focus group interviews) aimed to enhance the credibility and trustworthiness of the key themes drawn from the qualitative data. Dependability of the qualitative findings was enhanced as investigators first coded independently, then came together to compare and refine the central themes emerging from the qualitative data (Lincoln and Guba, 1985).

Statistical Analyses

Pre- and postcourse subscale score mean differences were analyzed and evaluated using the Wilcoxon Signed-Rank Test in Statistical Package for Social Scientists (SPSS), version 22 for Windows (IBM Corp., Armonk, NY). All 97 students from the various Health Sciences programs were analyzed and evaluated together.

RESULTS

Quantitative Results

Mean pre- and postcourse subscale scores across student groups combined for both IEPS and RIPLS are demonstrated in Tables 2 and 3, respectively. Several subscale scores showed statistically significant pre- versus postcourse change ($P \leq 0.05$). Both the “perception of actual cooperation” and “competency and autonomy” subscales within the IEPS survey demonstrated statistically significant positive change ($P \leq 0.05$). Similar results were seen within the RIPLS survey, where the “teamwork and collaboration”, “positive professional identity,” and “roles and responsibilities” subscales showed statistically significant positive change ($P \leq 0.05$).

Qualitative Results

Four main themes emerged from the analysis of the qualitative data: (1) Learning about self and others, (2) Learning about anatomy, (3) Experiencing the benefits of a long dura-

Table 3.

Descriptive Statistics for Readiness for Interprofessional Learning Scale (RIPLS) Subscale Scores for All Professions Combined

Subscale	Precourse mean (\pm SD)	Postcourse mean (\pm SD)
Teamwork and collaboration ^a	4.54 \pm 0.41	4.68 \pm 0.34
Negative professional identity	1.58 \pm 0.58	1.48 \pm 0.54
Positive professional identity ^a	4.37 \pm 0.52	4.53 \pm 0.50
Roles and responsibilities ^a	2.30 \pm 0.74	2.11 \pm 0.65

^aIndicates a significant difference between pre- and postcourse subscale score means ($P < 0.05$); data are means \pm standard deviation; $n = 97$.

tion IPE initiative (Pride and Faith), and (4) Going forward. Below is a brief description of each theme, as well as supporting verbatim from the focus groups.

Learning About Self and Others

Role clarity and role articulation are common areas of learning that arise from IPE experiences, regardless of duration, or frequency of event. Throughout the duration of the 10-week course, students from each of the health professional programs reported that their perceptions of their own professional roles changed, as well as that of other professional roles.

Through this interaction, I managed to learn the different scopes of practice of the different professions really well. And not just in a superficial sense but in a very collaborative way . . . this is what we do and this is what we specialize in and this is when you can refer to us. For a team . . . I think this was really valuable.

They [the other pre-licensure students] are coming . . . from a different perspective and it's forcing me to kind of go back into my own . . . and what I know about my profession or future profession.

Learning with, from and about others was facilitated by the format of the course. Each week, students educated their peers about their profession through discussion of clinical scenarios and clinically-relevant anatomy, and by coming together to dissect as a team. Together, the components of the course fostered a healthy environment for peer mentoring, and the sharing of role-related experiences and expertise.

I think it was definitely helpful to dissect in an interprofessional team . . . for example, I hate doing muscle anatomy and I'm really bad at it but . . . the PTs and OTs in particular had experience with it and . . . they made re-learning some of the muscles really kind of fun . . . and a lot of it actually has stuck with me.

Learning About Anatomy

All students agreed that the course design enhanced their knowledge of anatomy, physiology, and dissection. More specifically, they appreciated the combination of dissection and prosection, citing benefits of both approaches.

I found that dissection was amazing for function because I could see the connections and I could see how it was all

related...and I got a much better sense of texture...like how much pressure that tissue was going to put out, and give me back as a result of its strength. I can't get that in a prosection...but I certainly benefitted from looking at the prosected specimens before I started the dissection.

I think that having a prosection approach and a dissection approach combined was very valuable.

Experiencing the Benefits of a Longer Duration IPE Initiative

A prominent theme from the focus groups related to higher-order interprofessional competencies: establishing relationships, working through conflict, pride, and self-assurance in one's role in a team, and establishing trust for other health professions. It is extremely difficult to expose students to such competencies in a typical, one-time IPE event. Over 10 weeks, students learned to work together as a team, through both relational and educational experiences.

The more longitudinal program allows you to develop relationship and rapport with each of the other professionals on the team, which I would not encounter in any other setting. And that was really, really valuable in developing an interprofessional consciousness.

There were instances, especially early on, that the med students kind of were taking charge and telling other people in our course what to do—which kind of fed into that stereotype...but to watch that change over the course of the interprofessional dissection course and watching them kind of step back and knowing when to step in was really good.

Developing Pride in One's Profession

Pride in one's profession was a prevalent theme, especially among students from nursing, midwifery and the rehabilitative sciences (physiotherapy and occupational therapy).

I think as far as the role of the physiotherapist goes, I think I now better appreciate the expertise that we bring from our field and how it is important for us to input as much of our knowledge as we can.

I found myself really being proud to be a midwife...after all of the positive reactions, and seeing people learning about and taking a keen interest in my profession...I hope that I was able to provide that for people by asking them questions about their profession. It also really made me kind of proud of what I'm doing and what I've chosen to do with my career and my life.

Developing Faith (Trust) in Others

Trust in other's profession was another strong theme, especially in the verbatim from the medical students.

Learning everyone else's role and knowing that there is that continuity of care...was something that I took away from this...When I start practicing, it will be nice knowing that I have faith in what other health care providers do, and knowing that we can all work together to make the patient better.

I think the only way that my role may have changed is that I'm aware that there's a lot of other professionals who are more

qualified in certain areas, and it...sort of eases my responsibilities rather than trying to handle everything myself in the future.

Going Forward

The interprofessional dissection course in anatomy positively influenced the students who experienced this innovative initiative. All participants shared visions of their future professional practices, which included working with other professionals, and embracing key principles of interprofessional care.

What will I do differently as a result of this course? I will consult actively more with OTs and PTs. I feel also that I will have the ability to discuss midwifery options...in a more positive light with my clients. I now have a better understanding of what happens...because the midwives in this group really just blew me away with their understanding of what's going on and how much they care as well.

I think definitely after being in this course...I've discovered how easy it can be to actually include other health care professions in your treatment if you seek them out. So I think now I will definitely whenever possible...consult other health professionals instead of thinking that I need to take it all on my own.

I just have a lot more faith in the horizontality of it all...I want to be a family doctor in a community health care setting which is really interdisciplinary, and I have a tonne of faith that that is the best way to go for patients.

DISCUSSION

Data from this study indicate that a 10-week, 30 hour IPE dissection course for health professional students had a positive effect on the attitudes and perceptions of students toward interprofessional collaboration, and toward anatomy as a venue for IPE. The course was well-received by all five participating cohorts who felt it was an effective method of learning about anatomy, and about health professionals' scope of practice. The study was adequately powered to yield significant quantitative findings, while qualitative results maintained credibility, dependability, confirmability, and transferability—enriching the interpretation of the quantitative findings. The findings of this course are generalizable to academic institutions that educate several health disciplines and teach anatomy, provided that these institutions are dedicated to offering the resources required to facilitate an IPE dissection curriculum.

Being that effective healthcare delivery requires a team-based approach, this study demonstrates definite clinical relevance. Longitudinal initiatives like this course allows prelicensure students to foster team-building skills and positive interprofessional attitudes early in their careers, while improving basic knowledge of anatomy and dissection techniques. Such techniques may otherwise be unavailable to students through their home programs.

This IPE dissection initiative is the first of its kind. It reinforced anatomy education as a relevant means of disseminating anatomical knowledge to multiple health sciences professions simultaneously. It used cadaveric dissection as a venue for longitudinal IPE among students from six health professional programs, and it used validated outcome measures to demonstrate student progress after the course. Results derived from RIPLS and IEPs were reproducible from year to year, suggesting their reliability.

A strength of this initiative was that it was created and sustained annually by interprofessional student groups, for students. The curriculum, including the course manual, weekly anatomy and scope of practice presentations, clinical cases, and team dissection experiences were synthesized by alumni of previous years' courses. The curriculum derived emphasized intentional, professional, role-focused discussions—a tenant of quality IPE—particularly during scope of practice presentations and case-based discussions. Intentional scope-of-practice discussions early in each session set the stage for the rest of the session where students were often heard discussing their home-program curricula, their frank professional stereotypes, and their hopes for future interprofessional practice.

Additionally, the course included health professional students at the early stages of their training. Only a portion of participants had exposure to clinical environments, and so their understanding of professional roles was not comprehensive, and their ability to share their own scope of practice with others was initially limited. However, during the course, students began to elaborate on their understanding of professional roles, and form positive schemas of interprofessionalism early in their careers.

Study Limitations

This IPE intervention has some limitations. First, IEPS and RIPLS both use Likert scales as a means of quantifying changes in participant attitudes and perceptions and Likert scales can be problematic (McFayden et al., 2005, 2007; Pinto et al., 2012). The response categories of Likert scales have a rank order and researchers frequently assume the intervals between values are equal. Incorrect assumptions of intervals may lead to the use of the incorrect statistical technique (Jamieson, 2004). Additionally, internal consistency of the scale may be difficult to achieve (Blaikie, 2003). Fortunately, McFadyen et al. revised both the RIPLS and IEPS to improve psychometric stability and demonstrate high internal consistency (McFadyen et al., 2005, 2007).

This was a resource-intensive offering unlike the typical transient seminar-based format for IPE. Course delivery required adequate physical space, with access to cadaveric material, anatomy laboratory infrastructure, qualified staff to oversee the use of the laboratory, and funding. The ability of academic institutions to provide for such resource demands will depend on their interest in emphasizing longitudinal IPE initiatives, and their ability to direct resources accordingly.

This course is currently an elective initiative, rather than a mandatory curricular responsibility for students. Therefore, while the course was offered to all students in six health professional programs at McMaster University, those who elected to participate in the course likely had a baseline interest in (1) anatomy dissection, (2) IPE, or (3) both. This selection bias has the potential to influence the interpretation of results.

Another issue was that program representation was unequal. Each year, four students from each discipline were participants in the course; however, the MD program is larger and its students showed considerably more interest in participating than other programs. This substantial interest prompted a doubling in the number of MD spots available in the course (8 from 4), leading to unequal program representation in each small group.

CONCLUSIONS

This study found that a ten-week IPE dissection course positively affected the attitudes and perceptions of health professional students toward IPE and other health professions immediately following the program. To build on this, it is essential to measure if the results promise future benefit. A potentially-useful adjunctive study could involve follow-up surveys and focus groups with previous course participants who are now working in the healthcare field. This would enable assessment of the long-term effects of this course on participant attitudes and perceptions towards IPE and other health professions. These results could be compared with a survey of a control group of health professional students who did not participate in the 10-week IPE dissection course. Another adjunctive study could survey IPE program facilitators to highlight means of IPE program improvement from the facilitator perspective (Lindqvist and Reeves, 2007).

Interprofessional education anatomy dissection is a feasible means of integrating IPE into health professional program anatomy curricula. All health professional students require a basic understanding of anatomy. Allowing them to interact intentionally in an interprofessional dissection team can have a dual educational benefit. Integrating this initiative more formally into health professional program curricula would offer all health professional students—not just those with a baseline interest in IPE and anatomy—the opportunity to experience the benefits of interprofessional anatomy dissection.

ACKNOWLEDGMENTS

The authors would like to thank the members of the Education Program in Anatomy at McMaster University; Glen Oomen, the anatomy prosector; our many student facilitators; the IPE pioneering team: Stephanie Chan, Karen Tsui, and Lauren De Meester; the Program for Interprofessional Practice, Education and Research (PIPER), and the Faculty of Health Sciences at McMaster University.

NOTES ON CONTRIBUTORS

ALISHA REBECCA FERNANDES, B.A.S. (Hon.), M.D., is a first-year resident in general surgery in the Department of General Surgery at Faculty of Health Sciences, McMaster University in Hamilton, Ontario, Canada.

ANDREW PALOMBELLA, B.A. (Hon.), M.Sc., M.Sc., is an anatomy prosector and the head of prosection for the Education Program in Anatomy at Faculty of Health Sciences, McMaster University, Hamilton, Ontario, Canada. He teaches anatomy to first- and second-year medical students.

JENN SALFI, R.N., B.Sc.N., M.Sc., Ph.D., is an assistant professor with the Department of Nursing, at Faculty of Applied Health Sciences, Brock University in St. Catharines, Ontario, Canada. Her research interest is in the interprofessional education and collaborative practice, nursing education, and community case management.

BRUCE WAINMAN, B.Sc.(Hon.), M.Sc., Ph.D., is an associate professor of in the Department of Pathology and Molecular Medicine at McMaster University, Hamilton, Ontario, Canada. He is also Director of the Education Program in Anatomy and Director of the McMaster Surgical Skills Laboratory. He teaches pharmacology, anatomy and physiology within various programs at the undergraduate and graduate levels and his research interest relates to exposure and impact of low level environmental toxicants on human reproductive health, IPE and cognitive psychology.

LITERATURE CITED

- Aston SJ, Rheault W, Arenson C, Tappert SK, Stoecker J, Orzoff J, Galitski H, Mackintosh S. 2012. Interprofessional education: A review and analysis of programs from three academic health centers. *Acad Med* 87:949–955.
- Azer SA, Eizenberg N. 2007. Do we need dissection in an integrated problem-based learning medical course? Perceptions of first- and second-year students. *Surg Radiol Anat* 29:173–180.
- Barr H, Freeth D, Hammick M, Koppel I, Reeves S. 2000. Evaluations of Interprofessional Education. 1st Ed. London, UK: The United Kingdom Centre for the Advancement of Interprofessional Education and the British Educational Research Association. 42 p. URL: <http://caipe.org.uk/silo/files/evaluations-of-interprofessional-education.pdf> [accessed 1 October 2014].
- Barnsteiner JH, Disch JM, Hall L, Mayer D, Moore SM. 2007. Promoting interprofessional education. *Nursing Outlook* 55:144–150.
- Blaikie N. 2003. *Analyzing Quantitative Data: From Description to Explanation*. 1st Ed. London, UK: Sage Publication. 352 p.
- Burnard P. 1991. A method of analysing interview transcripts in qualitative research. *Nurse Educ Today* 11:461–466.
- Chan S, Tsui K, De Meester L, Lacharite V, Oomen G, Wainman B, Solomon P. 2011. Dissecting through barriers: Findings from a pilot study on the effect of interprofessional education in a gross anatomy course. *McMaster Univ Med J* 8:11–15.
- CIHC. 2010. Canadian Interprofessional Health Collaborative. A National Interprofessional Competency Framework. 1st Ed. Vancouver, British Columbia, Canada: College of Health Disciplines University of British Columbia. 32 p. URL: http://www.cihc.ca/files/CIHC_IPCompetencies_Feb1210.pdf [accessed 1 October 2014].
- Creswell JW. 2008. *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. 3rd Ed. Boston, MA: Pearson Education. 640 p.
- Escobar-Poni B, Poni E. 2006. The role of gross anatomy in promoting professionalism: A neglected opportunity. *Clin Anat* 19:461–467.
- Gilbert JH, Yan J, Hoffman SJ. 2010. A WHO report: Framework for action on interprofessional education and collaborative practice. *J Allied Health* 39: S196–S197.
- Hamilton SS, Yuan BJ, Lachman N, Hellyer NJ, Krause DA, Hollman JH, Youdas JW, Pawlina W. 2008. Interprofessional education in gross anatomy: Experience with first-year medical and physical therapy students at Mayo Clinic. *Anat Sci Educ* 1:258–263.
- Hammick M, Freeth D, Koppel I, Reeves S, Barr H. 2007. A best evidence systematic review of interprofessional education: BEME guide no. 9. *Med Teach* 29:735–751.
- Ho K, Jarvis-Selinger S, Borduas F, Frank B, Hall P, Handfield-Jones R, Hardwick DF, Lockyer J, Sinclair D, Lauscher HN, Ferdinands L, MacLeod A, Robitaille MA, Rouleau M. 2008. Making interprofessional education work: The strategic roles of the academy. *Acad Med* 83:934–940.
- Hood K, Cant R, Baulch J, Gilbee A, Leech M, Anderson A, Davies K. 2014. Prior experience of interprofessional learning enhances undergraduate nursing and healthcare students' professional identity and attitudes to teamwork. *Nurse Educ Pract* 14:117–122.
- Hopkins D (Editor). 2010. *Framework for Action on Interprofessional Education & Collaborative Practice*. 1st Ed. Geneva, Switzerland: Health Professions Networks Nursing and Midwifery Human Resources for Health, World Health Organization Press. 64 p. URL: http://whqlibdoc.who.int/hq/2010/WHO_HRH_HPN_10.3_eng.pdf?ua=1 [accessed 1 October 2014].
- Jamieson S. 2004. Likert scales: How to (ab)use them. *Med Educ* 38:1212–1218.
- Krause DA, Hollman JH, Pawlina W, Newcomer KL. 2014. Interprofessional education: Collaboration or competition? A tale of two experiences. *Curr Sports Med Rep* 13:291–292.
- Lerner S, Magrane D, Friedman E. 2009. Teaching teamwork in medical education. *Mt Sinai J Med* 76:318–329.
- Lincoln YS, Guba EG. 1985. *Naturalistic Inquiry*. 1st Ed. Newbury Park, CA: Sage. p 416.
- Lindqvist SM, Reeves S. 2007. Facilitators' perceptions of delivering interprofessional education: A qualitative study. *Med Teach* 29:403–405.
- Luecht RM, Madsen MK, Taugher MP, Petterson BJ. 1990. Assessing professional perceptions: Design and validation of an interdisciplinary education perception scale. *Med Teach* 19:181–191.
- McFadyen AK, Webster V, Strachan K, Figgins E, Brown H, McKechnie J. 2005. The readiness for interprofessional learning scale: A possible more stable sub-scale model for the original version of RIPLS. *J Interprof Care* 19:595–603.
- McFadyen AK, Maclaren WM, Webster VS. 2007. The interdisciplinary education perception scale (IEPS): An alternative remodelled sub-scale structure and its reliability. *J Interprof Care* 21:433–443.
- Mellor R, Cottrell N, Moran M. 2013. "Just working in a team was a great experience..."—Student perspectives on the learning experiences of an interprofessional education program. *J Interprof Care* 27:292–297.
- Mitchell BS, McCrorie P, Sedgwick P. 2004. Student attitudes towards anatomy teaching and learning in a multiprofessional context. *Med Educ* 38:737–748.
- Nolte J. 2005. *Enhancing Interdisciplinary Collaboration in Primary Health Care in Canada*. 1st Ed. Ottawa, Canada: The Enhancing Interdisciplinary Collaboration in Primary Care (EICP) Initiative c/o the Conference Board of Canada. 42 p. URL: <http://www.eicp.ca/en/resources/pdfs/enhancing-interdisciplinary-collaboration-in-primary-health-care-in-canada.pdf> [accessed 1 October 2014].
- Parsell G, Bligh J. 1999. The development of a questionnaire to assess the readiness of health care students for interprofessional learning (RIPLS). *Med Educ* 32:95–100.
- Pinto A, Lee S, Lombardo S, Salama M, Ellis S, Kay T, Davies R, Landry MD. 2012. The impact of structured inter-professional education on health care professional students' perceptions of collaboration in a clinical setting. *Physiother Can* 64:145–156.
- Reeves S. 2009. An overview of continuing interprofessional education. *J Contin Educ Health Prof* 29:142–146.
- Shields RK, Pizzimenti MA, Dudley-Javoroski S, Schwinn DA. 2015. Fostering interprofessional teamwork in an academic medical center: Near-peer education for students during gross medical anatomy. *Anat Sci Educ* 8:331–337.
- Snelling J, Sahai A, Ellis H. 2003. Attitudes of medical and dental students to dissection. *Clin Anat* 16:165–172.
- Thistlethwaite J. 2012. Interprofessional education: A review of context, learning and the research agenda. *Med Educ* 46:58–70.
- Thistlethwaite J, Dallest K. 2014. Interprofessional teamwork: Still haven't decided what we are educating for? *Med Educ* 48:556–558.
- Thistlethwaite J, Moran M, World Health Organization Study Group on Interprofessional Education and Collaborative Practice. 2010. *Learning outcomes for interprofessional education (IPE): Literature review and synthesis*. *J Interprof Care* 24:503–513.
- Thomas KJ, Denham BE, Dinolfo JD. 2011. Perceptions among occupational and physical therapy students of a nontraditional methodology for teaching laboratory gross anatomy. *Anat Sci Educ* 4:71–77.
- WHO. 1988. *World Health Organization. Learning Together to Work Together for Health. Report of a WHO Study Group on Multiprofessional Education for Health Personnel: The Team Approach*. World Health Organization Technical Report Series 769. 1st Ed. Geneva, Switzerland: World Health Organization Press. 72 p. URL: http://apps.who.int/iris/bitstream/10665/37411/1/WHO_TRS_769.pdf [accessed 1 October 2014].
- WHO. 2006. *World Health Organization. Working Together for Health: The World Health Report 2006*. 1st Ed. Geneva, Switzerland: World Health Organization Press. 209 p. URL: http://www.who.int/whr/2006/whr06_en.pdf [accessed 14 December 2014].
- WHO. 2010. *World Health Organization. Framework for Action on Interprofessional Education and Collaborative Practice*. 1st Ed. Geneva, Switzerland: World Health Organization Press. 64 p. URL: http://whqlibdoc.who.int/hq/2010/WHO_HRH_HPN_10.3_eng.pdf?ua=1 [accessed 14 December 2014].
- Yan J, Gilbert JH, Hoffman SJ. 2007. World Health Organization Study Group on interprofessional education and collaborative practice. *J Interprof Care* 21:588–589.

APPENDIX

Appendix A.

Weekly Topic, Objectives, and Case Study Breakdown

Topic	Objectives	Case study
Week 1: Introduction to Dissection and the Integumentary System	<ul style="list-style-type: none"> • Become oriented with your dissection team and set group learning goals for the course. • Become familiarized with and practice proper dissection technique. • Appreciate the roles of the integumentary system and the different layers of skin; identify these skin layers on your cadaver. 	<p>Case Study 1.1</p> <ul style="list-style-type: none"> • After an uncomplicated birth, a 30-year old female is diagnosed with pre-eclampsia and sepsis. <p>Case Study 1.2</p> <ul style="list-style-type: none"> • A 86-year old male recently had a hip replacement. After a fall during rehab, the man develops an ulcer on his coccyx and necrotizing fasciitis on his heel.
Week 2 Upper Limb, Elbow and Wrist	<ul style="list-style-type: none"> • To integrate your knowledge of the anatomy of the upper limb with assessment and treatment practices related to clinical cases. • To dissect the wrist, forearm, elbow, and arm gaining an appreciation for the musculature, nerves, arteries, and veins in each region. • To discuss clinical approaches and significant anatomy with interprofessional peers. 	<p>Case Study 2.1</p> <ul style="list-style-type: none"> • A 24-year old male presents with lateral pain near his elbow after recently taking up tennis. <p>Case Study 2.2</p> <ul style="list-style-type: none"> • A 25-year old pregnant female presents with number of first 3 digits and wasting of thenar eminence.
Week 3 Shoulder, Brachial Plexus, and Muscles of the Neck	<ul style="list-style-type: none"> • To integrate your knowledge of shoulder and neck anatomy with assessment and treatment practices related to clinical cases. • To dissect muscles of the shoulder. • To dissect the axilla and its contents, including the brachial plexus. • To dissect the neck, appreciating the muscles and nerve roots in the region. • To discuss clinical approaches and significant anatomy with interprofessional peers. 	<p>Case Study 3.1</p> <ul style="list-style-type: none"> • A 47-year old male commercial painter complains of chronic pain when his shoulder is above his head. <p>Case Study 3.2</p> <ul style="list-style-type: none"> • A child is born and displays healthy vitals; however, doctors notice decreased muscle tone in his right arm.
Week 4 Lower Limb, Hip, and Knee	<ul style="list-style-type: none"> • To integrate your knowledge of lower limb, hip, and knee anatomy with assessment and treatment practices related to clinical cases. • To dissect the muscles of the gluteal region, thigh, and leg. • To dissect the knee joint and popliteal region. • To dissect the major nerves, arteries, and veins of the lower limb, following their pathways. • To discuss clinical approaches and significant anatomy with interprofessional peers. 	<p>Case Study 4.1</p> <ul style="list-style-type: none"> • A 60-year old female, who previously fractured her hip, has hip pain and trouble bearing weight. <p>Case Study 4.2</p> <ul style="list-style-type: none"> • A 17-year old male soccer player receives a blow to lateral side of knee. He complains of pain and swelling on medial side of knee.
Week 5 Thorax, Lungs, and Heart	<ul style="list-style-type: none"> • To integrate your knowledge of thorax, heart, and lung anatomy with assessment and treatment practices related to clinical cases. • To dissect the heart and lungs. • To assess the thoracic cavity and its contents in relationship to one another. • To discuss clinical approaches and significant anatomy with interprofessional peers. 	<p>Case Study 5.1</p> <ul style="list-style-type: none"> • A 26-year old pregnant female is in an automobile accident. Trauma team discover a tension pneumothorax and cardiac tamponade. <p>Case Study 5.2</p>

Appendix A. *Continued*

Topic	Objectives	Case study
		<ul style="list-style-type: none"> • A 15-year years later, same woman is diagnosed with a pulmonary embolism shortly after delivery of another child.
Week 6 Gastrointestinal System and Liver	<ul style="list-style-type: none"> • To integrate your knowledge of the abdomen and its organs with assessment and treatment practices related to clinical cases. • To dissect the anterior abdominal wall. • To assess the abdominal cavity and its contents in relationships to one anatomy. • To discuss clinical approaches and significant anatomy with interprofessional peers. 	<p>Case Study 6.1</p> <ul style="list-style-type: none"> • A 70-year old male is diagnosed with obstructive colorectal cancer. <p>Case Study 6.2</p> <ul style="list-style-type: none"> • A 40-year old female presents with right upper quadrant pain. A CT scan reveals a cystic duct blockage.
Week 7 Renal System	<ul style="list-style-type: none"> • To integrate your knowledge of renal anatomy with assessment and treatment practices related to clinical cases. • To dissect the kidneys, adrenal glands, ureters, and bladder. • To assess the retroperitoneal area and its contents in relationship to one another. • To discuss clinical approaches and significant anatomy with interprofessional peers. 	<p>Case Study 7.1</p> <ul style="list-style-type: none"> • A 52-year old male presents with left flank pain. An x-ray reveals a kidney stone in the left ureter. <p>Case Study 7.2</p> <ul style="list-style-type: none"> • A 19-year old female presents with stenosis of the right renal artery.
Week 8 Male and Female Reproductive Anatomy	<ul style="list-style-type: none"> • To integrate your knowledge of male and female reproductive anatomy with assessment and treatment practices related to clinical cases. • To dissect the male and female reproductive organs and surrounding pelvic cavity. • To assess the pelvic cavity and its contents in relationship to one another. • To discuss clinical approaches and significant anatomy with interprofessional peers. 	<p>Case Study 8.1</p> <ul style="list-style-type: none"> • A 25-year old female dealing with an ectopic pregnancy. <p>Case Study 8.2</p> <ul style="list-style-type: none"> • A 50-year old male is diagnosed with an adenocarcinoma of the prostate.
Week 9 Head, Neck, and Brain	<ul style="list-style-type: none"> • To integrate your knowledge of head, neck, and neuroanatomy with assessment and treatment practices related to clinical cases. • To dissect the head and neck. • To assess the cranial cavity and its contents. • To discuss clinical approaches and significant anatomy with interprofessional peers. 	<p>Case Study 9.1</p> <ul style="list-style-type: none"> • A 33-year old female with an atherosclerotic internal carotid artery deals with an embolism causing a blockage of a cerebral artery.
Week 10 Open Dissection	<ul style="list-style-type: none"> • To have the opportunity to revisit any additional areas of interest. • To dissect areas that were not touched upon or highlighted in the weekly dissection guides. • To have access to demonstrators who can review concepts with you. 	No Case Study

Appendix B.

Revised Interdisciplinary Education Perception Scale (IEPS), (McFayden et al., 2007)

	Strongly disagree	Moderately disagree	Somewhat disagree	Somewhat agree	Moderately agree	Strongly agree
	1	2	3	4	5	6
1. Individuals in my profession are well trained						
2. Individuals in my profession are very positive about their goals and objectives						
3. Individuals in my profession are very positive about their contributions and accomplishments						
4. Individuals in my profession trust each other's professional judgement						
5. Individuals in my profession are extremely competent						
6. Individuals in my profession need to cooperate with other professions						
7. Individuals in my profession must depend upon the work of people in other professions						
8. Individuals in my profession are able to work closely with individuals in other professions						
9. Individuals in my profession are willing to share information and resources with other professionals						
10. Individuals in my profession have good relations with people in other professions						
11. Individuals in my profession think highly of other related professions						
12. Individuals in my profession work well with each other						

Appendix C.

Revised Readiness for Interprofessional Learning Scale (RIPLS), (McFayden et al., 2005)

	Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
1. Learning with other students will help me become a more effective member of a healthcare team					
2. Patients would ultimately benefit if healthcare students worked together to solve patient problems					
3. Shared learning with other healthcare students will increase my ability to understand clinical problems					
4. Learning with healthcare students before qualification would improve relationships after qualification					
5. Communication skills should be learned with other healthcare students					
6. Shared learning will help me to think positively about other professionals					
7. For small group learning to work, students need to trust and respect each other					
8. Team working skills are essential for all healthcare students to learn					
9. Shared learning will help me to understand my own limitations					
10. I don't want to waste my time learning with other healthcare students					
11. It is not necessary for undergraduate healthcare students to learn together					
12. Clinical problem solving skills can only be learned with students from my own department					
13. I would welcome the opportunity to work on small group projects with other healthcare students					
14. Shared learning will help to clarify the nature of patient problems					
15. Shared learning before qualification will help me become a better team worker					
16. The function of nurses and therapists is mainly to provide support for doctors					
17. I'm not sure what my professional role will be					
18. I have to acquire much more knowledge and skills than other healthcare students					

Appendix D.

Revised Interdisciplinary Education Perception Scale (IEPS), and revised Readiness for Interprofessional Learning Scale (RIPLS) subscale breakdowns (McFayden et al., 2005, 2007)

Revised Interdisciplinary Education Perception Scale (IEPS) Subscale Breakdown	Revised Readiness for Interprofessional Learning Scale (RIPLS) Subscale Breakdown
Perception of actual cooperation subscale <ul style="list-style-type: none">• Derived from items 1 through 5	Teamwork and collaboration subscale <ul style="list-style-type: none">• Derived from items 1 through 9
Perceived need for cooperation subscale <ul style="list-style-type: none">• Derived from items 6 through 7	Negative professional identity subscale <ul style="list-style-type: none">• Derived from items 10 through 12
Competency and autonomy subscale <ul style="list-style-type: none">• Derived from items 8 through 12	Positive professional identity subscale <ul style="list-style-type: none">• Derived from items 13 through 15
	Roles and responsibilities subscale <ul style="list-style-type: none">• Derived from items 16 through 18

Appendix E.

Open-Ended Focus Group Questions

1. Do you feel that learning with other healthcare students will help you to become a more effective member of a healthcare team?
 - Why or what not?
 - How do you see your role in a healthcare team now as opposed to before this course?
 2. How did you find this course changed your understanding of anatomy?
 - Do you prefer dissection or viewing prosected specimens? Which facilitated your learning of anatomy and why?
 - Did you find dissecting in an Interprofessional team changed your understanding of anatomy?
 - Did your team members contribute to your understanding of anatomy? Give examples.
 3. How do you think this course changed your understanding of other professions?
 - What did you experience in this course that reinforced or changed your opinion? Give examples.
 4. How do you think this course changed your understanding of your own profession?
 - What, if anything, will you do differently? Give examples.
-